

ABSTRACT

Title of Document: EXPLORING THE RELATIONSHIP
BETWEEN INSTITUTIONAL REVENUE
PATTERNS, STUDENT FINANCIAL AID
PACKAGES, AND DEGREE COMPLETION
FROM A MULTILEVEL PERSPECTIVE

Yekaterina Narozhnaya, Doctor of Philosophy,
2015

Directed By: Professor Marvin A. Titus,
Department of Counseling, Higher Education,
and Special Education

This study utilized data from the 2004 Integrated Postsecondary Education Data Systems (IPEDS) and 2004-2009 Beginning Postsecondary Students (BPS) study to examine the extent to which institutional revenue patterns influence the relationship between college completion and first-year financial aid packages. It drew from resource dependence and financial aid theories to examine the research questions. Multilevel statistical techniques, specifically hierarchical generalized linear modeling (HGLM), were used to estimate the effects of individual- and institutional-level variables on college completion.

This research makes a contribution to the literature by highlighting the effect of institutional financial context on the relationship between college completion and student financial aid at the national level. The main findings suggest that the relationship

between student completion and financial aid packages varies based on institutional revenue patterns. Specifically, students who receive financial aid packages with the highest proportion of loans at institutions with a high percent of revenue from tuition and fees benefit less, with regard to their chance of completion, than students at institutions without a high percent of revenue from tuition and fees. Additionally, students who receive financial aid packages with the highest proportion of grants and loans at institutions with a high level of revenue from state government appropriations benefit less from relatively high grants and loans, in terms of their chances of completion, than students at institutions without a high level of revenue from state government appropriations.

The implications of these findings deal with the distribution of institutional resources on campuses that are mostly dependent on state government appropriations. The study's results suggest that public support for higher education may become increasingly important if student-specific financial aid resources decline.

EXPLORING THE RELATIONSHIP BETWEEN INSTITUTIONAL REVENUE
PATTERNS, STUDENT FINANCIAL AID PACKAGES, AND DEGREE
COMPLETION FROM A MULTILEVEL PERSPECTIVE

By

Yekaterina Narozhnaya

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2015

Advisory Committee:

Associate Professor Marvin Titus, Chair
Professor Alberto Cabrera
Associate Professor Noah Drezner
Associate Professor Robert Croninger
Associate Professor Sharon Fries-Britt

© Copyright by
Yekaterina Narozhnaya
2015

Acknowledgements

I would like to thank Marvin Titus, my advisor and chairperson, for his continued guidance throughout the dissertation process. I would also like to thank Robert Croninger for helping me sort out methodological intricacies of quantitative research. I wish to thank the members of my committee including Drs. Alberto Cabrera, Robert Croninger, Noah Drezner, and Sharon Fries-Britt whose valuable feedback shaped the study. Additionally, I would like to thank Greg Kienzl whose thoughtful advice helped move my dissertation along.

Table of Contents

Acknowledgements.....	ii
Table of Contents.....	iii
List of Tables.....	v
List of Figures.....	vi
CHAPTER 1: Introduction.....	1
The purpose of the study.....	3
Theoretical framework.....	4
Methodology.....	7
CHAPTER 2: Theoretical framework and literature review.....	13
Theoretical framework.....	14
Resource dependence theory.....	15
Theoretical frameworks used in student financial aid research.....	22
Human capital theory.....	23
Net-price theory.....	25
Financial aid and degree completion.....	29
Grants.....	31
Loans.....	34
Work-study.....	36
Aid packaging.....	37
Institutional financial context and college completion.....	39
Summary.....	44
CHAPTER 3: Methods.....	47
Data Sources.....	48
Beginning Postsecondary Students Longitudinal Study.....	48
Integrated Postsecondary Education Data System.....	52
Variables.....	56
Dependent variable.....	56
Independent variables.....	56
Statistical analysis.....	63
Presentation of results.....	71
Centering.....	73
Limitations.....	74
CHAPTER 4: Results.....	79
Overview.....	79
Sample.....	80
Descriptive analysis.....	80
Student-level data.....	80
HGLM Estimates.....	87
Unconditional model.....	87
Student-level variables related to completion.....	89
Institution-level variables related to completion.....	92
Cross-level interactions.....	95
CHAPTER 5: Discussion.....	101
Discussion.....	101

Research question 1	101
Research question 2	105
Research question 3	105
Conclusions	111
Implications	113
Recommendations for future research.....	115
References	107

List of Tables

Table 1: Variables, their sources, and definitions.....	60
Table 2: Number and percentages of missing data cases for all variables in the analytic sample.....	76
Table 3: Descriptive statistics of the analytic sample.....	81
Table 4: Distribution of the analytic sample by bachelor's degree completion.....	83
Table 5: Distribution of the analytic sample by institutional characteristics.....	85
Table 6: HGLM unconditional model.....	87
Table 7: Student-level predictors of completion at a four-year institution among fall 2004 first-time full-time students.....	89
Table 8: Institution-level predictors of completion at a four-year institution among fall 2004 first-time full-time students.....	92
Table 9: Multicollinearity diagnostics results for institutional variables.....	94
Table 10: The effects of financial aid packages on the chance of degree completion at a four-year institution among fall 2004 first-time full-time students.....	95
Table 11: HGLM estimates with interaction effects.....	96

List of Figures

Figure 1: Analytical model to examine student degree completion	69
---	----

CHAPTER 1: Introduction

As federal and state policymakers and major foundations are challenging higher education institutions to double the number of college graduates by 2020, degree completion continues to occupy the attention of both scholars and practitioners. Although more Americans are going to college than ever before (Aud et al., 2010; National Center for Education Statistics [NCES], 2009), college attainment rates, especially at the baccalaureate level, have been lagging (Bound, Lovenheim, & Turner 2007).

In this context, the labor market incentives of completing a degree, particularly the earnings for those with postsecondary education compared to the high school graduates, have soared (Murphy & Welch, 2001; Carnevale & Desrochers, 2003; Carnevale, 2008; Baum, Kurose, & Ma, 2013). More students are seeking a college education and strong economic advantages associated with postsecondary education completion, but a persistent percentage of individuals continue to leave higher education without credentials. Among 2003–04 beginning students, 46 percent of students earned a bachelor’s degree within six years from any four-year institution and only 31 percent from the same 2003-2004 cohort had received a bachelor’s degree within six years from any institution (Radford, Berkner, Wheelless, & Shepherd, 2010).

While student completion remains a national priority, higher education institutions continue to play a vital role in improving student progress and success (Pascarella & Terenzini, 2005; Tinto & Pusser, 2006). An increased focus on student outcomes has brought attention to institutional characteristics and policies that promote student success. What institutions do “in the process of transforming initial college

participation to collegiate attainment and completion” matters (Turner, 2004, p. 50). The research on institutional behavior and its role in student success continues grow, but it is still limited (Bailey, 2006). One important strand of this nascent research is institutional financial context as it relates to student persistence and college completion.

Although there have been studies exploring institutional financial context and various student outcomes, (Ryan, 2004; Oseguera, 2005; Titus, 2004, 2006a, 2006b, 2006c), many authors continue to emphasize the need for more research to improve our understanding of these linkages. For example, Titus whose studies explored the relationship between revenue and expenditure patterns and student persistence, suggested that little research has addressed the role of institutional characteristics on student outcomes at the national level. He maintained that “future research should explore the extent to which organizational behavior influences college completion and other student outcomes” (2006a, p. 370).

This research builds on a growing area of literature that investigates how financial aspects of institutional functioning including revenues, expenditures, endowment, etc. influence persistence and degree completion (Kim, 2007; Rhee, 2008; Titus, 2004, 2006a, 2006b, 2006c). Utilizing multilevel data, the present study seeks to extend this line of research by linking institutional revenue patterns, student financial aid, and college completion. By exploring this connection, the study attempts to move toward a deeper understanding of the impact of institutional behavior on postsecondary outcomes.

The Purpose of the Study

A burgeoning line of research focuses on the effects of institutional context, resources, and policies on degree completion. Among the institutional-level variables associated with degree attainment are institutional control (Ryan, 2004; Titus, 2004, 2006a, 2006b), size and selectivity (Astin, 1993; Berger, 2000; Gansemer-Topf & Schuh, 2006; Oseguera, 2005; Titus, 2004, 2006a, 2006b, 2006c), institutional culture (Berger, 2000; Braxton, 2000) as well as the availability and quality of academic/social student support and programming to students, namely, curriculum and instruction, tutoring, mentoring, and career counseling (Pascarella & Terenzini, 2005). Other prominent financial institutional context variables include revenues and expenditure patterns as well as the allocation of resources to instruction, administration, and student services (Gansemer-Topf & Schuh, 2006; Titus, 2004, 2006a, 2006b, 2006c).

Existing analyses of degree completion shed some light on the ways in which institutional financial context (e.g., revenues, expenditures, etc.) impacts student outcomes. However, no research has empirically explored the influence of financial aspects of institutions in conjunction with student financial aid on the likelihood of college completion. Using student- and institution-level data drawn from Integrated Postsecondary Education Data Systems (IPEDS) and Beginning Postsecondary Students (BPS) study, this research examines the extent to which the relationship between college completion and first-year financial aid packages is influenced by institutional revenue patterns such as high percent of total revenue derived from student tuition and fees and high percent of total revenue derived from state government appropriations.

The study addresses the following research questions:

- 1) How is the chance of college completion influenced by first-year financial aid packages, controlling for other student-level variables?
- 2) After taking into account student- and other institution-level variables, is college completion influenced by institutional revenue patterns?
- 3) Controlling for student variables and other institutional variables, how is the relationship between college completion and first-year financial aid packages influenced by institutional revenue patterns at four-year institutions?

Theoretical Framework

To frame the study of the influence of the financial aspects of institutional behavior on degree completion, this research used a theoretical framework anchored in resource-dependence theory in tandem with theories found in the extant student financial aid literature. Resource-dependence theory explains how institutional financial context marked by resource dependence and external constraints can relate to student outcomes. Student financial aid theories illuminate the role of financial aid in persistence and degree attainment.

Resource-dependence theory is one of the approaches to examining organizational behavior in a changing environment and “seeks to explain organizational and inter-organizational behavior in terms of the critical resources an organization must have in order to survive and function” (Johnson, 1998, p. 1968). It assumes that no organization is self-sufficient and resources (e.g., revenue and expenditures) are necessary for any organization to survive (Pfeffer, 1982). It predicts that institutions will behave in a

manner likely to secure their resource streams and maximize future revenues (Pfeffer & Salancik, 1978).

Resource dependence theory can help analyze institutional use of revenues during times of fiscal austerity (e.g., state appropriations). Given the reductions in state support, colleges and universities are becoming increasingly dependent on tuition and fees as an important source of revenue. To the extent that students can be viewed as a source of revenue, institutions are motivated to engage in stronger retention efforts. For instance, using resource dependence theory in multilevel analyses of bachelor's degree completion, Titus (2006a, 2006b, 2006c) found that institutions in which a larger share of revenues came from tuition had a higher rate of completion. He suggested that students on campuses that derived a high portion of their support from tuition had higher persistence rates because those institutions viewed those students as return customers (Titus, 2006a, 2006b).

To understand student-level financial aid factors associated with completion, the study draws upon two theoretical perspectives to illuminate the impact of student financial aid— human capital theory and net-price theory. Human capital theory predicts that, for students, the decision to invest in higher education is based upon the perceived costs and benefits associated with obtaining a college degree. The benefits of college education, as defined by human capital theorists, are the future earnings students expect to acquire while using their education to engage in economic activity (Becker, 1993). The costs of college education are the tuition and fees used to finance education and the opportunity costs, the earnings that individuals forego while enrolled in college. Financial aid such as loans, grants, and others functions as a price subsidy. The presence of financial aid can decrease the overall costs of degree completion. Human capital

theory therefore suggests that financial resources, including financial aid, can improve student chances to attend and complete college (Becker, 1993; St. John & Starkey, 1995b). The theory also suggests that a reduction in the net price of college would improve access to higher education for some student populations (e.g., low-income students).

Focusing on the direct costs of college, a net-price theory similarly shows that reducing the financial burden of higher education will allow more students to persist to graduation (Leslie & Brinkman, 1987). Empirical evidence supports this notion by showing generally positive effects of financial aid on college enrollment and persistence decisions (Bettinger 2004, 2011; Bound & Turner, 2006; Deming & Dynarski, 2010; DesJardins et al., 2002; Kane, 2007; Light & Strayer, 2000; Paulsen & St. John, 2002; Richburg-Hayes et al., 2009; Seftor & Turner, 2002; Singell, 2004; Singell & Stater 2006; Stater 2009).

The human capital model also provides insights into the extent to which various forms of financial aid influence postsecondary outcomes (Goldrick-Rab, Harris, & Trostel, 2009). Students have different levels of price sensitivity to the cost of education in their college-going behavior (St. John & Starkey, 1995a). Ample evidence shows that while higher levels of aid are associated with a greater likelihood of persistence and graduation (DesJardins et al., 2002; Dowd & Coury, 2006; St. John, Paulsen, & Carter, 2005), loans do not appear as effective as nonrepayable grant aid in fostering persistence and ultimate completion (St. John, 2004; Dowd, 2004; Dowd & Coury, 2006). Students are also sensitive to the changes in the types of aid as well as amounts. Research shows that student outcomes vary by the amount and type of aid provided (Perna, 1998; Horn & Peter, 2003; Chen & DesJardins, 2008) and the composition of financial aid packages

(DesJardins & McCall, 2010), although the effects of allocating resources among grants, loans, and other types of financial aid on postsecondary outcomes are still unclear.

Using a multilevel approach with individual and institutional-level variables, the study employed a framework that uses key elements of two theoretical perspectives. It presents a new analytic approach by integrating resource dependence and financial aid theories to examine whether the relationship between college completion and financial aid packages is influenced by institutional revenue patterns. The new theoretical lens for this research, not yet employed in the research on student persistence and college completion, elucidates the link between the financial aspects of the institutional context, financial aid, and college completion.

Methodology

This study used a multilevel statistical technique known as hierarchical generalized linear modeling (HGLM), an extension of hierarchical linear modeling (HLM), to estimate the effects of individual- and institutional-level variables on college completion.

The multilevel modeling approach was developed to analyze hierarchically structured data that consists of lower-level observations (e.g., student) nested within higher level(s) (e.g., institution). Multilevel models break out the variance attributable to different units of analysis and untangle the interactions between levels and various components at each level. This approach improves estimation of individual- and cross-level effects by simultaneously modeling within- and between-group effects (Raudenbush & Bryk, 2002). By accounting statistically for different units of analysis, it helps avoid underestimations of standard errors and specification errors, and aggregation bias, which are common mistakes when analyzing hierarchically structured data (Raudenbush &

Bryk, 2002; Hox, 2002). In sum, multilevel models help explore the effects of characteristics measured at different levels of the hierarchy, thus producing more accurate estimates and hypothesis tests (Snijders & Bosker, 1999).

Multilevel techniques account for the clustered data structure in their estimations (Raudenbush & Bryk, 2002). Because students are nested within institutions, multilevel modeling is typically used with nationally representative survey data that are clustered (Perna & Titus, 2005; Porter, 2006; Titus, 2006a, 2006b, 2006c). BPS represents clustered data; therefore, multilevel models take into account the nested nature of the survey data such as BPS.

Multilevel modeling is an appropriate analytic method to examine the relationship between college completion and financial aid packages as influenced by institutional revenue patterns for several reasons. First, college completion is a multilevel phenomenon. The study employs two units of analysis: the individual and the institutional (Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). Second, multilevel modeling is an appropriate method for the exploration of a dichotomous outcome, like degree completion (Kleinbaum et al., 1998; Snijders & Bosker, 1999). Many important student outcomes in higher education, including degree completion, can be appropriately conceptualized as dichotomous outcomes (Cabrera, 1994). The dependent variable for the current study—bachelor's degree completion—is binary. Third, employing multilevel theories to anchor the study—resource dependence theory at the institutional level and human capital as well as financial aid at the student level—calls for the use of multilevel modeling.

Data

To address the research questions, the study draws on student-level data from the 2004/09 the Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and the institution-level data 2004-2009 Integrated Postsecondary Education Data System (IPEDS) sponsored by the U.S. Department of Education's National Center for Education Statistics (NCES). For the purposes of this project, the analytic sample includes only full-time, first-time degree-seeking students. The sample is further restricted to students enrolled in public and private non-for-profit four-year institutions.

BPS:04/09 is a nationally representative sample of students who started in a postsecondary education institution for the first-time in the 2003-2004 academic year, following them as they navigate postsecondary education. The BPS cohort was drawn from the NCES-sponsored National Postsecondary Student Aid Study (NPSAS). The first-time students in the BPS:04/09 study were interviewed three times: in the Spring of 2004, at the end of their first year in postsecondary education; in 2006, three years after they had started in postsecondary education; and in 2009, six years following the start of their college careers. BPS collects information on students' postsecondary experiences, work while enrolled, persistence in school, degree completion, and certain labor market outcomes (e.g., employment). Because BPS contains complete information on student progress over a six-year undergraduate academic career as well on how students and their families finance postsecondary education, including financial aid awards, it is an appropriate database to use for this study, given the intent to examine educational outcomes.

The study drew institution-level variables from the IPEDS institutional characteristics, enrollment, and finance surveys for FY 2004. IPEDS surveys campuses

in seven areas: characteristics, prices, enrollment, student financial aid, degrees and certificates awarded, student persistence and success, and institutional human and financial resources.

Variables

Dependent variables

The dependent variable in the analysis is baccalaureate degree completion. It indicates whether a student received a bachelor's degree within six years of enrollment for those who started as first-time, full-time students at four-year institutions. It has two categories: 1=yes (completed bachelor's degree) and 0=no (did not complete bachelor's degree).

Independent variables

The independent variables comprise both student- and institutional- level variables. Both public and private institutions are included in the analysis. Independent institution-level variables include financial context and structural/demographic characteristics including selectivity, mission, and size. Financial context is measured by the revenue variables including the percent of total revenue derived from student tuition and fees and percent of total revenue derived from state government appropriations. Barron's measure of college selectivity is employed because it is associated with the quality of a student body (Clotfelter, 1996; Winston, 1999). Finally, the analysis controls for mission measured by 2005 Basic Carnegie Classification Framework of Institutions of Higher Education TM and size measured by full-time equivalent enrollments.

The student-level variables incorporate demographic and socioeconomic characteristics, academic and financial features including financial aid packages, and non-educational pressures such as employment during enrollment. Consistent with prior

research, the analysis accounts for race/ethnicity, age, gender, and socioeconomic background (parents' highest education and income levels). To approximate academic achievement, students' high school self-reported GPA and college cumulative GPA variables are used.

Student financial characteristics include financial aid variables, which measure how aid is distributed to the student by the type of aid. The study uses several combinations of financial aid packages received at the end of the first year. Working during college is included and operationalized as hours worked per week while enrolled at the end of the first year.

Implications

The study makes several contributions. First, this research adds to existing literature that seeks to explain the connection between institutional financial context and college completion at the national level. It does so by highlighting the impact of institutional revenue patterns on the likelihood that students with different financial aid packages will complete their bachelor's degrees. Second, the findings have implications in terms of the distribution of institutional resources on campuses that are mostly dependent on state government appropriations. The results also underscore the increasing importance of public funding of higher education if the student-specific investment in financial aid declines. Third, the results demonstrate the utility of using multilevel statistical techniques to estimate the extent to which various factors predict the probability of a dichotomous outcome, such as completion of a bachelor's degree. Multilevel models are useful for investigating how the relationship(s) between student-level variables vary as a function of institution-level variables.

Limitations

This research has at least five limitations. First, data used in the study are based on secondary sources. Second, this research may be limited by the availability and adequacy of the variables in the IPEDS and BPS datasets. Two variables, originally intended to be used in the analysis, were excluded due to multicollinearity issues. They include measures reflecting the percent of total revenue from endowment income and the percent of total revenue from competitive grants and contracts. Work-study variables were also dropped from the analysis because of the small numbers of students receiving such financial assistance. Third, the study does not estimate the impact of financial aid packages on completion over a total of six years; it only examines the effect of first-year financial aid packages on completion six years later. Fourth, the findings regarding the effects of financial aid packages on student degree completion should be interpreted with caution due to the inability of this research to deal with endogeneity in financial aid. Fifth, this study is limited by the size of sub-sample of the BPS:04/09 survey. However, despite these limitations, this study produced results that have implications in several areas.

CHAPTER 2: Theoretical Framework and Literature Review

Using student- and institution-level data, this study examines the extent to which the relationship between college completion and financial aid packages is influenced by institutional revenue patterns such as the percent of total revenue derived from student tuition and fees and percent of total revenue derived from state government appropriations at four-year institutions. The research questions guiding the dissertation are:

- 1) How is the chance of college completion influenced by first-year financial aid packages, controlling for other student-level variables?
- 2) After taking into account student- and other institution-level variables, is college completion influenced by institutional revenue patterns?
- 3) Controlling for student variables and other institutional variables, how is the relationship between college completion and first-year financial aid packages influenced by institutional revenue patterns at four-year institutions?

This chapter describes the theoretical framework that guided the inquiry and provides a literature review that synthesizes research regarding the influence of institutional behavior on postsecondary outcomes. Utilizing concepts from resource dependence and student financial aid theories, the chapter opens with an overview of the theoretical framework and its application to the study of the relationship between financial aspects of institutional behavior, degree completion, and student financial aid packages. It presents resource dependence theory and student financial aid theories as central to the study.

The second section of the chapter reviews the empirical research about the impact of financial aspects of institutional functioning on student persistence and degree completion. The chapter concludes by summarizing what is known and still to be discovered about the influence of institutional behavior on student degree completion and describes the ways in which the study addresses the gap in knowledge.

Theoretical Framework

This study of how the financial aspects of institutional behavior influence degree completion uses a theoretical framework anchored in resource dependence theory and student financial aid theories. Resource dependence theory, also referred to as the resource dependency theory, helps explain how institutional financial context characterized by resource dependence and external constraints is related to student outcomes. Student financial aid theories illuminate the role of financial aid in persistence and degree completion.

Using a multilevel approach with individual and institutional variables, the study employs a framework that uses key elements of two theoretical perspectives. By integrating resource dependence and financial aid theories, this research presents a new analytic approach to the examination of whether the relationship between college completion and financial aid packages is influenced by institutional revenue patterns. The new theoretical lens, not yet employed in the student persistence and college completion research, may illuminate the connection between the financial aspects of the institutional context, financial aid, and college completion.

Resource Dependence Theory

Resource dependence theory is utilized to examine organizational behavior in a changing environment. The theory focuses on two primary aspects of organizations: 1) the context or environment in which they operate and 2) the extent to which they depend on resources (Pfeffer & Salancik, 1978). It therefore seeks to explain organizational behavior conditioned by external constraints and a constant need to manage resource dependencies.

Resource dependence theory helps explain how the external environment influences organizational decision-making since “[o]rganizations are inescapably bound up with the conditions of their environment” (Pfeffer & Salancik, 1978, p. 1). The environment can encompass “concentration, the extent to which power and authority in the environment is widely dispersed; munificence, or the availability or scarcity of critical resources; and interconnectedness, the number and pattern of linkages, or connections, among organizations” (Pfeffer & Salancik, 1978, p. 68). One particular aspect of the environment described by Pfeffer & Salancik—munificence—is most relevant to this investigation.

Because resource dependence theory asserts that conflicting demands and external environment pressures shape organizational behavior, it assumes that organizations actively engage with the external environment in their struggle for survival (Pfeffer & Salancik, 1978). Specifically, organizations have to contend with, and rely on, the external environment to acquire and exchange resources. Resource dependence theory views organizations as “capable of changing, as well as responding to the environment” (Aldrich & Pfeffer, 1976, p. 83). In doing so, organizations find themselves responding to the environment in different ways to reduce uncertainties and dependencies.

Organizations attempt to manage dependencies in two major ways: they either adapt to the changing environment, or they alter the nature of their environment (Gumpert & Sporn, 1999). Organizations “alter their purposes and domains to accommodate new interests, sloughing off parts of themselves to avoid some interests, when necessary, becoming involved in activities far afield from their stated central purposes” (Pfeffer & Salancik, 1978, p. 23). Organizations can either change their goals to suit available resources or restructure to cope with new demands. Regardless of its response, an organization’s survival is contingent on its ability to respond to these environmental changes (Pfeffer & Salancik, 1978).

Resource dependence theory also focuses on resources: how they are exchanged, and what dependencies are created as a result of these exchanges (Johnson, 1998). It assumes that no organization is self-sufficient and all organizations require a dependable flow of resources from the external environment to survive because uncertainty puts survival in jeopardy (Emerson, 1962; Pfeffer & Salancik, 1978). For example, resource dependence theory predicts that higher education institutions in response to declines in traditional revenue sources (e.g., government appropriations) will explore other revenue streams. In the search for resources, organizations engage in transactions with other entities in their environment which have the resources they seek. This process creates various interdependencies, which need to be continuously managed: “the effective organization...is the organization which satisfies the demands of those in the environment from whom it requires support for its continued existence” (Pfeffer & Salancik, 1978, p. 60). Put differently, dependence denotes the strength organizations exhibit with respect to their environment (Pfeffer & Salancik, 1978). It is “a measure of how much these organizations must be taken into account and also how likely it is that

they will be perceived as important and considered in the organizations decision making” (Pfeffer & Salancik, 1978, p. 52). As organizations diversify their resource streams and gain independence from a previous source, they automatically generate new interdependencies.

Because organizational needs for different kinds of resources vary, dependencies created as a result of exchanges differ depending on the importance of the resource in meeting organizational goals, the degree of organizational control over its use, and the extent to which alternatives are available (Pfeffer & Salancik, 1978). Resource importance refers not only to the extent of supply but also to how vital resources are to organizational survival (Pfeffer & Salancik, 1978). In higher education, the supply of resources does not just include state, federal, and local government appropriations, the available pool of quality high-school graduates, and the availability of quality faculty, but also institutional capacity to continue to fulfill its mission in times of scarce resources. Resource dependence theory suggests that institutions that are less dependent on traditional revenues (e.g., public funding) are more likely to overcome funding instability than their counterparts that are more reliant on public appropriations.

Resource discretion refers to control over the allocation and use of the resource (Pfeffer & Salancik, 1978). Organizations try to acquire resources without creating too many dependencies, with the related goal of achieving increased autonomy. Colleges and universities prefer unconditional appropriations and less regulation from the state and other entities.

Finally, the availability of alternatives influences the nature of the dependencies (Pfeffer & Salancik, 1978). Dependencies increase when there are few alternative organizations that can provide critical resources. For example, many public institutions

that are heavily dependent on state governments for funds are also subject to state control and regulation of their tuition and fees. In addition, many colleges and universities have institutional missions that may prevent them from developing alternative sources of funding. For example, endowment income is not a major source of revenue for most public institutions.

Higher education institutions are multi-functional entities and rely on many sources of revenue to survive: net tuition; state and local appropriations; private gifts, investment returns, and endowment income; state and local grants and contracts; federal appropriations, grants, and contracts; auxiliary enterprises and hospitals, independent operations, and other sources (Kirshstein & Hurlburt, 2012). Over the past two decades, in response to environmental changes and to manage new dependencies, colleges and universities have resorted to numerous strategies to increase and diversify their revenue streams (Ehrenberg, 2000; Clark, 1998, 2004; Hearn, 2005). One way was increasing commercialization of institutional activities (Bok, 2003). Many institutions were forced to pursue alternative sources of revenue including research, development and analysis activities; technology transfer and service contracts; development office activities focused on private giving and endowment; financial decision-making, human resource and management reforms; auxiliary ventures, facilities and real estate activities; franchising, licensing, sponsorship initiatives and various public/private partnerships (Hearn, 2005).

For most institutions, however, one of the most potent institutional mechanisms to cope with austere financial conditions has become pricing initiatives (Kiley, 2012; SHEEO, 2012). As the share of state operating support for higher education has decreased during the past two decades, colleges and universities have become more

dependent on students as a revenue source (Slaughter & Rhoades, 2004). Private institutions have historically been dependent on the revenues derived from tuition and fees; but public institutions are increasingly following suit to fill the funding gaps. While public institutions typically do not rely on revenue streams characteristic of privates and are still dependent on state/local appropriations, a recent report shows that, for public colleges and universities, revenues from tuition and fees rose from \$42.2 billion in 2008 to \$56.3 billion in 2011 (SHEEO, 2012).

In sum, resource dependence theory suggests that one way in which colleges and universities deal with environmental constraints is to pursue multiple sources of revenue, allowing them to minimize their resource dependence and increase institutional autonomy. With its focus on resources, how these resources are exchanged, and what dependencies are created as a result of these exchanges, this theoretical lens can help analyze the institutional use of revenues in student degree completion during times of fiscal austerity. Tuition is an increasingly important revenue source. To the extent that students can be viewed as a source of revenue, institutions can be motivated to engage in stronger retention efforts (Titus, 2006a, 2006b).

Moreover, by subsidizing student costs with funds derived through institutional revenues institutions are investing in student success. Some research has given credence to this notion. For example, using resource dependence theory in multilevel analysis of bachelor's degree completion, Titus (2006a, 2006b) found that institutions which received a larger share of revenues from tuition had a higher rate of completion. He suggested that students attending institutions that derived a high portion of their resources from tuition had higher persistence rates because those institutions viewed their students as return customers (Titus, 2006a, 2006b). Revenue structures and patterns can thus be

inextricably connected to student outcomes and considered in institutional decision-making about, and strategic to, degree completion.

Resource Dependence Theory in Higher Education Research. Several researchers applied resource dependence theory to higher education research in general and some specifically to the study of student outcomes, including college student retention/completion. Using higher education economic data from four countries including the United States, Slaughter and Leslie (1997) used resource dependence theory to explain entrepreneurialism and the manifestation of market principles in higher education by examining institutional revenue generating practices. They showed how, driven by competition for external resources, institutions secure money through market-like behaviors. Their research reinforced the idea that organizational behavior can be explained by focusing on revenue generation and expenditure patterns (Slaughter & Leslie, 1997).

Other studies have applied resource dependence theory to the study of change and, in particular, organizational adaptation (Gumport & Sporn, 1999; Sporn, 1999). Guided by resource dependence theory, some scholars have analyzed the extent to which shifts in the financial structure of colleges and universities influence institutional governance patterns to manage dependencies associated with the scarcity of resources (Gumport & Pusser, 1999; Leslie & Rhoades, 1995; Slaughter, 1995; Tolbert, 1985).

Additional research has highlighted the influence of resource dependence on organizational work patterns in university-industry relationships (Campbell & Slaughter, 1999), to explore the extent to which particular internal and external resources impact technology transfer practices of colleges and universities (Powers, 2003), and the relationship between institutional rankings and resources (Bastedo & Bowman, 2011).

For example, Bastedo and Bowman (2011) adopted a resource dependence lens (among other institutional theories) to investigate the extent to which college rankings influence the flow of institutional resources. Their research indicates that college rankings can be viewed as an inter-organizational dependence, where better rankings promote the acquisition of funds from a multitude of sources including government, industry, foundations, students, and alumni (Bastedo & Bowman, 2011).

Furthermore, resource dependence theory has been utilized in higher education research to inform several student persistence and completion studies. Titus (2006a, 2006b, 2006c) utilized a framework that leaned on concepts from resource dependence theory to examine the impact of the financial context on student outcomes at four-year institutions. First, he (Titus, 2006a) examined the effect of the institutional financial context on the likelihood of bachelor's degree completion for students with low socio-economic status at their initial four-year institutions. The second study (Titus, 2006b) attempted to explain the extent to which student persistence is influenced by institutional expenditure and revenue patterns, where persistence was defined as being enrolled or having completed a degree three years after being enrolled in the same four-year institution. Lastly, Titus (2006c) explored the degree to which college completion is influenced by financial aspects of the higher education policy context at the state level by applying Berger and Milem's (2000) organizational behavior/student outcomes model, which incorporates the notion of resource dependence. Finally, Chen (2012) borrowed the notion of resource dependence to create a conceptual framework for analyzing how institutional policies and practices, particularly financial resources, influence student dropout behavior.

This study differs from the above research in two ways. While the impact of the institutional financial context on various student outcomes has drawn some empirical attention, most available studies have focused on two outcomes: persistence and dropout. Only one study focused on the outcome of bachelor's degree completion from the institutional perspective (Titus, 2006a). However, its main focus was on completion by SES as influenced by institutional revenues and expenditure patterns. In addition, that study used BPS:96/01 and IPEDS Fall 1995 institutional characteristics and 1996 financial survey data. In contrast, this study uses the most recent, nationally representative data to focus on college completion by linking the institutional financial context with student financial aid. While we know that institutional revenue and expenditure patterns are positively related to student outcomes and, in particular, persistence, nothing is known about the relationship between financial aspects of institutional behavior, degree completion, and student financial aid packages from a multilevel perspective. No known research has explored the influence of institutional financial context on the relationship between degree completion and student financial aid packages. This study seeks to fill this gap.

Theoretical Frameworks Used in Student Financial Aid Research

Resource dependence theory is used to inform this research along with student financial aid theories that facilitate the examination of the link between the financial aspects of the institutional context, financial aid, and college completion. To illuminate the impact of student financial aid, the research draws upon two perspectives— human capital theory and, to a smaller degree, net-price theory. Because aid is a “financial intervention,” most research on its effects tends to utilize the lens of a standard economic

model, using human capital and net-price theories (Goldrick-Rab, Harris, & Trostel, 2009, p. 3).

Human Capital Theory

Human capital theory has been applied to the study of student enrollment, student choice and other literature on student behavior to explore the extent to which postsecondary outcomes depend on financial resources, including financial aid (Bettinger, 2004; DesJardins, Dundar, & Hendel, 1999; DesJardins, Ahlburg, & McCall, 2002; Hossler, Schmit, & Vesper, 1999; Kane, 2003; Manski & Wise, 1983; St. John, Asker, & Hu, 2001; Toutkoushian, 2001). It can provide a useful framework for the analysis of the connection between financial aid and college completion as elaborated below.

Human capital theory views higher education as an investment in human capital, namely, the productivity- and income-enhancing skills, knowledge, and related attributes possessed by individuals (Becker, 1993). As a form of investment in human capital, a college degree is expected to improve labor productivity and ultimately produce premium public and private returns once the individual enters the labor market (Schultz, 1961; Becker, 1993).

In its simplest form, human capital theory predicts that, for students as rational decision-makers, the decision to invest in higher education is to gauge the perceived costs and benefits associated with getting a college degree and the expected return to education (Becker, 1993; Paulsen, 2001; DesJardins & Toutkoushian, 2005). Educational investment is expensive, the costs being both monetary and non-monetary. Direct financial costs associated with attending college include tuition and fees, room and board, books and supplies, and other incremental living expenses plus the opportunity costs or

forgone labor market earnings (Becker, 1993; DesJardins & Toutkoushian, 2005). Non-monetary costs can also be psychic, such as aversion to studying, or the amount of effort required to complete coursework (Heckman, Lochner, & Todd, 2006). Financial aid such as loans, grants, and others functions as a price subsidy. The benefits of college education, as defined by human capital theorists, are the future earnings students expect to acquire while using their education in an economic activity and other non-pecuniary benefits (DesJardins & Toutkoushian, 2005; Paulsen, 2001).

Human capital theory suggests that changes in prices (e.g., tuition and fees) or subsidies (e.g., grants or loans) influence the cost of higher education and may force individuals to reevaluate the benefits arising from their investment. In other words, students will invest in education as long as the marginal benefits are equivalent to the marginal costs (Leslie & Brinkman, 1988; Manski and Wise, 1983). The costs associated with college investment, along with students' credit constraints and/or aversion to borrowing, create a potential role for financial aid, which can decrease the overall costs of degree completion. A reduction in net price, achieved through either a discount to the tuition rate or an increase in financial aid, should boost the supply of resources to pay for a college degree.

Research has showed consistently that, all else being equal, lower costs increase the likelihood of an individual making an investment in higher education (Manski & Wise, 1983; Paulsen, 1998). Human capital theory therefore suggests that financial resources can improve student chances to attend and complete college (Becker, 1993; St. John & Starkey, 1995a, 1995b). Financial aid also mitigates the need for employment while in college, thereby allowing more time for completing course work, which can eventually improve college performance and lead to degree completion. Empirical

evidence supports this notion by showing generally positive effects of financial aid on college enrollment and persistence decisions (Bettinger, 2004, 2010; Bound & Turner, 2007; Chen, 2008; Deming & Dynarski, 2010; DesJardins et al., 2002; Heller, 1997; Kane, 1995; Light & Strayer, 2000; Paulsen & St. John, 2002; Richburg-Hayes et al., 2011; Seftor & Turner, 2002; Singell, 2004; Singell & Stater, 2006; Stater, 2009).

Research consistently shows that higher levels of aid are associated with increased likelihood of persistence and graduation (DesJardins et al., 2002; Dowd & Coury, 2006; St. John et al., 2005).

Net-price Theory

Focusing on the direct costs of college, net-price theory similarly shows that reducing the financial burden of financing college education will allow more students to enroll and persist to graduation (Leslie & Brinkman, 1987). This theory has been used to explain mainly student enrollment and, to a lesser extent, persistence behavior.

Researchers have produced substantial literature analyzing student price responsiveness and the effect of changing tuition and “net price” levels on aggregate enrollments (Heller, 1997, 1999; Leslie & Brinkman, 1988; Rouse, 1994).

Two well-known meta-analyses on the topic (Leslie and Brinkman, 1987; Heller, 1997) highlighted the following: 1) when the tuition of postsecondary education increases, enrollment rates diminish and 2) students have different levels of price sensitivity to college costs in their college-going behavior. Research related to enrollment responsiveness suggests that increases in the net price of college education negatively impact enrollment rates for eligible students (Dynarski, 2003; Heller, 1997, 1999; Hossler, Braxton, & Coopersmith, 1989; Kane, 1995; Leslie & Brinkman, 1987; Manski and Wise, 1983; Paulsen & St. John, 2002; Savoca, 1991; St. John, 1990a). For

instance, in a meta-analysis of 25 studies Leslie and Brinkman (1987) suggested that tuition increases resulted in declines in the college enrollment rate of about 0.75% per \$100. St. John (1990) showed similarly that a \$1,000 increase in tuition is associated with a 2.8% decrease in enrollment.

Net-price theory also suggests that reducing the net price of college would improve access to higher education for some student populations. For example, low-income students have been found to have a greater level of price sensitivity than their higher income counterparts and they are less likely to enroll in higher education due to net price increases compared to other students (St. John, 1992, 1994; St. John & Paulsen, 2001; St. John & Starkey, 1995a, 1995b). Likewise, community college and minority students experience greater price sensitivity than higher income students (Heller, 1997, Leslie & Brinkman, 1987).

Net-price theory further submits that students are sensitive to tuition changes not only in enrollment but in persistence decisions. St. John (1992, 1994), St. John and Starkey (1995a), and St. John and Paulsen (2001) confirmed this by showing that that changes in net prices negatively influenced within-year persistence for traditional college-age students at four-year institutions. Examining the relationship between tuition and financial aid, St. John and Starkey (1995a) and Hippensteel et al. (1996) found that the cost of tuition had a negative effect on within-year persistence for community college students. In the first study, the likelihood of persistence dropped by 1.4 percentage points with each \$100 increase in tuition for traditional age community college students. In the second study, the likelihood of persistence dropped by 1.8 percentage points with each \$100 increase in tuition for adult students. In sum, net-price theory suggests that reduced tuition and fees are effective in increasing student enrollment and persistence. It does not

tell us, however, about the extent to which basic forms of financial assistance such as direct grants, low-interest loans, or work-study influence student outcomes.

Human capital theory fills this gap by providing insights into the extent to which various forms of financial aid influence postsecondary outcomes (Goldrick-Rab, Harris, & Trostel, 2009). Research shows that student outcomes vary by the amount and type of aid provided (Chen & DesJardins, 2008; Dowd, 2004; Horn & Peter, 2003; Perna, 1998). The effects also differ depending on configurations of financial aid programs (Chen, 2008; Perna, 2006) and the composition of financial aid packages (DesJardins et al., 2002; Desjardins & McCall, 2010).

As mentioned earlier, human capital theory assumes that financial aid serves as a source of funds to invest in college education (Paulsen & Toutkoushian, 2008). Through the lens of the human capital model, grants are the least subsidized form of aid and “most desirable source of funds” for students because they have a marginal interest cost of zero (Paulsen & Toutkoushian, 2008, p. 21). Unlike loans, grants do not have to be repaid and are therefore likely to have a greater impact on student outcomes.

Human capital theory suggests that once availability of zero-marginal-interest-cost grants is depleted, individuals resort to funds with the second-lowest marginal interest costs—subsidized student loans and then high-interest funds—unsubsidized loans (Paulsen & Toutkoushian, 2008). From the human capital perspective, loans provide a reasonable form of financial aid to finance one’s investment in college (Mumper, 1996; St. John, 2003). If individuals are aware of the expected economic benefits of attending college and are not debt averse, they should be willing to take out a loan to defray the costs of higher education against their future lifetime income. However, loans may

stimulate less investment in higher education due to the higher marginal interest costs (Paulsen & Toutkoushian, 2008).

By the same logic, the standard model of human capital investment also suggests that financial aid packages consisting of grants, loans, and work-study may influence student investment in higher education and ultimately their outcomes (St. John, Cabrera, Nora, & Asker, 2000a; Paulsen & Toutkoushian, 2008). The composition of a financial aid package, which can provide a mix of grants, loans, and work-study, may have different effects because each yields a distinctly different subsidy. For instance, generous subsidized aid has a positive effect on liquidity constrained individuals by reducing their net tuition. Subsidized loans, which are awarded on the basis of financial need, generally defer repayment until students complete their degrees and charge lower interest rates. College work-study provides a per-hour subsidy but leads to the loss of human capital caused by foregone leisure.

Various packages have different dollar values and other benefits, therefore, it is reasonable to assume that students would respond differently to an alternative mix of grants, loans, and work-study. In addition, changes in the composition of the original student aid package can influence an individual's initial calculations regarding the cost of investing scarce resources in higher education (Goldrick-Rab et al., 2009). "Students who consider financial aid ... as motivation intended to create an action (be it enrollment or persistence), should be more likely than others to respond strongly to that incentive. They should also be affected more when aid diminishes or is withdrawn. This might explain why the front-loading of financial aid...and the revision of aid packages from year to year based on changes in students' circumstances would have significant impacts on students" (Goldrick-Rab et al., 2009, p. 30).

Financial Aid and Degree Completion

Having outlined the main tenets of student financial aid theories, the next section further illuminates the role of financial aid in persistence and degree attainment as manifested in relevant empirical research. Fairly recent studies are the focus because, using advanced quasi-experimental techniques, they have provided more reliable estimates of financial aid effects. One of the weaknesses of earlier scholarship was its inability to arrive at accurate causal estimates of aid effects by failing to control for potential endogeneity of financial aid—the correlation of financial aid with unobserved attributes of students (Goldrick-Rab et al., 2009).

Most studies investigating the effects of financial aid have focused on enrollment outcomes or college choice (Dynarski, 2003; Ehrenberg & Sherman, 1984; Kane, 1999; Leslie & Brinkman, 1987). Generally, quasi-experimental research assessing the effectiveness of financial aid in encouraging enrollment shows some positive outcomes, although the effectiveness of aid tends to be mixed. Kane (2003) found that a \$1,000 reduction in college costs resulted in a three or four percentage point increase in college attendance rates and influenced college choice. Using difference-in-differences analysis to examine the effects of the Social Security program benefits, Dynarski (2003) found that aid discontinuation decreased the likelihood of attending college by about one fourth. An offer of \$1,000 in grant aid was estimated to increase the probability of attending college by about 3.6 percentage points (Dynarski, 2003). Seftor and Turner (2002) suggested that a decrease in the Pell Grant depressed enrollment among older college students by four percentage points, evidence comparable to the effect of removing Social Security program benefits on the likelihood of going to college (Dynarski, 2003).

Recent work by Castleman and Long (2013) investigated the effects of a need-based Florida Student Access Grant (FSAG). Using a regression-discontinuity design, they found a positive effect of FSAG on student enrollment at public, four-year institutions. The study estimated that \$1,000 in grant aid increased the enrollment by 2.5 percentage points. The estimates were consistent with earlier research (Dynarski, 2003; Kane, 2003).

The impact of merit-based aid has also been documented. For instance, Dynarski (2000) showed that the Georgia HOPE scholarship program increased college enrollment rates by seven to 7.9 percentage points. She estimated that for every \$1,000 in aid, college enrollment grew by 3.7 to 4.2 percentage points (Dynarski, 2000). Examining the same program, Cornwell, Mustard, and Sridhar (2005) similarly found that HOPE increased overall enrollment by 6.9 percentage points, with the largest share of enrollment observed in four-year institutions.

Similar effects were observed with state aid (Dynarski, 2004; Kane, 2003), Pell Grants (Curs et al., 2007; Seftor & Turner, 2002), and institutional aid (DesJardins et al., 2002; Gross et al., 2007; Van der Klaauw, 2002). However, these estimates varied by student background and demographics, the type of institution attended, and structure and configuration of the financial aid programs (Cellini, 2010; Cornwell et al., 2005; Curs et al., 2007; Dynarski, 2000, 2002, 2003; Kane, 2003, Linsenmeier et al., 2006; Seftor & Turner, 2002; Singell, 2004; Van der Klaauw, 2002).

Less is known about the effects of financial aid on student persistence and completion, although more attention has been paid to these outcomes in recent years. A handful of studies attempted to establish a strong causal link between financial aid and college completion. The following section provides an overview of the recent extant

research on the effect of grants, loans, and work-study on college persistence and completion.

Grants

Most research over the past decade supports the effectiveness of grant aid in improving persistence and college completion (Bettinger, 2004, 2010; Bound & Turner, 2002; DesJardins et al., 2002; Dynarski, 2003; Kane, 2007; Light & Strayer, 2000; Paulsen & St. John, 2002; Seftor & Turner, 2002; Singell, 2004; Singell & Stater, 2006; St. John, 1989; 2003; Stater, 2009; Stinebrickner & Stinebrickner, 2003; Van der Klauuw, 2002). Analyzing the NLS72 and HSB data, St. John (1989) consistently found a positive link between grant aid and persistence in the first, second, and third years of college enrollment. Using difference-in-differences analysis to examine the effects of Social Security program benefits, Dynarski (2003) found that a \$1,000 aid increase was associated with a 3.6 percentage point increase in persistence. Relying on discontinuities in the aid formulae, Bettinger (2004) examined the effect of grants on student persistence. He similarly found that that a \$1,000 increase in the Pell Grant resulted in a three percentage point increase in persistence in a student's first year of enrollment (Bettinger, 2004). In a subsequent study, Bettinger (2010) focused on the effects of a change in need-based grant formula in Ohio, which switched from using income and family size parameters to using students' FAFSA-estimated family contributions. For those who benefitted from the new formula, an average increase of \$750 in aid improved persistence from first to second year by two percentage points.

Using a regression-discontinuity design, Castleman and Long (2013) investigated the effects of a need-based Florida Student Access Grant (FSAG) on student outcomes at public four-year institutions. They found that grant aid increased eligible students' short-

term persistence and credit accumulation. FSAG also increased the probability of bachelor's degree completion within six years by 3.5 percentage points. For those on the margin of eligibility, the aid increased the likelihood of bachelor's degree completion by 22 percent.

Most research on the effects of merit-based aid on college completion also provides evidence that financial aid contributes to student persistence and completion. A few studies, however, suggest a weak relationship. Using a treatment-comparison research design, Dynarski (2008) provided strong evidence from the Arkansas and Georgia programs that merit-based subsidies had a positive effect on both college persistence and completion. The probability of persistence increased by five to 11 percentage points and of degree completion grew by three to four percentage points. She noted that was a "substantial effect, given that the baseline share of the affected population with a college degree was just 27 percent" (Dynarski, 2008, p. 607). Henry, Rubenstein, and Bugler (2004) also found that Georgia's HOPE recipients had a higher likelihood of graduating in four years than non-recipients.

Another merit-based program, West Virginia's PROMISE scholarship, has been shown to promote degree completion (Scott-Clayton, 2011a). Using regression-discontinuity techniques, Scott-Clayton's (2011a) study suggested that PROMISE, which provides free tuition and fees to students to earning a minimum GPA and completing thirty credits annually, increased five-year bachelor's degree completion rates by 3.7 percentage points and four-year bachelor's degree completion rates by 6.7 percentage points.

Carruthers and Ozek (2013) used two-way fixed effects models to estimate the effect of losing the Tennessee HOPE scholarship on student outcomes. They found that

the loss of a scholarship substantially increased the likelihood of dropping out of college: students were seven percentage points more likely to withdraw, and each \$1,000 in aid reduction increased the drop-out rate by 1.3-1.7 percentage points (Carruthers & Ozek, 2013).

Few recent studies focusing on the effects of merit-based aid suggested a negligible impact on completion (Bruce & Carruthers, 2011; Cohodes & Goodman, 2012; Sjoquist & Winters, 2012). Using regression discontinuity and difference-in-difference methods, Bruce and Carruthers (2011) used ACT score cutoffs that determine eligibility for Tennessee's HOPE program to examine the effect of the scholarship on student outcomes. They found little evidence that Tennessee HOPE had a positive impact on whether students graduated in four years. Using Census and American Community Survey data, Sjoquist and Winters (2012) investigated the effects of multiple broad-based merit aid programs on student outcomes in 25 states and found no meaningful effect on college completion graduation rates as a result of exposure to merit aid.

Some research focused on whether incentive awards and scholarships to improve student outcomes demonstrated a positive relationship between aid and completion. Three rigorous random assignment studies suggested that these subsidies positively influenced semester-to-semester persistence and credit attainment of low-income community college students (Cha & Patel, 2010; Richburg-Hayes et al., 2011). Drawing from another randomized experiment, a recent study examined the effect of need-based awards on student persistence in four cohorts of Wisconsin students from four-year public universities (Goldrick-Rab et al., 2012). The findings suggested that, after four semesters of treatment, a need-based award offered to Pell Grant recipients improved

credit accumulation and re-enrollment rates for a second year of college (Goldrick-Rab et al., 2012).

Loans

Subsidized and unsubsidized loans are another important part of a student's financial aid package. It is well-documented that financial aid—especially the purchasing power of the Pell Grant—has not kept pace with the costs of college attendance (Baum, McPherson, & Steele, 2008) while state aid has shifted from being predominantly grants to predominantly loans. Moreover, over the past several decades, loans have assumed a greater share of student aid packages. At the same time, students have relied increasingly on borrowing to offset the costs of college, particularly because of the addition of unsubsidized loans.

While loans have become a key financing strategy for many students, less is known about their impact on persistence and, especially, completion. Some researchers deem the impact of loans on student outcomes to be situational, depending on variables such as the level of debt and other factors (St. John, 2003). Generalizations about the role of loans in encouraging persistence based on extant studies is complicated by methodological differences, including the treatment of financial aid variables (dichotomous or continuous), distinguishing between loan types (subsidized and unsubsidized), the inclusion of aid thresholds, and other research design decisions (Hossler, Ziskin, Sooyeon, Osman, & Gross, 2008). With so many statistical challenges, the findings on the effects of loans are mixed.

Early research documents the association between loans, enrollment and persistence (Moore et al., 1991; St. John, 1990a, 1990b; St. John et al., 1991) but the evidence is not very robust. Some studies suggest that increases in loan eligibility result

in higher college enrollment rates, but the effects are observed for mainly middle- and upper-income households (Dynarski, 2002; Long, 2007). For example, Dynarski (2002) used the removal of home equity values from the federal aid formula to examine the effects of augmented loan availability on middle-income student outcomes. The availability of subsidized loans had a small effect on college enrollment and college choice (Dynarski, 2002). Similarly examining the impact of increased availability of student loans, Long (2007) found that loan expansion positively influenced college enrollment.

With few exceptions (Cofer & Somers, 2000; DesJardins et al., 2002; Somers, 1995), research shows that loans do not appear as effective as nonrepayable grant aid in fostering persistence, particularly for low-income households (DesJardins et al., 2002; Dowd & Coury, 2006; Paulsen & St. John, 2002; Perna, 1998; St. John, 1998; St. John, Andrieu, Oescher, & Starkey 1994; St. John & Starkey, 1995a, 1995b) and can even decrease the chances of completion (Kim, 2007). Some NPSAS analysis indicates that loans do not promote student within-year persistence at four-year institutions (St. John et al., 1994). Using BPS data, Dowd and Coury's (2006) research supports the negative association between loans and persistence into a second year and suggests that borrowing is not related to an associate's degree completion. Using the same data, Perna (1998) indicates that loans do not promote persistence behavior, even when they are mixed with grants in a student's aid package. Financing higher education with substantial loans in the first year was found to negatively influence degree completion for low-income students (Kim, 2007).

Work-Study

Along with grants and loans, federal work study programs provide an extra financial incentive for needy students. Available research on the impact of work-study on student persistence and completion is scant and inconclusive.

The majority of studies suggest that the effects of work-study are either positive or not significant (Alon, 2005; Braunstein et al., 2000; Cofer & Somers, 2000; DesJardins et al., 2002; Dowd & Coury, 2006; Hu & St. John, 2001; Perna, 1998; St. John et al., 1991; St. John et al., 1994; St. John et al., 2000b; Somers, 1995). For example, using a hazard model DesJardins et al. (2002) observed that work-study promoted persistence (defined as continuous enrollment) in the early years of college while, for later years, work-study produced the highest statistically significant positive influence on persistence compared to grants and loans. Using instrumental variable probit models, Alon (2005) found that work-study dollars had a positive effect on the probability of completion. The author noted, however, that it was likely due to the ceiling on the number of hours students could be employed while enrolled (Alon, 2005).

Evidence also indicates that work-study incentives may produce a negative effect on completion (Scott-Clayton, 2011b). In the first quasi-experimental study to date, Scott-Clayton (2011b) used difference-in-difference analysis to identify causal effects of work-study for students in West Virginia. The author reported that it had no effect on the academic outcomes for the full sample, while it affected females more negatively than men and older students. Scott-Clayton (2011b) warns that, due to the limitation of the sample and the fact that the analysis focused only student outcomes conditional on enrollment, the above findings should be interpreted with caution.

Aid Packaging

Because students may receive multiple sources of aid, some scholars have focused on dissecting the role of financial aid packaging. Olivas' (1985) research on provided the first empirical call towards a better understanding of the differential effects of aid and its impact on educational outcomes. Since then, a few studies analyzing national data found that aid packages with a loan component are positively associated with persistence for all students in the sample and particularly for middle-income students (St. John et al., 1991; St. John & Starkey, 1995a, b). Most of the studies relying on institutional data, however, suggest that aid packages including loans do not exert influence on persistence (Braunstein et al.; 2000; Herzog, 2005; St. John, 1998; St. John et al., 2000b). One study using data from a single state examined the effect of financial aid packaging on within-year student persistence in that state's higher education system (Hu & St. John, 2001). It explored the extent to which persistence was influenced by loans only, grants only, loans and grants combined, or other aid package formats. Hu and St. John (2001) suggested that, at four-year institutions, aid recipients with a mix of grants and loans persisted better than non- recipients.

A related strand of research finds that changes in aid packaging may influence student persistence and other outcomes based on the relative share of loans, grants or scholarships, and work-study in a student's aid package (DesJardins et al., 2010; Linsenmeier et al., 2006; Savoca, 1991; St. John, 1989; St. John et al., 1991). For example, using the NLS72 data, Savoca (1991) studied the extent to which the shift in the composition of student financial aid away from grants to loans negatively affected college enrollments from 1972 to 1985. The results suggest that the probability of

college enrollment decreases when loans replace grants, dollar-for-dollar, in the student financial aid package.

Using regression-discontinuity and difference-in-difference analyses, Linsenmeier, Rosen, and Rouse (2006) investigated the changes in the financial aid packaging policy at an anonymous northeastern university. They found that an institution's switch from loans to grants had a positive impact on enrollment for low-income, minority students. Specifically, the policy change was associated with an increased likelihood of these students' matriculation by eight and ten percentage points. Their study suggested that replacing loans with grants increases the chances of persistence for students who are averse to borrowing.

DesJardins et al. (2010) employed event history modeling to examine the extent to which financial aid packaging influenced degree completion at four-year institutions. In a simulation, the authors found that replacing loans with grants or scholarships reduces stopouts and increases student likelihood of completion. Specifically, for students who experience an initial stopout, the probability of reenrollment increases by 27% while the chance of completion increases by approximately 32% (if a student has one stopout spell) (DesJardins et al., 2010).

Despite some of the above findings, more research is necessary to further illuminate the role of financial aid packaging on student outcomes. Studies focused on the role of financial aid packaging in student persistence and completion is scarce and has some limitations. First, with the exception of one study (DesJardins et al., 2010), most research about the role of financial aid packaging focuses on enrollment and persistence rather than completion. Second, there is still a lack of understanding of how different forms of aid in a student package influence student outcomes and what types of financial

aid packages are most effective in supporting these outcomes. Third, prior studies tend to focus on the effects of only grants and/or loans in a student mix of aid thus ignoring the work-study component. In summary, while the potential benefits of providing financial aid appear positive, much more research is needed to learn about the impact of financial aid packages on persistence and completion.

This section has provided a brief overview of the empirical research related to the impact of financial aid on student outcomes which has informed the examination of the student-level financial aid factors associated with completion. What follows is a review of the research examining the impact of financial aspects of institutional functioning on student outcomes for the analysis of the institutional-level factors associated with completion in the study.

Institutional Financial Context and College Completion

A significant body of research conducted over the last three decades attempted to unpack what contributes to student completion from an individual's perspective (Bean, 1980, 2005; Braxton, 2000; Braxton, 2004; Cabrera, Castañeda, Nora, & Hengstler, 1992; Pascarella & Terenzini, 2005; Perna & Thomas, 2008; Tinto, 1993). Academic, socio-economic, cultural, personal and other factors play a well-documented part in explaining students' likelihood of degree completion. A growing number of recent studies focused on the determinants of degree completion have suggested the importance of accounting more deeply for state-level characteristics and policies such as tuition and financial aid policies (Berger & Kostal, 2002; Heller, 1999, 2002; Kane, 1995; Perna & Titus, 2004; Titus, 2006c), fiscal aspects of state higher education (Titus, 2009) and state context (Roksa, 2010) as well as certain state economic conditions such as wage and employment opportunities (Light, 1995).

A parallel line of inquiry has drawn attention to the effects of institutional context, resources, and policies on degree completion but this research is less abundant (Berger & Milem, 2000; Titus, 2004, 2006a, 2006b, 2006c). Because these studies take an institution-centric approach, I build on a growing body of literature exploring the extent to which financial aspects of institutional behavior influence persistence and degree completion (Kim, 2007; Rhee, 2008; Titus, 2004, 2006a, 2006b).

Berger and Milem's (2000) work contributed to a better conceptual understanding of the impact of organizational behavior on student outcomes. Their framework assumes that student pre-college characteristics and organizational attributes, including structures, practices, and policies, influence student socialization patterns and peer environment, and, therefore, student outcomes (Berger & Milem, 2000). It emphasizes "structural-demographic features" of institutions and "organizational behavior dimensions" (Berger & Milem, 2000, p. 310). The former refers to the influence of such institutional characteristics as size, control, admission selectivity, Carnegie Classification™ type, and location. The latter has to do with organizational behavior, culture, and climate, clustering organizational behavior into bureaucratic, collegial, political, symbolic, and systemic types (Berger & Milem, 2000). "Organizational behavior dimensions" describe internal organizational environments by highlighting an institution's structures, practices, policies, and climate. Berger and Milem's (2000) framework suggests that, unlike more static institutional characteristics (e.g., size or institutional type), these specific internal organizational structures, practices, and policies influence student outcomes (directly or indirectly) because they can promote or impede certain kinds of student experiences and can therefore be aligned to cultivate and advance student success.

Titus (2004, 2006a, 2006b) borrowed Berger and Milem's (2000) framework to expand the systemic dimension of organizational behavior to analyze student persistence. Berger and Milem (2000) maintain that a systemic organization functions as a constellation of interconnected subsystems, where organizational behavior is influenced by both internal and external forces. Titus (2004, 2006a, 2006b) has developed this further by focusing on institutional financial context and, specifically, institutional resources, including revenue and expenditure patterns. His work considers financial and educational resources, the impact of resource allocation and spending patterns, as well as the impact of this behavior on student outcomes. The systemic dimension of organizational behavior is linked to the availability, allocation and scope of resources that institutions can employ in their daily operational functioning. This study follows Titus's (2006a, 2006b) focus on the institutional financial context and similarly views the systemic dimension of organizational behavior through the lens of resource dependence theory.

Studies have shown that institutional financial resources, including revenues and expenditure patterns and their distribution, matter for degree completion. This strand of research reveals some important effects of institutional financial context on persistence and degree completion, although the results are mixed (Gansemer-Topf & Schuh, 2006; Porter, 2000; Ryan, 2004; Titus, 2004, 2006a, 2006b, 2006c).

In general, institutions with larger expenditures tend to have higher rates of persistence and completion but the effects vary by type (Bailey et al., 2005; Gansemer-Topf & Schuh, 2006; Hamrick et al., 2004; Oseguera, 2005; Ryan, 2004). Using data from baccalaureate institutions, Ryan (2004) estimated the impact of expenditures for instruction, academic support, student services, and administrative support on the six-

year cohort graduation rates. He found that, after controlling for several important retention variables, instructional and academic support expenditures have a positive effect on degree completion while expenditures on student services and administrative support had no impact. Using data from the IPEDS, Hamrick and colleagues (2004) similarly found that instructional and academic support expenditures were significantly related to student completion, explaining between 21 and 34 percent of the variance in bachelor's degree completion in their study of how institutional resource allocations influence graduation rates at public four-year institutions. In another study the relationship between expenditures and completion was positive. Using national institutional and individual student data, Bailey et al. (2005) investigated institutional characteristics that affect community college student success. They found that instructional and student service expenditures produced some positive impacts on completion rates of community college students.

One more study of bachelor's degree completion explored the relationship between college expenditures and student outcomes over a ten-year period at private baccalaureate institutions (Gansemer-Topf & Schuh, 2006). The authors concluded that increased expenditures that support the academic mission of an institution, except the ones for the institutional/administrative support purposes, had a positive impact on student outcomes. Specifically, instructional expenditures were positively associated with first-year student persistence and six-year graduation rates for all institutions in the sample. Similarly, expenditures for academic support services positively predicted both persistence and completion but they seem to matter only for highly selective institutions (Gansemer-Topf & Schuh, 2006). This finding echoes the results of Oseguera's (2005)

research, namely, that students at less selective institutions, which tend to have lower levels of expenditures, are also less likely to obtain a bachelor's degree.

In his longitudinal, multilevel analyses of student persistence and degree completion at four-year institutions, Titus (2006a, 2006b) addressed the role of institutional financial context as well. Using BPS and IPEDs data, he found that institutional financial context operationalized as financial activities, including sources of revenue and expenditure patterns, have important implications for student persistence and completion at four-year institutions (Titus, 2006a, 2006b). The results suggest that institutional revenue derived from tuition and expenditure per full-time equivalent student is associated with greater degree completion (Titus, 2006a). The author maintained that persistence, on average, depends on the extent to which institutions rely on tuition as a source of revenue, implying that the greater institutional reliance on tuition as a source of revenue, the more institutions attend to student retention (Titus, 2006b). Additionally, the average chance of persistence was found to depend on institutional expenditure patterns: it decreases as institutions allocate more funds to administrative purposes (Titus, 2006b).

Webber and Ehrenberg (2010) used institutional level data to estimate whether non-instructional expenditures influenced graduation and first-year persistence rates of undergraduate students. They observed that student service expenditures are positively related to graduation and persistence rates, and their marginal effects are higher for students attending institutions with lower admission scores and higher Pell Grant expenditures. The results, however, were not very robust. The researchers concluded that “an increase in student services expenditures of \$100 per student, on average, would increase an institution's 6-year graduation rate by 0.2 percentage points” and that

“similar increases in instructional expenditures and academic support services expenditures would, on average, increase the graduation rate by about 0.08 percentage points” (Webber & Ehrenberg, 2010, p. 952).

More recently, in a multilevel event history study, Chen (2012) identified key institutional characteristics related to student dropout risk at four-year institutions. The author suggested that higher rates of expenditures on student services were associated with a lower risk of student departure. However, contrary to some of the research described above, expenditures on instruction and academic support were not significantly related to dropout risk at students’ first institution (Chen, 2012).

In summary, existing institutional analyses of degree completion shed some light on the ways in which financial context impacts student outcomes including persistence, retention, or degree completion. Collectively, these studies suggest that institutional financial context matters and it matters more for less selective institutions or ones with lower graduation and persistence rates (Gansemer-Topf & Schuh, 2006; Oseguera, 2005; Webber & Ehrenberg, 2010).

Summary

This chapter presented a theoretical framework that incorporates resource dependence and financial aid theories to examine whether the relationship between college completion and financial aid packages is influenced by institutional revenue patterns. In order to understand organizational behavior and, specifically, institutional financial context, the research draws from resource dependence theory. The study further borrows from two perspectives to illuminate the impact of student financial aid—human capital theory and, to a smaller degree, net-price theory.

The chapter also provided an overview of the empirical research related to the impact of financial aid on student persistence and completion as well as studies examining the impact of financial aspects of institutional functioning on the same outcomes. Despite mixed results, there is strong evidence of a positive relationship between financial aid, persistence, and completion. It's also fairly clear that institutional financial context exerts influence, although often indirectly, on student outcomes. The findings are somewhat inconsistent due to methodological differences but the bulk of the studies support this notion. Although there has been a surge of investigations into institutional financial context and various student outcomes, (Chen, 2012; Oseguera, 2005; Ryan, 2004; Titus, 2004, 2006a, 2006b; Webber & Ehrenberg, 2010), many authors continue to emphasize the need for more research (Bound et al., 2010; Titus, 2004, 2006a, 2006b). A better understanding of the institution-level factors preventing student success is warranted because student characteristics alone are not sufficient to explain existing rates of college completion (Bound & Turner, 2006; Bound et al., 2010).

While we know that revenue and expenditure patterns are positively related to student outcomes, nothing is known about the relationship between financial aspects of institutional behavior, degree completion, and student financial aid packages from a multilevel perspective. This study aims to address the void. Using nationally representative data, it attempts to provide a foundation for investigating a more complex linkage between college completion and financial aid packages as influenced by institutional revenue patterns.

The use of multilevel theories to anchor the study—resource dependence theory at the institutional level, and human capital as well as financial aid theories at the student level—calls for the use of multilevel modeling. This approach may lead to a more

nuanced understanding of organizational behavior's impact on postsecondary outcomes. This investigation merges resource dependence theory and financial aid theories into a unified framework to potentially better understand the relationship between financial aspects of institutional behavior, degree completion, and student financial aid packages. Chapter 3 describes in detail the research design, including the data, analytic sample, statistical methods, variables, and study limitations to investigate how the relationship between the probability of a student completing a bachelor's degree and their financial aid packages is influenced by institutional revenue patterns.

CHAPTER 3: Methods

Utilizing resource dependence theory and student financial aid literature, this study explores the extent to which the relationship between college completion and financial aid packages is influenced by institutional revenue patterns such as high percent of total revenue derived from student tuition and fees and high percent of total revenue derived from state government appropriations at four-year institutions.

Using multilevel methods, this study uses student- and institution-level data to explore the following research questions:

- 1) How is the chance of college completion influenced by first-year financial aid packages, controlling for other student-level variables?
- 2) After taking into account student- and other institution-level variables, is college completion influenced by institutional revenue patterns?
- 3) Controlling for student variables and other institutional variables, how is the relationship between college completion and first-year financial aid packages influenced by institutional revenue patterns at four-year institutions?

This chapter begins with a description of the data drawn from the IPEDS and BPS datasets. It then describes the variables included in the study and presents the conceptual framework. The statistical techniques used to address the research questions are presented next, followed by limitations of the study.

Data Sources

To address the research questions, the study draws on student-level data from the 2004/09 the Beginning Postsecondary Students Longitudinal Study (BPS:04/09) and the institution-level data from the 2004-2009 Integrated Postsecondary Education Data System (IPEDS) sponsored by the U.S. Department of Education's National Center for Education Statistics (NCES). This research will link the data from the IPEDS FY 2004 to the data from the BPS:04/09 survey where the latter is a longitudinal dataset containing information on students who started in a postsecondary education institution for the first-time in the 2003-2004 academic year.

For the purposes of the study, the analytic sample includes only full-time, first-time degree-seeking students enrolled in not-for-profit public or private four-year institutions. It is further restricted to U.S. citizens and permanent residents. The sample is also limited to dependent students because financial aid packages vary considerably among independent and dependent students.

Beginning Postsecondary Students Longitudinal Study

BPS:04/09 is a nationally representative survey following students as they navigate the system of postsecondary education. BPS collects information on students' postsecondary experiences, work while enrolled, persistence, degree completion, and certain labor market outcomes such as employment.

The data files for the BPS:04/09 contain student-level data collected from government and administrative databases, student interviews, and student transcripts. These data are available via two ways. First, they are offered as a set of research files restricted to licensees from the NCES with full documentation provided by an electronic codebook (ECB). The restricted files are available to researchers who have applied for

and obtained authorization from NCES. Second, public-use data are also available through the NCES online application PowerStats, which contains variable documentation and can be accessed at <http://nces.ed.gov/datalab/>. Any user can run tables and regression analyses via Powerstats. This research utilizes the former method of accessing the BPS:04/09 data.

The final BPS:04/09 dataset includes information on almost 16,700 students (Wine et al., 2013). BPS:04/09 is the most recent in the series of BPS studies. Two earlier surveys took place between 1990 and 1994 (BPS:90/94) and between 1996 and 2001 (BPS:96/2001) (NCES, n.d.). The target population for the BPS:04/09 study is first-time beginners: students who started their postsecondary education for the first time during the 2003–04 academic year at any postsecondary institution in the United States or Puerto Rico regardless of the high school completion date. The BPS:04/09 sample included 18,640 eligible students. The final BPS:04/09 dataset includes information on 16,680 students with an overall weighted response rate of 89 percent (Radford et al., 2010). The respondents were individuals who were eligible for the study, were still alive during the BPS:04/09 data collection, and had the necessary data to construct their enrollment history (Wine et al., 2011).

The BPS cohort is drawn from a NCES-sponsored National Postsecondary Student Aid Study (NPSAS:04), which is used as its sampling frame. NPSAS collects data drawn from student financial aid information supplied by the federal and state governments, postsecondary institutions, employers, and private entities, as well as student demographic and enrollment data. Data for NPSAS:04 were collected from a variety of sources: institutional records, government databases, and student interviews. Institutional records supply data on student participation in financial aid programs while

web-based student interviews provide detailed data about their demographics, families, education, educational aspirations, and work experiences (NCES, n.d.). NPSAS:04 has a two-stage sampling design. The first stage involves the selection of eligible postsecondary institutions and the second stage involves the selection of eligible students located within the eligible institutions (Wine et al., 2011).

Students are surveyed three times: in the first year by NPSAS and then three and six years after entering postsecondary education in the BPS follow-up surveys. The first-time beginners in the BPS:04/09 study were interviewed in the spring of 2004 at the end of their first year; in 2006, three years after they began their studies; and in 2009, six years following the start of their college careers.

NCES used several procedures to ensure the validity of information from the BPS:04/09 surveys. First, data were collected from multiple sources. BPS:04/09 data was garnered not only from student interviews but also from student records, IPEDS, the Central Processing System (CPS), the National Student Loan Data System (NSLDS), College Board, ACT, the National Student Clearinghouse (NSC), student transcripts, and other sources. Second, throughout the data collection, NCES processed and examined the files for quality control (Wine et al., 2011).

The data cleaning and editing process for the BPS:04/09 data files included several quality control procedures. It involved using statistical procedures to 1) handle blank or missing data and check for the reasonableness of data values; 2) to identify legitimate skip patterns to ensure data consistency; and 3) variable formatting and logical recoding. Logical recoding was performed when the value of missing items could be ascertained from preloaded values or to the previous responses. Variable formatting and logical recodes were reviewed and verified by expert coders (Wine et al., 2011).

The study uses the complete data set BPS:04/09 to obtain information such as student characteristics and financial aid. BPS:04/09 dataset is appropriate for the research. It contains a nationally-representative study of all beginning students entering postsecondary education for the first time, including students who delay postsecondary entry. BPS contains information on student progress over six-year undergraduate academic careers as well on how students and their families finance postsecondary education including financial aid (NCES, n.d.). It is therefore an appropriate database to use for the study, given the intent to examine an educational outcome of degree completion. In addition, due to its complex sample design, this national data set is well-suited for the use of multilevel techniques when analyzing student outcomes.

Several recent studies, which examined the effects of institutional characteristics on degree completion, have utilized data from various BPS surveys. For example, Titus employed BPS in conjunction with IPEDs in three of his studies (Titus, 2004; 2006a; 2006b). In the earliest research, he merged BPS:96/98 and IPEDS:95 to examine the effect of institutional characteristics on student persistence at four-year institutions (Titus, 2004). He later used BPS:96/01 and IPEDS:95 to explore the effect of the institutional financial context on the likelihood of bachelor's degree completion for students with low socio-economic status at their initial four-year institutions (Titus, 2006a). He also drew from BPS:96/98 and IPEDS:95/96 to explain the extent to which student persistence is influenced by institutional expenditure and revenue patterns, where persistence referred to being enrolled or having completed a degree three years after being enrolled in the same four-year institution (Titus, 2006b). In another notable study, Kim (2007) utilized BPS:96/01 to explore how certain institutional structural characteristics were related to degree-attainment rates among students who began their postsecondary education in four-

year institutions with the expectation of earning a bachelor's degree. Additionally, Chen (2012) used BPS:96/01 and IPEDS:1995-2000 to explore the extent to which institutional characteristics influence the risk of college student dropout in a longitudinal process.

In sum, BPS remains a rich source of data, capturing postsecondary student characteristics, experiences, and a wide range of outcomes including persistence and attainment. As the most recent comprehensive national survey of beginning students in postsecondary education, BPS:04/09 can help address the research questions with the potential of producing nationally generalizable and relevant results.

Integrated Postsecondary Education Data System

In this study, institution-level variables are derived from the annual Enrollment and Finance Surveys of the Integrated Postsecondary Education Data System (IPEDS). Sponsored by NCES, IPEDS contains information on all institutions and organizations whose primary purpose is to provide postsecondary education. IPEDS surveys nearly 7,500 private and public postsecondary institutions such as research universities, state colleges and universities, private religious and liberal arts colleges, for-profit institutions, community and technical colleges, and non-degree-granting institutions. It excludes facilities and training sites not open to the general public (i.e., prison sites, military bases or private corporations), hospital internships or residency programs, entities offering non-credit programs or continuing education (i.e., test preparation centers), branch campuses of U.S. institutions abroad, and others (NCES, n.d).

IPEDS consists of several interrelated surveys that are conducted annually and divided into fall, winter, and spring collections. These surveys gather information about postsecondary education institutions: characteristics and cost, enrollments, degrees and

certificates awarded, student financial aid, student persistence and success, and human and financial resources used to provide postsecondary education.

Depending on the year, NCEES conducts Human Resources, Fall Enrollment, and Finance surveys in winter; Student Financial Aid and Graduations Rate surveys in the spring; the Institutional Characteristics, Completions, and Enrollment surveys in the fall. Many states and systems have IPEDS coordinators who are responsible for state- or system-level coordination and verification of IPEDS submissions and. Once the surveys are submitted to the National Center for Education Statistics, NCEES staff check them and follow up with institutions that make errors in data reporting.

NCEES regularly performs quality checks of the IPEDS survey data to ensure their accuracy and integrity (Jackson et al., 2005). For example, in 2005, NCEES assessed the quality of some IPEDS data that were gathered using web-based collection procedures in 2002–03 from Title IV institutions and offices in the United States and other jurisdictions, which were eligible to participate in the IPEDS surveys. The evaluation used Thomson Peterson data from the Thomson Corporation to determine the validity of IPEDS data in contrast to the data collected via non-IPEDS sources and concluded that IPEDS is the most “comprehensive data system available for information related to postsecondary education” (Jackson et al., 2005, p. ix).

IPEDS is an appropriate dataset for this research because it is longitudinal and collects many variables that provide a great deal of information about postsecondary institutions in the United States. The IPEDS surveys discussed above are the source of several institution-level variables in the study. This research utilizes data on the number of undergraduate students attending the institution in the fall semester. The study also uses the data providing basic information about institutions and their finances. The

Institutional Finance survey is the source of several independent variables used in this study: institutional financial context, including revenues, and institutional structural/demographic characteristics, including institutional size, control, and mission.

Furthermore, because IPEDS data collection is mandatory for Title IV institutions, it has a very high response rate. The unweighted response rate over the past several years has been 100 percent for degree-granting institutions. In the fall of 2010, the overall unweighted response rate for non-degree-granting institutions was 99.9 percent. Due to the high response rate, the chance of non-sampling errors in the data is negligible (NCES, n.d.).

By providing the most comprehensive list of institutions with their characteristics, IPEDS data remain the most reliable dataset to explore the research questions. One notable limitation of the dataset is that, in certain instances, public institutions (particularly flagships and main campuses) report data to IPEDS only at the system-level, rather than campus-level (Jaquette & Parra, 2014). To alleviate this concern, a final dataset was manually examined to ensure some of the public institutions were not reporting revenue and expenditure data from other institutions or branch campuses within the same system.

Three IPEDs surveys are relevant to this study: Institutional Characteristics, Fall Enrollment, and Institutional Finance. The study drew data from these IPEDS surveys from FY 2004. The Institutional Characteristics survey is key to IPEDS data collection because it forms the sampling frame for all other NCES surveys. Institutional characteristics data include contact information, tuition, fees, room and board, control or affiliation, type of calendar system, levels of degrees/awards offered, types of programs,

admissions requirements, and accreditation. This study utilizes institutional size, control, and mission variables from this survey.

The Fall Enrollment survey provides data on students enrolled in credit-bearing courses for a degree/award and in courses comprising vocational or occupational programs. It collects the following information from four-year institutions: the number of students by status (full-time, part-time), student level (undergraduate, first professional, graduate), race/ethnicity, gender, age, degree-seeking status, major field of study, year of study, and residence.

The Institutional Finance survey collects data from the same group of institutions in the Institutional Characteristics survey. The Finance component follows the format of institutional financial statements recommended by the Financial Accounting Standards Board (FASB) and the Governmental Accounting Standards Board (GASB) (Knapp, Kelly-Reid, & Ginder, 2012). Public Institutions use GASB forms while private institutions use FASB forms. Additionally, the Finance component responses are expected to follow college and university accounting policies and practices as prescribed by the National Association of College and Universities' Business Officers (NACUBO) in the Financial Accounting and Reporting Manual (FARM). All revenue and expense categories are designed to be consistent with the FARM definitions. Finance survey responses are subject to an annual independent audit.

The Institutional Finance survey component data covers financial activities for the fiscal year. Data elements of the Institutional Finance survey include revenues by source (e.g., tuition and fees, government funding, private giving, etc.), expenditures by function (e.g., instruction, research, physical plant maintenance and operation), physical plant assets and indebtedness, endowment investments, and others (NCES, n.d.). The Finance

survey data collection varies to a small extent by institutional control. For public institutions, data are collected on current funds revenues by source, current funds expenditures by function, scholarship/fellowship expenditures, physical plants indebtedness, endowment assets, hospital revenues, and physical plant assets. For private not-for-profit institutions, data are collected on statements of financial position, changes in net assets, student grants, revenues and investment returns, and expenses by functional classification. The study utilized revenue data from the Institutional Finance survey.

Variables

Dependent variable

The dependent variable in the analysis is bachelor's degree completion within six years after the first enrollment at the initial institution. It is restricted to first-time, full-time students at four-year institutions (binary variable, 0=no; 1=yes). Within BPS:04/09, it is students who entered postsecondary education during the fall of 2003. Both public and private institutions are included in the analysis.

Independent variables

The independent variables include both student- and institutional- level variables. Independent institution-level variables include institutional financial context and institutional structural/demographic characteristics including institutional selectivity, mission, size, and control. Institutional financial context is measured by the revenue variables including the high percent of total revenue derived from student tuition and fees and high percent of total revenue derived from state government appropriations.

Student-level variables incorporate student demographic and socioeconomic characteristics, academic and financial characteristics including financial aid packages

and non-educational pressures such as employment during enrollment. Six independent variables are used as controls. Consistent with prior research, they serve as predictors of student success in degree completion. The analysis accounts for age, gender, race/ethnicity, socioeconomic background, academic ability, and working during college.

Age is captured by a dummy variable indicating the student's age at first enrollment (over 20 as the reference group). A dummy variable indicating whether the student is a female controls for gender. The analyses include four racial/ethnic groups: African-American, Asian, Hispanic, and White (reference group). American Indians/Alaskan natives (14), Native Hawaiian/Pacific Islanders (7), More than one race (108) and Other (65) were excluded because of their small numbers. Similar to previous research, socioeconomic status is measured by a variable which is a composite of standardized parental income and standardized parental education (Titus, 2006c).

The analysis includes a basic control for academic ability and performance. Precollege academic performance is measured by admissions test scores (ACT or SAT) and high school GPA. Admissions test scores indicate the score for the SAT I combined verbal and math score, derived from either the SAT I combined verbal and math score or the ACT composite score converted to an estimated SAT I combined verbal and math score using a concordance table provided by the College Board. College academic performance is measured by college GPA at the end of the first year of enrollment. A z-score transformation was applied to the measures of socioeconomic status, high school GPA, SAT/ACT scores, and college GPA to facilitate the interpretation of results.

Following Titus (2006b), to approximate non-educational pressures, working during college variable is included. It is operationalized as hours worked per week while

enrolled at the end of the first year (1 to 20 hours, 20 or more hours, and 0 hours as the reference category).

Key independent variables of interest are those for financial aid, which measure how aid (by type) is distributed to the student. The study uses three types of financial aid packages received at the end of the first year: 1) a student financial aid package with the highest proportion of *grants*; 2) a student financial aid package with the highest proportion of *loans*; 3) a student financial aid package with the highest proportion of *grants* and *loans*. Each financial aid source is converted into three independent binary variables that represent instances when the given source amount falls into the 75th percentile of the source distribution across all students. For example, a student financial aid package with the highest proportion of *grants*, measures the packages with the proportion of grants that are in the 75th percentile (0=no, 1=yes).

Independent institution-level variables include institutional financial context and institutional structural/demographic characteristics. Institutional financial context is represented by two revenue variables. They include *high percent of total revenue derived from student tuition and fees* and *high percent of total revenue derived from state government appropriations* in the 2003-2004 fiscal year. All the financial measures were adjusted for student enrollments by dividing revenues per full-time equivalent student enrollment.

Tuition and fees refers to all revenue from students (sans refunds, discounts, and allowances) for educational purposes. Excluded are charges for room, board, and other services rendered by auxiliary enterprises. State government appropriations are funds received by the institution through legislation, except grants and contracts and capital

appropriations. These funds are for meeting current operating expenses but not for specific projects or programs.

These variables were calculated similarly to the financial aid packages variables. Each revenue source was converted into two independent binary variables that represented instances when the given source amount falls into the 75th percentile distribution. For example, the variable high percent of total revenue derived from state government appropriations indicates institutions in which the percent of total revenue derived from state government appropriations is in the 75th percentile (0=no, 1=yes).

As for other institutional structural/demographic characteristics, institutional size, control, mission, and selectivity were considered. Institutional size is measured by full-time equivalent enrollments. Following Titus' (2006c) recommendation, to lessen the effects of a skewed distribution of institutional enrollment, the variable is recoded into three categories: small (less than 4,000), medium (4,000 – 15,000), and large (more than 15,000). Medium is the reference group.

The analysis also accounts for institutional control (public/private). Further, the analysis includes the mission variable as determined by the 2005 Basic Carnegie Classification Framework of Institutions of Higher Education™. Four categories are considered: doctoral-granting universities, master's colleges and universities, specialized institutions that award baccalaureate or higher-level degrees (e.g., schools of business and management, schools of art, music, and design, schools of law, schools of engineering), and baccalaureate institutions as the reference group.

A measure of college selectivity was borrowed from the classification developed by Barron's for its *Profiles of American Colleges*. This measure takes into account several factors: the median SAT I or median composite ACT entrance exam score;

students' high school class rank; students' grade point average; and the percentage of students accepted. Barron's groups schools into six different levels from the most selective to the least selective: most competitive, highly competitive, very competitive, competitive, less competitive, and noncompetitive. I collapsed these six categories into three based on a rating of mostly competitive or highly competitive; very competitive or competitive; and less competitive or non-competitive.

The BPS:04/09 analysis was weighted by the full sample weight (WTB000). WTB000 is a normalized panel weight that applies to eligible respondents who participated in all three BPS surveys. NCES constructed WTB000, along with other cross-sectional and panel weights, to correct for the oversampling of certain groups while minimizing the effects of large sample sizes on tests of statistical significance and standard errors (Wine et al., 2011).

Table 1 lists all the variables used in the study and their sources.

Table 1: Variables, their sources, and definitions

Variable	Definition	Source
Dependent variable		
Received a bachelor's degree	Indicator of whether a student attained a bachelor's degree within six years (1 = Yes; 0 = No)	BPS: PROUTFI6
Independent variables		
<i>Student characteristics</i>		
Gender	Indicator of students' gender (1 = Female; 0 = Male)	BPS: GENDER
Age	Dichotomous measure of students' age (1 = 20+ years old; 0 = Under 20)	BPS: AGE
Race/Ethnicity	Separate indicators of students' race/ethnicity (1 = African-American; 1 = Hispanic; 1 = Asian; 0 = White)	BPS: RACE
Average socio-economic status (SES)	Indicates a composite measure of socio-economic status based on parental income and parental educational attainment	BPS:PAREduc, DEPINC
<i>Student academic background</i>		
High School GPA	Indicates student's self-reported high school grade point average on the standardized test date	BPS: HCGPAREP
Admissions test scores (ACT or SAT)	Indicates the score for the SAT I combined verbal and math score, derived from either the SAT I combined verbal and math score or the ACT composite score converted to an estimated SAT I combined verbal and math score using a concordance table	BPS: TESATDER
Cumulative GPA	Indicates cumulative college GPA for the 2003-2004 academic year	BPS: GPA
Employment while enrolled	Indicates the average hours a student worked per week during the 2003-2004 academic year (excluding work-study/assistantship/traineeship) (0 = 0 to 20 hours; 1 = 20 or more hours)	BPS: JOBHOUR

<i>Financial Aid Packaging</i>		
Package with the highest proportion of grants	A package with the highest (in the 75th percentile) proportion of grants received at the end of the first year (1=yes; 0=no)	BPS: derived from TOTGRT (the total amount of all grants and scholarships)
Package with the highest proportion of loans	A package with the highest (in the 75th percentile) proportion of loans received at the end of the first year (1=yes; 0=no)	TOTLOAN (total amount of loans excluding federal PLUS undergraduate loans)
Package with the highest proportion of grants and loans	A package with the highest (in the 75th percentile) proportion of grants and loans received at the end of the first year (1=yes; 0=no)	
<i>Institution-level factors</i>		
Institutional size	Dichotomous variable indicating whether full-time equivalent student enrollment in the Fall 2004 is small, medium, or large	IPEDS IC survey: FTE
Institutional control	Control of institution: 1=private, 0=public	IPEDS IC survey: CONTROL
Institutional mission	Dichotomous variable indicating whether an institution is classified in the Carnegie classification as Baccalaureate, Master's, Research/Doctoral, or Specialized	IPEDS IC survey: CARNEGIE
Institutional selectivity	Dichotomous variable indicating whether an institution is most or highly competitive, very competitive or competitive, less competitive or non-competitive	Barron's Profiles of American Colleges, 2009
<i>Institutional financial context</i>		
High percent of total revenue from tuition and fees	Indicates the high percentage of total revenue from tuition and fees per FTE in the 2003-2004 fiscal year (1=yes; 0=no)	IPEDS Finance Survey: derived from FTE, REVENUES AND OTHER
High percent of total revenue from state government appropriations	Indicates the high percentage of total revenue from state government appropriations per FTE in the 2003-2004 fiscal year (1=yes; 0=no)	ADDITIONS, REVENUES AND INVESTMENT RETURN
Weights		
WTB000	Base panel weight for the 2003-2009 data.	BPS

Statistical Analysis

The study used multilevel modeling to estimate the effects of individual- and institutional-level variables on college completion. Specifically, it utilized a form of multilevel modeling HGLM, also referred to as generalized linear mixed models or generalized linear models with random effects. Because HGLM can be applied to binary outcomes, it provides estimates of how different factors predict the probability of a dichotomous outcome, such as completion of a bachelor's degree. Multilevel modeling is an appropriate analytic method to examine the study's research questions for several reasons.

First, employing multilevel theories to anchor the study—resource dependence theory at the institutional level and human capital as well as financial aid at the student level—warrants the use of multilevel modeling. A multilevel modeling approach is appropriate because there are two units of analysis in the study: individual and institutional (Raudenbush & Bryk, 2002; Snijders & Bosker, 1999).

Second, the multilevel modeling approach makes it possible to analyze hierarchically structured data that consists of lower-level observations (e.g., students) nested within higher level(s) (e.g., institutions). Standard statistical models generally rely on the assumption of independent observations. With clustered or multilevel data, observations are typically correlated, which violates the standard independence assumption. However, hierarchical or multilevel models account for the dependencies between observations. These models break out the variance attributable both to the student and the institution and isolate the interactions between different levels and various components at each level. Because multilevel modeling appropriately partitions variance in the outcome between individuals (student) and groups (institutions), we may

be able to more accurately estimate the how differential characteristics in the higher-level contexts explain variation in individual-level outcomes.

Third, multilevel modeling allows for individual variation within a single context as well as cross-level interactions. By being able to treat some or all model parameters as random instead of fixed, this approach improves estimation of individual- and cross-level effects by simultaneously modeling within- and between-group effects (Raudenbush & Bryk, 2002). Multilevel modeling captures differences at each level thus making relationships more explicit. Each level in the hierarchical structure is represented by its own sub-model to clearly explain how and where effects occur. Each sub-model can consequently illustrate the relationship among the variables at that level as well as how the variables influence relationships at other levels (Raudenbush & Bryk, 2002).

Finally, multilevel techniques account for the clustered data structure in their estimations (Raudenbush & Bryk, 2002). When analyzing hierarchically structured data, multilevel modeling helps avoid underestimations of standard errors and specification errors, aggregation bias, and misspecification of models (Raudenbush & Bryk, 2002; Hox, 2002). Because students are nested within institutions, this approach is typically used with nationally representative survey data that are clustered (Perna & Titus, 2005; Porter, 2006; Titus, 2006a, 2006b, 2006c). BPS represents clustered data; therefore, multilevel modeling takes into account the nested nature of the survey data such as the BPS.

The next section describes the logic and flow of the HGLM analysis. It provides information on the reporting and interpretation of results and explains the use of centering in the multilevel framework. HGLM analysis was preceded by data preparation, including recoding the variables and handling missing data.

HGLM analyses

The study used multilevel statistical software (HLM 7) to analyze the data. The HGLM analyses proceeded in two stages. The first step involved determining whether there was sufficient variance in degree completion across institutions to warrant the use of a multilevel approach. Typically, in building multilevel models, the outcome must vary significantly across institutions. Therefore, a simple two-level model was created in order to provide preliminary information about how much variation in the outcome was due to within- and between-institution factors. The second step involved estimating two models: within-institution (Level-1) and institution (Level-2).

The fully unconditional model or null model is the simplest multilevel model that contains no Level-1 or Level-2 predictors (Raudenbush & Bryk, 2002). HLM typically uses the intra-class correlation (ICC) to determine the amount of variation in the outcome variable attributed to group-level effects (Raudenbush & Bryk, 2002). While the ICC may be instructive in determining the level-2 effects for continuous outcome variables, it is not useful for a dichotomous outcome variable in the current study because level-1 variance is heteroscedastic (Raudenbush & Bryk, 2002).

The study used the results of the unconditional HGLM model and empirical Bayes (EB) residual estimates to see if there was sufficient variation in the unadjusted completion rates between institutions. The unconditional HGLM model without predictors generates the point estimate of the average expected log-odds of completion at a four-year institution with a random effect of zero. Log-odds can be converted into estimated rates for easier interpretation. The parameter estimates from the unconditional model can then be used to calculate 95 percent confidence intervals, provided that the institution-level variance is normally distributed (Raudenbush & Bryk, 2002). As the

first step to HGLM analysis, a fully unconditional model was run to determine the significance of the random variance component at level-2. The significance of the chi-square statistic ($\chi^2 = 2041.40, p < 0.001$) suggested that the variance of student completion across institutions was significantly greater than zero.

Additionally, the analysis relied on EB estimates to determine whether the average bachelor's degree completion rates vary across institutions. As recommended by Raudenbush and Bryk (2002) and followed by other researchers (Titus, 2004; Eagan & Jaeger, 2009; Rumberger & Thomas, 2000), the study examined box plots of estimates of EB residuals and found that average completion rates varied significantly among institutions. In sum, the unconditional model results and EB estimates indicated that there was statistically significant variation among institutions in the log-odds of completion; with these visual and statistical results, the analysis moved on to both within- and between-institution models in HGLM.

To address the research questions, the study estimated two models: within-institution (Level-1) and institutional (Level-2). Because the study has a dichotomous outcome variable, the sampling model is Bernoulli (Raudenbush & Bryk, 2002):

$$\text{Prob}(Y_{ij} = 1 | \beta_j) = \Phi_{ij},$$

where i denotes the student, j denotes the institution, and Φ denotes the predicted probability ranging from 0 to 1.

The equations below display the Level-1, within-group model and the Level-2, between-group model.

Level-1

The level-1 equation addresses the first research question of how the chance of college completion is influenced by financial aid packages, controlling for other student-level variables. The within-institution model with student-level predictors is expressed as follows:

Eq. 1

$$\text{Log}[\varphi_{ij}/(1 - \varphi_{ij})] = \eta_{ij},$$

$$\begin{aligned} \eta_{ij} = & \beta_{0j} + \beta_{1j}*(Female)_{ij} \\ & + \beta_{2j}*(Black)_{ij} + \beta_{3j}*(Hispanic)_{ij} + \beta_{4j}*(Asian)_{ij} \\ & + \beta_{5j}*(Age)_{ij} \\ & + \beta_{6j}*(SES)_{ij} \\ & + \beta_{7j}*(HS\ GPA)_{ij} \\ & + \beta_{8j}*(SAT)_{ij} \\ & + \beta_{9j}*(College\ GPA)_{ij} \\ & + \beta_{10j}*(Employment)_{ij} \\ & + \beta_{11j}*(Financial\ aid\ packaging)_{ij} \end{aligned}$$

where η_{ij} is log-odds of college completion within six years, φ_{ij} is the predicted probability of completing a college degree within six years, i denotes the student, j denotes the institution, and β s are regression coefficients that reflect the distribution of degree completion in institution j given observable student demographic characteristics, socioeconomic background, academic ability, working during college, and financial aid packaging.

In this study, the intercept for the level-1 equation (Eq.1) varies between institutions, while the coefficients for all within-institution predictors are fixed for all institutions. Put differently, students' average likelihood of completion is expected to

vary by institutional context, while the effects of student-level variables are expected to be the same irrespective of the college attended.

Level-2

The between-institution model, which includes institutional characteristics, is expressed as follows:

Eq. 2

The level-2 equation (Eq. 2) addresses the second research question of whether institutional context influences student chances of degree completion.

$$\begin{aligned}\beta_{0j} = & \gamma_{00} + \gamma_{01}*(\text{Institutional size})_j \\ & + \gamma_{02}*(\text{Institutional control})_j \\ & + \gamma_{03}*(\text{Institutional mission})_j \\ & + \gamma_{04}*(\text{Institutional selectivity})_j \\ & + \gamma_{05}*(\text{Institutional revenue patterns}) + u_{0j}\end{aligned}$$

Where β_{0j} indicates average completion rates for institution j ; γ_{00} indicates the average completion rate for all institutions; γ_{01} indicates the average effect of institutional size on completion rate for all institutions; γ_{02} represents the average effect of institutional control on completion; γ_{03} indicates the average effect of institutional mission on completion for all institutions; γ_{04} indicates the average effect of institutional selectivity on completion for all institutions; γ_{05} indicates the average effect of institutional revenue patterns on completion for all institutions; u_{0j} is error associated with institution j .

The final stage of the HGLM analyses involved fitting the model with an interaction term, i.e., an interaction between student financial aid packages and institutional revenue patterns. This step addressed the third research question about the

extent to which the relationship between college completion and financial aid packages is influenced by institutional revenue patterns. To explore a cross-level interaction, a slopes-as-outcomes model can be utilized (Raudenbush & Bryk, 2002). This model tests a cross-level interaction where a level-2 variable (institutional revenue patterns) is expected to moderate the relationship between two individual-level variables (completion and financial aid packaging). Here the variables were entered sequentially to the level-1 model by block to determine the incremental variance explained while non-significant variables were retained to control for their effect on the dependent variable.

The level-1 model remains as specified earlier:

$$\begin{aligned} \eta_{ij} = & \beta_{0j} + \beta_{1j}*(Female)_{ij} \\ & + \beta_{2j}*(Black)_{ij} + \beta_{3j}*(Hispanic)_{ij} + \beta_{4j}*(Asian)_{ij} \\ & + \beta_{5j}*(Age)_{ij} \\ & + \beta_{6j}*(SES)_{ij} \\ & + \beta_{7j}*(HS\ GPA)_{ij} \\ & + \beta_{8j}*(SAT)_{ij} \\ & + \beta_{9j}*(College\ GPA)_{ij} \\ & + \beta_{10j}*(Employment)_{ij} \\ & + \beta_{11j}*(Financial\ aid\ packaging)_{ij} \end{aligned}$$

The level-2 model also remains the same but adds a cross-level interaction term.

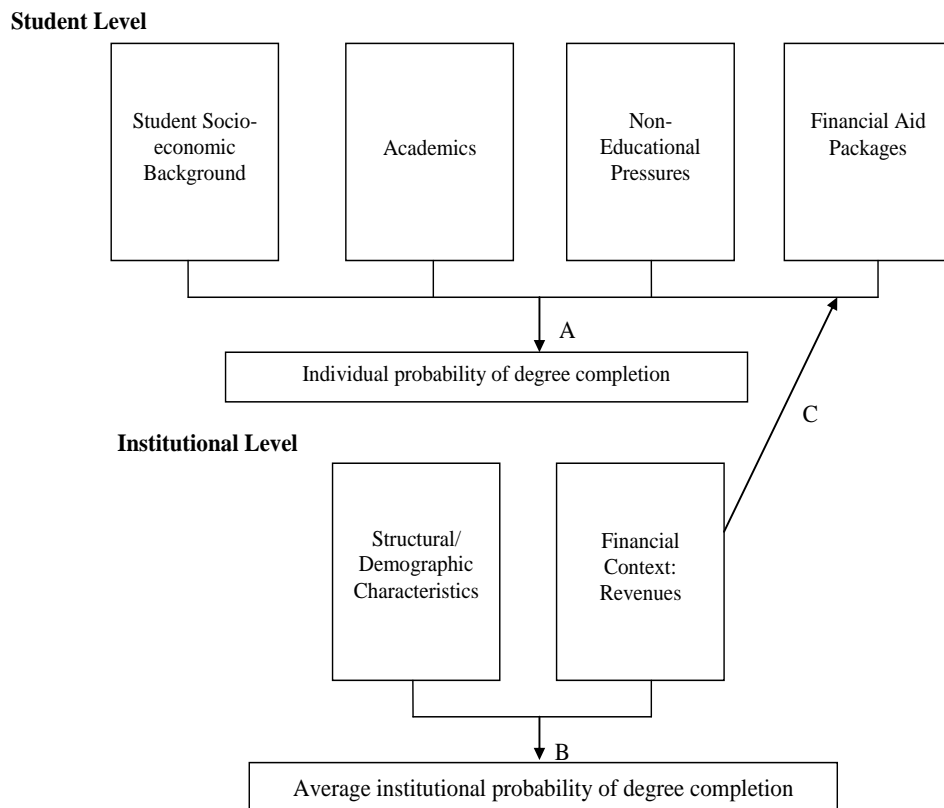
$$\begin{aligned} \beta_{0j} = & \gamma_{00} + \gamma_{01}*(Institutional\ size)_j \\ & + \gamma_{02}*(Institutional\ control)_j \\ & + \gamma_{03}*(Institutional\ mission)_j \\ & + \gamma_{04}*(Institutional\ selectivity)_j \\ & + \gamma_{05}*(Institutional\ revenue\ patterns)_j + u_{0j} \\ \beta_{11j} = & \gamma_{110} + \gamma_{111}*(Institutional\ revenue\ patterns)_j + u_{1j} \end{aligned}$$

Where β_{11j} indicates the relationship between financial aid packaging and degree completion; γ_{111} is how institutional revenue patterns influences the change in the log-

odds effect of college completion, i.e., how institutional revenue patterns mediate the relationship between financial aid packaging and degree completion.

Following the specification of the within-institution (Level-1) and between-institution (Level-2) models, Figure 1 presents the components of the analytical model used to address the research questions.

Figure 1: Analytical Model to Examine Student Degree Completion



- A. Student-level characteristics influence individual probability of degree completion.
- B. Institution-level structural/demographic and financial context influence average institutional probability of degree completion.
- C. Financial context influences the relationship between individual probability of degree completion and financial aid packages.

The first stage of modeling is used to assess the direct effects of students' student demographic, socioeconomic, academic and financial characteristics on degree completion (A). The next series of modeling occurs at the institutional level (level-2). Here modeling is used to assess the direct effects of institution-level structural/demographic and financial context on the average institutional probability of degree completion (B). Additional modeling tests for any interaction effects that occur across level-1 and level-2 variables "revenues" and "student financial aid packages" (C).

Presentation of Results

The statistical output of the HGLM analysis is based on the log-odds scale. Level-1 coefficients estimates the influence of the student-level variables on the log-odds that a student has completed a bachelor's degree. Level-2 coefficients estimate the influence of the institution-level variables on the log-odds that a student has completed a bachelor's degree. The regression coefficients in HGLM for continuous predictors can be interpreted as the expected change in the log-odds of success for each unit change in the predictor. With dichotomous predictors, regression coefficients represent the expected log-odds ratio of the group described by the corresponding predictor variable and a reference group. The predicted log-odds from the models can then be transformed to an odds ratio by exponentiating the log-odds coefficient [$\exp(\beta)$]. The odds ratio, $\exp(\beta)$, for a given predictor variable, is a factor by which the odds change for a one-unit change in the predictor. Log-odds can further be transformed into expected probabilities ($p=1/1+\exp(-\text{log-odds})$).

In the present study, odds ratios represent the change in the odds of completing a bachelor's degree within six years of enrolling in college relative to not completing that is associated with a one-unit change in a specific independent variable, while holding all

other variables constant (Peng et al., 2002). Odds ratios greater than one suggest an increase in the likelihood of completing a degree in a four-year institution relative to not completing. A value less than one indicates a reduced likelihood of completion (Hedeker & Gibbons, 2006). To facilitate analysis and interpretation, the study presents all significant results using odds ratios. Odds ratios were estimated only for statistically significant variables.

HGLM output normally includes estimates and statistics for both unit-specific and population-average models with robust standard errors (Raudenbush et al., 2011). The unit-specific models estimate how the effects of level-1 predictors in each level-1 unit vary across level-2 units. The population-average models estimate the mean effect of level-2 explanatory variables across all level-2 units. Results from unit-specific and population-average models are generally similar but the population-average models are robust to the misspecification of the random effects while the unit-specific ones are not.

In this study, the estimates from the unit-specific model would show an expected difference in the log-odds of completion associated with a one unit increase in a given institutional-level predictor for a student in an institution with a typical completion rate for an institution of its type. Population-average estimates would illustrate an expected difference in the log-odds of completion associated with a one unit increase in an institutional-level predictor, averaging across students in the sample. The central interest of the study is the extent to which institutional financial context influences student completion, and how differences in the financial context influence the relationship between student completion and financial aid packages, holding constant the institution attended. Because the analysis is expected to describe relationships such as a slope (e.g.,

the change associated with a one-unit change in a predictor) at the discrete unit (e.g., student), the study presents unit-specific results of the HGLM analyses.

For both unit-specific and population-average models, HGLM produces tables with regular standard errors and with robust standard errors. Robust standard errors are standard errors that are relatively insensitive to misspecification at the levels of the model and heteroscedasticity or distributional problems at each level (Raudenbush et al., 2011). Because all variables in the study are not normally distributed, the study reports robust standard errors with its unit-specific results.

Centering

When using multilevel modeling techniques, it is important to consider how variables are centered, because centering affects the interpretation of coefficients and variance components and reduces multicollinearity between higher-order terms (e.g., interactions and nonlinear terms).

Grand-mean centering involves subtracting the overall grand-mean, i.e., the mean for the variable across all units from each score. When variables are grand-mean centered, the intercept then represents the average score on the dependent variable for all individuals in the dataset (Raudenbush & Bryk, 2002). For example, the intercept β_{0j} in Equation 1 can be interpreted as the adjusted mean rate of degree completion for students with average values for demographic characteristics, socioeconomic background, academic ability, working during college, and financial aid packaging within an institution. To control for differences in student characteristics between institutions, all student-level and institution-level variables were grand-mean centered, except the variables aggregated at a higher unit. Because the focus of this study is to examine the

extent to which degree completion is influenced by the interaction between financial aid packages and the institutional financial context, level-1 variables measuring “financial aid packages” were group-mean centered. Group-centering of this variable, aggregated at a higher level, helps test whether the estimated coefficient varies systematically across units at a higher level (Raudenbush & Bryk, 2002).

Limitations

The study is subject to several limitations. First, it relies on the use of secondary data. The BPS survey information represents the most extensive and comprehensive national data available for examining the relationship between financial aid and student degree completion. While highly reliable, some variables in the analysis are based on self-reported information. For example, high school GPA is based on self-reported data; therefore, it may not be completely accurate for some students (Kuncel, Credé, & Thomas, 2005). More importantly, high school GPA varies widely by school in the way it is constructed. Because its influence may vary as a function of the high school students graduated from, this measure may “overcontrol” for some students or “undercontrol” for others in the study.

Second, similar to all secondary data analyses, this research may be limited by the availability and adequacy of the variables in the IPEDS and BPS datasets. Initially, the study planned to use the BPS variable “endowment income” to measure the percent of total revenue from endowment income. However, in 2004, IPEDS changed the way it collected data and discontinued the use of the variable “endowment income” in their financial surveys. Current variables that capture endowment income for public and private institutions are “investment income” and “investment return,” respectively. However, the “investment income” reported by the publics, based on its full definition, is

not directly comparable to the “investment return” reported by the privates. “Investment income” is revenue derived from the institution’s investments, including investments of endowment funds such as interest, dividends, rents or royalties, and includes both realized and unrealized gains and losses. “Investment return” includes all investment income (i.e., interest, dividends, rents and royalties); gains and losses (realized and unrealized) from holding investments; student loan interest; and amounts distributed from irrevocable trusts held by others. Based on these differences, the study removed the variable “the percent of total revenue from endowment income.”

Next, the study excluded financial aid variables such as work-study because the initial analysis showed that very few students benefit from this type of aid and the amount they receive is very small. More importantly, the calculation for the variable in the study “package with the highest proportion of work-study” involved finding the proportion of work-study in the package that was in the 75th percentile. Because so few students receive this aid, the 75th percentile threshold for work-study was zero. Therefore, this variable was dropped from analysis.

Third, the study does not estimate the impact of financial aid packages on completion over a total of six years. It only examines the effect of first-year financial aid packages on completion six years later. The use of a more appropriate technique to examine the longitudinal effect of aid, multilevel event history modeling, would produce a much more complex model. One serious methodological challenge then becomes in temporally aligning institutional context with student-level institutional financial aid variables that change year to year. Nonetheless, because front-loading financial aid is a primary way in which institutions develop these packages, the study presents a conservative estimate regarding the influence of financial aid packages on completion. In

addition, when using financial aid packaging variables, the study does not examine the extent to which financial aid packages cover college tuition. The analysis focuses on the types of different mixes of financial aid and not necessarily on its reduction.

Fourth, in terms of student financial aid estimation, the study was unable to deal with the self-selection or omitted variable bias issue due to the inability to account for all sources of variation in the dependent variable. Students who receive financial aid are different in terms of observed and unobserved variables from those who do not (Cellini, 2010). Without a proper experimental research design, it is impossible to account for the effects of the unobserved student characteristics associated with aid eligibility on the observed effects of financial aid.

Fifth, this study is limited by the size of sub-sample of the BPS:04/09 survey. Because HGLM requires variation in the dependent variable within and between groups, institutions with an enrollment of less than two students were deleted from the sample. In this study, the number of students per institution ranges from 2 to 108 and the average number of students per institution is 24.

Lastly, as in most empirical research, the data used in this study has missing cases for some of the variables. Addressing missing data protects the study's internal validity by ensuring that the study's analysis accurately reflects the respondents within the analytical sample (Croninger & Douglas, 2005). The number and percentages of missing data cases for all variables in the analytic sample are reported in Table 2. Missing data for the independent variables in the final analytic dataset is less than 10 percent, a number that some analysts consider a cut-off point for potential deletion or imputation (Hair, Black, Babin, Anderson, & Tatham, 2006; Tabachnick & Fidell, 2012). At level-2, the measures of institutional revenues were missing data for about 1% of cases.

Table 2: Number and Percentages of Missing Data Cases for all Variables in the Analytic Sample (n=8,205)

Variable	Total N	Missing N	%
Level-1 variables			
Dependent Variable			
Bachelor's Degree Attainment	8,205	0	0
Gender	8,205	0	0
Age	8,205	0	0
Race/Ethnicity	8,205	0	0
SES	8,205	0	0
High School GPA	8,205	0	0
ACT/SAT	8,205	0	0
Cumulative college GPA	8,205	0	0
Employment while enrolled	8,205	0	0
Package with the highest proportion of grants	8,205	0	0
Package with the highest proportion of loans	8,205	0	0
Package with the highest proportion of grants and loans	8,205	0	0
Level-2 variables			
Institutional size	8,196	9	.1
Institutional control	8,205	0	0
Institutional mission	8,205	0	0
Institutional selectivity	8,205	0	0
Percent of total revenue from tuition and fees	8,113	92	1.1
Percent of total revenue from state government appropriations	8,113	92	1.1

Sources: BPS: 04/09 and IPEDS 2003-2004 datasets

This study used mean substitution to maintain the size of the sample. Large sample sizes typically produce more stable parameter estimates and more precise χ^2 distributions (Peng et al., 2002). The values were imputed for the institutional size and revenue variables. Because these measures had a very small amount of missing data, mean substitution was appropriate (Croninger & Douglas, 2005). The use of mean values for missing data may decrease the accuracy of the parameter estimates for the variable by deflating the correlations between that variable and other variables in the analysis (Tabachnick & Fidell, 2012). Deflated correlations can, in turn, result in distorted estimates and lower standard errors. A comparison of the correlation table of variables

with missing data with the correlation table of the variables that has missing data substituted with mean values showed no deflation in correlations. Although some students were missing institutional-level information, the current study sample is still representative of the 2009 bachelor's degree completers who participated in the study.

CHAPTER 4: Results

Overview

This study utilized HGLM analyses to examine the extent to which the relationship between college completion and first-year financial aid packages is influenced by institutional revenue patterns such as high percent of total revenue from tuition and fees and high percent of total revenue from state government appropriations. College completion is defined as bachelor's degree completion within six years after the first enrollment at the initial institution. The study's research questions are:

- 1) How is the chance of college completion influenced by first-year financial aid packages, controlling for other student-level variables?
- 2) After taking into account student- and other institution-level variables, is college completion influenced by institutional revenue patterns?
- 3) Controlling for student variables and other institutional variables, how is the relationship between college completion and first-year financial aid packages influenced by institutional revenue patterns at four-year institutions?

This chapter presents the results from the study's three research questions. The next section begins by displaying and summarizing the descriptive statistics that are related to the student-level and institutional-level variables used in the study. It then presents the results of the multilevel statistical analyses. These results include estimates from the within-institution and between-institution models and highlight variables associated with completion. The within-institution model shows estimates of student-level variables that influence completion. Incorporating student-level variables that are

found to be related to college completion, the between-institution model presents estimates of the variables that explain differences between institutions in the average chance of completion. The chapter further presents the results from the between-institution model with a cross-level interaction. The interaction tests whether level-2 variables (high percent of total revenue from tuition and fees and high percent of total revenue from state government appropriations) moderate the relationship between two individual-level variables (completion and financial aid packaging).

Sample

The analytic sample for the current study included first-time, full-time students who started postsecondary education in the 2003/2004 academic year at public and not-for-profit private four-year institutions. 16,684 students met these criteria and served as the baseline sample. Some cases were lost when BPS data were merged with corresponding IPEDS data, using an institutional identifier UNITID (8,251). Because some student- and institution-level data did not have a mutual match, the analytic sample was reduced to 8,433 students. Additionally, the study removed cases with an enrollment of less than 2 students (228). The final student sample consisted of 8,205 students nested in 718 institutions.

Descriptive Analysis

Student-level data

The descriptive statistics include information about the students and institutions in the study's analytic sample. Table 3 presents the descriptive statistics on student-level data from the study's analytic sample of 8,205 students and institution-level data from the analytic sample of 718 institutions. About half of the students (55%) in the analytic

sample completed a bachelor's degree in 2009, which is slightly higher than the national average.

Table 3 shows that the majority of the student population was female (56%). Students younger than 20 comprised 88% of the sample, suggesting that the sample represents traditional undergraduate students. Reflecting national trends in attendance, Whites were the largest racial/ethnic group in the study (72%). Approximately, one in ten was African-American or Hispanic, while Asians represented a smaller share of the sample (7%). On average, students came from families with a mean annual income of \$75,295, and had at least one parent who held a bachelor's degree or higher (27%) (not shown). The majority of the sample (91%) had a high GPA in high school while the rest (9%) were in the mid-level range (not shown). Most students in the sample (78%) worked less than twenty hours per week while enrolled. On average, these students scored about 1123 on the SAT/ACT while the average cumulative college GPA was 315.95 (not shown).

In terms of the financial aid variables, the majority of students in the analytic sample received grants (68%) while almost half received loans (43%) (not shown). Almost one-fifth of students in the analytic sample (19%) received financial aid packages with the highest proportion of grants compared to a higher share of those who received a package with the highest proportion of loans (37%). Additionally, almost one-fifth of students (18%) received a package heavy on grants and loans. The average amount of grant aid provided to students was \$4,345 and loan aid was \$1,755 (not shown).

Table 3: Descriptive Statistics of the Analytic Sample

Variable	%	Mean	SD	Min	Max	
<i>Level-1 variables (weighted)</i>						
Gender		1.56	.497	1	2	
	Female	56				
	Male	44				
Age		.12	.324	0	1	
	Age Under 20	88.1				
	Age 20+	11.9				
Race/ethnicity		1.53	.942	1	4	
	White	71.6				
	African-American	10.8				
	Hispanic	10.4				
	Asian	7.2				
High School GPA		-.0669	1.022	-5.52	.79	
SES		-.0324	1.550	-3.62	8.80	
Admission scores		-.099	.984	-3.49	2.75	
College GPA		-.025	1.021	-4.08	1.36	
Employment		1.22	.417	1	2	
	Employment <20 hours	77.6				
	Employment >20 hours	22.4				
Financial aid packaging						
	Package with the highest proportion of grants	19.4	.194	.395	0	1
	Package with the highest proportion of loans	37.2	.372	.483	0	1
	Package with the highest proportion of grants and loans	18	.181	.385	0	1
<i>Level-2 variables (unweighted)</i>						
Institutional size		2.04	.797	1	3	
	Small	30.1				
	Medium	36.3				
	Large	33.6				
Institutional control		1.42	.493	1	2	
	Public	58.3				
	Private	41.7				
Institutional mission		1.81	.875	1	4	
	Doctoral	44.9				
	Master's	33.3				
	Baccalaureate	17.4				
	Specialized	4.5				
Institutional selectivity		2.628	.680	1	3	
	Mostly and highly competitive	11.5				
	Very competitive and competitive	14.2				
	Less competitive and non-competitive	74.3				
Revenues						
	High percent of revenue from tuition and fees	.2509	.00479	.00	1.00	
	High percent of revenue from state government appropriations	.2507	.00479	.00	1.00	

Sources: BPS: 04/09 and IPEDS 2003-2004 datasets

^a Continuous variables at the student-level are standardized for the analytic sample.^b Student-level data are weighted by BPS:04/09 analysis weight WTB000. Institution-level data are not weighted because they are drawn from a universe survey rather than a sample survey.

Table 3 also shows that there is a slightly higher proportion of public institutions in the sample (58%) compared to privates (42%). Institutions with a medium enrollment represent more than a third of the sample (36%) compared to 34% of their counterparts with a large enrollment and 30% with a small enrollment. The average FTE enrollment of an institution in the study's sample is 12,088 (not shown). Doctoral institutions represent almost half (45%), compared to their Master's (33%), Baccalaureate (17%), and Specialized (5%) counterparts. In terms of selectivity, the majority of institutions were less or non-competitive (74%) followed by about a fifth very competitive and competitive (14%), and slightly more than a tenth (12%) mostly and highly competitive. On average, more than half of total institutional revenues came from tuition and fees (55%) and a quarter (25%) came from state government appropriations (not shown).

The next set of descriptive analyses illustrates differences in completion related to student demographic, socioeconomic, academic, and financial characteristics. Table 4 highlights select bachelor's degree recipients' characteristics that are associated with college completion.

Table 4: Distribution of the Analytic Sample by Bachelor's Degree Completion

	No Bachelor's Degree	Bachelor's Degree	Statistical Difference
Gender			$\phi=0.04$
	Women	41.4%	58.6%
	Men	46.6%	53.4%
Race/ethnicity			$\phi=0.13$
	White	46.0%	54.0%
	African-American	64.5%	35.5%
	Hispanic	64.8%	35.2%
	Asian	50.1%	49.9%
High School GPA			$\phi=0.29$
	High School GPA: Low-level	71.1%	28.9%
	High School GPA: Mid-level	55.1%	44.9%
	High School GPA: High-level	32.1%	67.9%
SES			$\phi=0.17$
	SES: Low-level	58.6%	41.4%
	SES: Mid-level	47.3%	52.7%
	SES: High-level	32.1%	67.9%
Admission scores			$\phi=0.31$
	Admission scores: Low-level	66.5%	33.5%
	Admission scores: Mid-level	44.4%	55.6%
	Admission scores: High-level	28.0%	72.0%
College GPA			$\phi=0.20$
	College GPA : Low-level	62.7%	37.3%
	College GPA : Mid-level	46.8%	53.2%
	College GPA : High-level	41.8%	58.2%
Employment			$\phi=0.25$
	Employment <20 hours	66.7%	33.3%
	Employment >20 hours	88.6%	11.4%
Financial aid packaging			$\phi=0.19$
	Package with the highest proportion of grants	31.6%	68.4%
	Package with the highest proportion of loans	45.3%	54.7%
	Package with the highest proportion grants and loans	34.2%	65.8%

Sources: BPS: 04/09 and IPEDS 2003-2004 datasets

^a Data are weighted by BPS:04/09 analysis weight WTB000.

^b The statistical difference column shows the strength of the relationship, calculated using the following formula: $\phi = \sqrt{(\chi^2 / n)}$. A ϕ below 0.3 represents a “small” effect size; a ϕ greater than 0.5 represents a “large” effect size.

Table 4 shows racial/ethnic and SES differences in completion at four-year institutions. For example, White (54%) or Asian (50%) students had higher completion rates than African-America and Hispanic students (36% and 35%, respectively). Bachelor's degree recipients were more likely to come from higher socio-economic backgrounds. High-SES students completed their degrees at higher rates than mid- and low-SES students (53% and 41%). In terms of academic characteristics, bachelor's degree recipients had higher high school GPAs, admission test scores, and higher first-year college GPAs. Bachelor's degree completers tended to have a higher GPA (68%) in high school compared to those with a mid-level GPA (45%) and a low-level GPA (29%). Regarding admission scores, the distribution leans in favor of students with the highest results (72%). Students with the high-level college GPA (58%) had greater completion rates than their counterparts with the mid-level GPA (53%) and low-level GPA (37%). Students who worked less than 20 hours per week had higher completion rates than those with greater job obligations (33% vs. 11%).

Finally, Table 4 demonstrates that, for many students, the cost of attendance was substantially reduced by financial aid. Completers tended to carry more substantial amounts of financial aid than non-completers. Specifically, more than two-thirds of completers (68%) received packages with the highest proportion of grants versus non-completers (32%). Slightly more than half of the students relied on packages heavy on loans (55%) while even a higher share of their peers (66%) relied on packages heavy on both grants and loans to finance their education.

Descriptive analyses also show differences in completion based on the institutional characteristics of the analytic sample (Table 5). Completion rates vary by institutional size, control, mission, and selectivity. As shown in Table 5, the shares of

students completing degrees in the small, medium, and large institutions were relatively similar (56%, 51%, and 60%, respectively). Completion rates were higher at private institutions (64% vs. 49%). The share of completers was greater at doctoral and baccalaureate institutions (63% and 61%) than master’s (47%) and specialized institutions (43%). The number of completers was smaller at less competitive or non-competitive institutions (48%) compared to very competitive or competitive (71%) and mostly or highly competitive institutions (85%). Completion rates seemed higher at institutions that rely more heavily on revenues from tuition and fees (60%) than at institutions that rely more heavily on revenues derived from state government appropriations (44%).

Table 5: Distribution of the Analytic Sample by Institutional Characteristics

	No Bachelor’s Degree	Bachelor’s Degree
Institutional size		
Small	44%	56%
Medium	49%	51%
Large	40%	60%
Institutional control		
Public	51%	49%
Private	36%	64%
Institutional mission		
Doctoral	37%	63%
Master’s	53%	47%
Baccalaureate	39%	61%
Specialized	57%	43%
Institutional selectivity		
Mostly or highly competitive	15%	85%
Very competitive or competitive	29%	71%
Less competitive or non-competitive	52%	48%
Revenues		
High percent of revenue from tuition and fees	40%	60%
High percent of revenue from state government appropriations	56%	44%

Sources: BPS: 04/09 and IPEDS 2003-2004 datasets

^a All Chi-square tests indicated $p < 0.001$.

HGLM Estimates

Unconditional Model

HGLM analysis started with estimating the unconditional model to determine whether student completion varied across institutions. The basic form of the unconditional model is: $\text{Logit}(\text{completion}) = \beta_{0j}$, where $\beta_{0j} = \gamma_{00} + u_{0j}$. Here, γ_{00} represents the average log-odds of completing a bachelor's degree between institutions, and u_{0j} represents the variability between institutions in the log-odds of completion. The reliability estimate for the model was .599. In the null model, the reliability indicator shows how well each institution's sample mean estimates the unknown parameter β_0 . The reliability coefficient ranges from zero to one; the higher the coefficient, the easier it is to distinguish between institutions on the basis of their completion rates. Hence, the magnitude of .599 is reasonable for modeling institutional effects.

Table 6 shows the results of the (unit-specific) null model with its estimated logits and corresponding odd-ratios. The model indicates that there is significant variation in the average completion rate across institutions ($p < .001$). The expected log-odds of completion for students within a typical institution is $\exp(.22) = 1.25$, and thus the corresponding probability of completion for these students within a typical institution is $\exp(0.222) / 1 + \exp(0.222) = 0.55$. The results suggest that bachelor's degree completers who had the reference category characteristics for the categorical variables and the average characteristics for the continuous variables in the sample had a 55% probability of completing a degree at four-year institutions.

The unconditional HGLM model estimates that about 95% of schools in the sample have logits between $-0.22 \pm 1.96 * (1.198)^{0.5}$, or (2.367, -1.923). These logits correspond to estimated probabilities between .29 and .91, indicating considerable variation in completion rates.

Table 6: HGLM Unconditional Model

		Coefficients	SE	Odds-ratio	T(df)
Fixed effects	Intercept	0.222048***	0.054152	1.248631	4.104 (681)
		Variance		Chi-square	df
Random effects		1.19827***		2041.41	681

*** p<.001

The variation across institutions is highlighted by the chi-square statistics for the outcome variable. The dependent variable yielded a significant chi-square ($\chi^2 = 2041.41$, $p < .001$). The significance of this statistic suggested that the variance of student completion across institutions was significantly greater than zero; therefore, the analysis moved on with both within- and between-institutional models in HGLM.

Additionally, following Raudenbush and Bryk's (2002) recommendation, an inspection of empirical Bayes (EB) estimates and their 95% confidence intervals of individual level-2 units provided additional information regarding the extent of variation in the outcome at the institutional level. The examination of the EB random intercept for the institutional level in the residual file from the fully unconditional model revealed that average institutional completion rates vary significantly among institutions.

Student-level Variables Related to Completion

The within-institution model shows the effects of student-level variables and addresses the first research question:

How is the chance of college completion influenced by first-year financial aid packages, controlling for other student-level variables?

Table 7 shows the odds of completion at four-year institutions reflecting student demographic, socioeconomic, academic and financial characteristics including financial aid and non-educational pressures such as employment during enrollment. Table 7 presents the estimates in adjusted log-odds (grand-mean centered), their corresponding standards errors and odds-ratios for significant coefficients. Coefficients were interpreted using odds-ratios, representing the change in the odds of completion associated with a one-unit change in the independent variable, holding all others constant. In the within-institution model, the intercept was set as random. All the student-level coefficients were treated as fixed, assuming that the effects of the variable are the same across institutions. The variables were centered around their grand means.

Table 7: Student-level predictors of completion at a four-year institution among fall 2004 first-time full-time students

	Variables	Coefficient (log-odds)	SE	Odds- ratios
Student-level fixed effects				
	Female	0.211***	0.061	1.235
	Male (reference group)			
	Age 20+	-0.520**	0.168	0.594
	Age Under 20 (reference group)			
	African-American	-0.012	0.115	
	Hispanic	-0.070	0.113	
	Asian	-0.088	0.131	
	White (reference group)			
	SES	0.104***	0.020	1.110
	High School GPA	0.242***	0.034	1.274
	Admission scores	0.354***	0.040	1.426
	College GPA	0.384***	0.033	1.469
	Employment >20 hours	-0.812***	0.082	0.443
	Employment <20 hours (reference group)			
	Package with the highest proportion of grants	0.524***	0.150	1.689
	Package not with the highest proportion of grants (reference group)			
	Package with the highest proportion of loans	0.350***	0.074	1.419
	Package not with the highest proportion of loans (reference group)			
	Package with the highest proportion of grants and loans	0.562***	0.081	1.754
	Package not with the highest proportion of grants and loans (reference group)			
Random effects				
	Intercept	0.665***		
	Reliability	0.455		
	Chi-square	1455.641		

Sources: BPS: 04/09 and IPEDS 2003-2004 datasets

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

Consistent with previous research, the results confirm the importance of all of these characteristics for student outcomes, except race/ethnicity. The last column in Table 7 shows that the odds of bachelor's degree completion at four-year institution are positively influenced by being a female (odds-ratio = 1.235, $p < .01$), socioeconomic status (odds-ratio = 1.110, $p < .001$), high school academic achievement (odds-ratio

=1.274, $p < .001$), college admission scores (odds-ratio =1.426, $p < .001$), college academic performance (odds-ratio =1.469, $p < .001$), financial aid package with the highest proportion of grants (odds-ratio =1.689, $p < .001$), financial aid package with the highest proportion of loans (odds-ratio =1.419, $p < .001$), and financial aid package with the highest proportion of grants and loans (odds-ratio =1.754, $p < .001$). Consistent with expectations, the odds of bachelor's degree completion at four-year institution are negatively influenced by student age over 20 (odds-ratio = 0.594, $p < .01$) and being employed for more than 20 hours (odds-ratio =0.443, $p < .001$). These results echo prior research by highlighting the negative impact of increased hours of employment among students, who are likely to work more to cover college costs and spend less time on academic pursuits and collegiate life (Bound et al, 2010; Titus, 2006b).

The odds of completion are 1.23 times higher for females than males. Students under the age of 20 are 0.59 times more likely to complete their degrees. A one standard deviation increase in student socioeconomic status is associated with an 11% increase in a student's odds of completion (that is, $100\% * (\text{Odds-ratio} - 1) = 100\% * (1.110 - 1) = 11\%$). For every unit increase in high school GPA, students become 27% more likely to complete a degree, controlling for other variables. Each additional unit increase in mean admissions scores is associated with a 43% increase in a student's odds of completion. With one standard deviation increase in college academic performance measured by GPA, a student's odds of completion are expected to increase by 47%, holding other effects constant.

All three types of financial aid packages were significant predictors of completion. Controlling for all other factors, receiving financial aid packages with the highest proportion of grants was associated with increased odds of degree completion by

69%. All else being equal, receiving financial aid packages with the highest proportion of loans was associated with increased odds of completion by 44% while receiving financial aid packages with the highest proportion of both grants and loans was associated with increased odds of completion by 75%.

The Relationship between Completion and Institutional Characteristics.

Controlling for the student-level variables from the within-institution model, the between-institution model shows the effects of institution-level variables and addresses the second research question:

After taking into account student- and other institution-level variables, is college completion influenced by institutional revenue patterns?

The purpose of this model was to determine whether the average completion rates vary when all level-2 variables are included. All level-1 and level-2 predictors were set as fixed. Level-1 variables were group-mean centered. Level-2 variables were grand-mean centered. In this model, the statistical significance of the intercept ($p < 0.001$) suggests that, even after taking student-level variables into account, there are still differences in completion between institutions. Table 8 provides the HGLM estimates from the between-institution model, controlling for student-level variables. It shows that the average chance of completion at four-year institutions is associated with some structural/demographic characteristics.

Table 8: Institution-level predictors of completion at a four-year institution among fall 2004 first-time full-time students

Variables	Coefficient (log-odds)	SE	Odds- ratios
<i>Institution-level fixed effects</i>			
Institutional size			
Small	0.148	0.096	
Large	0.051	0.084	
Medium (reference group)			
Institutional control			
Private	0.577***	0.117	1.78
Public (reference group)			
Institutional mission			
Doctoral	0.306*	0.122	1.35
Master's	-0.045	0.101	
Specialized	-0.459**	0.146	0.63
Baccalaureate (reference group)			
Institutional selectivity			
Institutional selectivity: Mostly and highly competitive	1.433***	0.118	4.23
Institutional selectivity: Very competitive and competitive	0.760***	0.083	2.13
Institutional selectivity: Less competitive and non-competitive (reference group)			
Revenues			
High percent of revenue from tuition and fees	0.009	0.096	
High percent of revenue from state government appropriations	-0.024	0.072	

Sources: BPS: 04/09 and IPEDS 2003-2004 datasets

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

Controlling for student- and other institution-level variables, attending a private institution is positively related to the average chance of completion. Attending a doctoral institution is positively associated with the average chance of completion, while attending a specialized institution produces the opposite effect, net of other variables. Institutional selectivity is also positively related to the average chance of completion, all else being equal.

Controlling for student-level variables and other institutional characteristics, students attending private institutions have higher odds of completion compared to their

peers from the public (odds-ratio = 1.78, $p < 0.001$). After taking all variables into account, attending a doctoral institution increases the chance of completion. Students in doctoral institutions have higher odds of completion than students in baccalaureate institutions (odds-ratio = 1.35, $p < 0.01$). However, students attending specialized institutions have lower odds of completion compared to students in baccalaureate institutions (odds-ratio = 0.63, $p < 0.01$).

Institutional selectivity also significantly and positively predicted the outcome variable, even controlling for individual differences in high school and college achievement as well as admission scores. Net of other variables, students in mostly or highly competitive institutions have higher odds of completion compared to students in less competitive and non-competitive institutions (odds-ratio = 4.23, $p < 0.001$) and for very competitive and competitive institutions (odds-ratio = 2.13, $p < 0.001$).

Turning to institutional financial context, the relative effects of revenues (i.e., their estimates in the presence of other student- and institution-level variables) were not statistically significant. Table 8 indicates that the average chance of student completion is not related to the high percent of revenue from tuition and fees and high percent of revenue from state government appropriations. Because the analysis anticipated a significant association of institutional revenue variables with the dependent variable, multicollinearity diagnostics were conducted to check for inflated standard errors. The results revealed that VIF values were at acceptable levels (Table 9). Therefore, the non-significance of the institutional revenue patterns coefficients was not caused by collinearity among variables.

However, the model that generated results for Table 8, but in the absence of institutional control variable (public vs. private), reveals that the average chance of

completion becomes positively associated with one type of institutional revenue pattern. Holding all else constant, the likelihood of completion increases in institutions where a high percent of revenue is derived from state government appropriations (odds-ratio=1.27, $p<0.003$). This finding suggests that the chance of completion increases in institutions with high state government appropriations, when we do not control for institutional sector.

Table 9: Multicollinearity Diagnostics Results for Institutional Variables

Variable	VIF
Small	2.59
Large	2.15
Private	3.02
Doctoral	4.95
Master's	3.08
Specialized	1.22
Mostly and highly competitive	1.38
Very competitive and competitive	1.16
High percent of revenue from tuition and fees	2.19
High percent of revenue from state government appropriations	1.46

Source: IPEDS 2003-2004 datasets

Cross-level interactions

The between-institution model with a cross-level interaction addresses the third research question:

Controlling for student variables and other institutional variables, how is the relationship between college completion and first-year financial aid packages influenced by institutional revenue patterns at four-year institutions?

As the first step to address the third research question, the analysis determined whether the slopes (coefficients) reflect the effect of financial aid packages on the likelihood of degree completion. The financial aid variables were group-centered and were allowed to vary. Table 10 demonstrates that there is a significant difference in the relationship between all three types of financial aid packages and the chance of

completion across institutions. The variance components for the intercepts indicate a significant variation in slopes; therefore, the effect of each type of financial aid package on the chances of completion varies across institutions.

Table 10: The effects of financial aid packages on the chance of degree completion at a four-year institution among fall 2004 first-time full-time students

Variables	Coefficient (log-odds)	SE	Odds-ratios
Fixed effects			
Package with the highest proportion of grants	0.583***	0.156	1.792
Package with the highest proportion of loans	0.378***	0.071	1.459
Package with the highest proportion of grants and loans	0.663***	0.084	1.942
	Variance component	Reliability	Chi-square
Random effects			
Package with the highest proportion of grants	0.826***	0.075	467.28
Package with the highest proportion of loans	0.385*	0.056	317.97
Package with the highest proportion of grants and loans	0.775*	0.209	403.64

Sources: BPS: 04/09 and IPEDS 2003-2004 datasets

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

The second step involved testing three groups of cross-level interaction effects between financial aid packages and institutional revenue patterns: *Package with the highest proportion of grants x High percent of revenue from tuition and fees*, *Package with the highest proportion of grants x High percent of revenue from state government appropriations*; *Package with the highest proportion of loans x High percent of revenue from tuition and fees*, *Package with the highest proportion of loans x High percent of revenue from state government appropriation*; *Package with the highest proportion of grants and loans x High percent of revenue from tuition and fees*, *Package with the highest proportion of grants and loans x High percent of revenue from state government appropriations*. A cross-level interaction occurs when a level-2 variable moderates the magnitude of a level-1 relationship.

These cross-level interaction effects were examined separately along with their corresponding main effects for each type of financial aid package. The cross-level interaction coefficients were the same, regardless of whether they were examined separately in three different random coefficient models or jointly in one model. Level-2 controls were entered sequentially to the level-1 model but they did not change the significance, direction or magnitude of the cross-level interaction coefficients.

Table 11 provides HGLM estimates for the first-order terms (the intercepts for the financial aid slopes) and second-order terms for the cross-level interaction effects.

Table 11: HGLM Estimates with Interaction Effects

Variables	Coeff. (log- odds)	SE	Odds- ratios
<i>Intercept for the highest proportion of grants slope</i>	0.433**	0.142	1.54
Package with the highest proportion of grants x High percent of revenue from tuition and fees	0.165	0.356	
Package with the highest proportion of grants x High percent of revenue from state government appropriations	0.440	0.382	
<i>Intercept for the highest proportion of loans slope</i>	0.152*	0.073	1.16
Package with the highest proportion of loans x High percent of revenue from tuition and fees	-0.416*	0.173	0.65
Package with the highest proportion of loans x High percent of revenue from state government appropriations	0.131	1.140	
<i>Intercept for the highest proportion of grants and loans slope</i>	0.285**	0.087	1.33
Package with the highest proportion of grants and loans x High percent of revenue from tuition and fees	0.083	0.171	
Package with the highest proportion of grants and loans x High percent of revenue from state government appropriations	-0.542*	0.214	0.58

Sources: BPS: 04/09 and IPEDS 2003-2004 datasets

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

To better understand the effects of the cross-level interactions, one needs to first examine the intercepts reflecting the financial aid slopes or direct first-order effects. For example, the first-order term, the intercept for the highest proportion of loans slope, reflects the effect of the package with the highest proportion of grants at institutions that do not derive a high percent of revenue from tuition and fees. The intercept is, in essence, a reference group; it reflects “zero” because the institutional revenues variable was coded 0=institutions that do not derive a high percent of revenue from tuition and fees, 1=institutions that derive a high percent of revenue from tuition and fees. The second-order term for the interaction between the *Package with the highest proportion of loans x High percent of revenue from tuition and fees* and *Package* can therefore be interpreted as the deviation from that effect for students at institutions that derive a high percent of revenue from tuition and fees.

The slope of the level-1 predictor *The highest proportion of loans* was significant and positive. It means that, for students with the highest proportion of loans at institutions that do not receive a high percent of revenue from tuition and fees, the odds of completion increase, controlling for other variables in the model (odds-ratio=1.16, $p=0.03$). The slope of the level-1 predictor *The highest proportion of grants and loans* was also significant and positive. It means that, for students with the highest proportion of grants and loans at institutions that do not receive a high percent of revenue from state government appropriations, the odds of completion increase, net of other variables in the model (odds-ratio=1.33, $p=0.001$).

This information supports the next set of findings by suggesting that the relationships between student completion and financial aid packages are not the same across institutions with different revenue streams. Table 11 reveals two statistically

significant interaction effects between *Package with the highest proportion of loans x High percent of revenue from tuition and fees* and *Package with the highest proportion of grants and loans x High percent of revenue from state government appropriations*. The first statistically significant negative coefficient in the second column in Table 11 shows the effect of a student financial aid package with the highest proportion of loans on completion between institutions that derive a high percent of revenue from tuition and fees, compared to those that do not derive a high percent of revenue from tuition and fees. It suggests that the effect of a student financial aid package with the highest proportion of loans on completion for institutions with a high percent of revenue from tuition and fees is lower, compared to institutions without a high percent of revenue from tuition and fees (odds-ratio=0.65, p=0.026). In other words, students who receive high loans at institutions with a high level of revenue from tuition and fees benefit less, with regard to their chance of completion, than students at institutions without a high level of revenue from tuition and fees.

Similarly, the second statistically significant negative coefficient in the second column in Table 11 shows the effect of a student financial aid package with the highest proportion of grants and loans on completion between institutions who receive a high percent of revenue from state government appropriations, compared to those who do not receive a high percent of revenue from state government appropriations. It indicates that the effect of a student financial aid package with the highest proportion of grants and loans on completion between institutions who derive a high percent of revenue from state government appropriations is lower, compared to those institutions who do not derive a high percent of revenue from state government appropriations (odds-ratio=0.58, p=0.011). Put differently, one would expect students who receive high grants and loans

at institutions with a high level of revenue from state government appropriations to benefit less, with regard to their chance of completion, than students at institutions without a high level of revenue from state government appropriations.

The results of the remaining four HGLM cross-level interactions reveal that the presence of a high percent of revenue from tuition and fees or a high percent of revenue from state government appropriations has no influence on the strength of the relationship between college completion for students with high grants in their financial aid packages ($b=0.17$, $p=0.63$; $b=0.456$, $p=0.24$). The presence of a high percent of revenue from state government appropriations did not moderate the strength of the relationship between college completion for students with high loans in their financial aid packages ($b=0.131$, $p=0.4$). Finally, the results produce no evidence that the relationship between student completion and student financial aid packages with the highest proportion of grants and loans depended on whether institutions derived a high percent of revenue from tuition and fees, once the effects of other variables are considered ($b=0.083$, $p=0.6$).

CHAPTER 5: Discussion, Conclusion, Implications, and Recommendations for Future Research

Discussion

The primary purpose of this study was to address the extent to which the relationship between college completion and first-year financial aid packages is influenced by institutional revenue patterns at four-year institutions. Using data from BPS:04/09 and 2004 IPEDS surveys, along with multilevel statistical techniques, this research drew from resource dependence and financial aid theories to examine the research questions. College completion was operationalized as bachelor's degree completion within six years after the first enrollment at the initial institution.

It represents an initial analytic effort to understand the connection between institutional revenue patterns, student financial aid, and college completion. The study hypothesized that institutional financial context, measured by revenues from student tuition and fees and from state government appropriations, may influence the relationship between student degree completion and different types of financial aid packages. Its theoretical framework used resource dependence theory to explain why universities are searching for alternative sources of revenue, given diminished state support. Institutions react to reductions in state government appropriations by matching the shortfall through tuition increases; tuition and fees have emerged as alternative substantial revenue sources for many public four-year institutions (Geiger, 2004; Heller, 2006; Derochers, Lenihan, & Wellman, 2010). The differences in institutional revenues influence the magnitude of student subsidies they are able to provide (Winston, 1999). These resources may contribute to subsidizing tuition generally or providing special discounts to students with constrained budgets in particular. Higher education institutions are able to subsidize all

of its customers whether it is due to cross-subsidization or because the price of education falls below the cost of its production (Winston, 1999).

Because students can be viewed as a source of revenue, colleges and universities pursue different revenue management strategies to capitalize on these resources (Hossler, 2006). The study conceptualized that institutions that are becoming tuition-dependent may be looking at students differently than in the past. Public colleges and universities, in particular, receive state allocations based on student enrollment and, unless they operate with debts, some of them have to balance their budgets with revenue generated by enrollment. Due to the institutional perception that students are an important source of revenue, colleges and universities have a reason to retain students because they may be viewing them as paying customers. Some research suggests that, by subsidizing student attendance costs with funds derived through institutional revenues, institutions may be motivated to invest in stronger retention efforts, which, in turn, may lead to higher persistence or completion rates (Titus, 2006a, 2006b). The study's descriptive analyses show that completion rates tend to be higher on campuses that rely more heavily on institutional revenues coming from tuition and fees than at institutions that rely more heavily on institutional revenues from state government appropriations (60% vs. 44%).

The purpose of this chapter is to interpret and to discuss the implications of the study's findings. The first section of the chapter discusses the findings that are presented in Chapter 4. The findings are presented in the same order as the study's research questions, although the focal point of this investigation is the link between institutional revenue patterns and the relationship between student financial aid and college completion. The next section presents several conclusions based on the discussion of the

findings. The chapter concludes with the implications of the study's results for methods, theory, and future research.

Research Question 1: The influence of first-year financial aid packages on student completion

How is the chance of college completion influenced by first-year financial aid packages, controlling for other student-level variables?

Multilevel analyses show that all three types of financial aid packages are positively related to the average likelihood of completion. This finding reinforces the important role of financial aid in promoting college attainment. Controlling for all other factors, receiving financial aid packages with the highest proportion of grants, receiving financial aid packages with the highest proportion of loans, and receiving financial aid packages with the highest proportion of both grants and loans were all associated with increased odds of completion. The positive effect of loans is consistent with human capital theory, as borrowing can offset the direct costs of college (Choy, 1998; Cofer & Somers, 2000). Financial aid package with the highest proportion of grants and loans was a strong student-level predictor of college completion as well. These findings are consistent with the descriptive analyses, showing that a much higher share of completers (68%) than non-completers (32%) received packages with the highest proportion of grants and a higher share of completers (66%) than non-completers (34%) relied on packages with the highest proportion of both grants and loans to support their education.

However, the findings regarding the effects of three types of financial aid packages should be interpreted with caution. The first research question was simply to ascertain if financial aid packages varied within institutions and not to properly investigate the effects of financial aid on student completion. The estimated effects of all three types of financial aid are likely overestimated due to the insufficient control for self-selection (endogeneity) in financial aid. This issue was touched upon in Chapter 3. The effects of aid may be confounded by self-selection into aid eligibility; students are not randomly awarded financial aid. In part, because the level-1 model from this study did not have robust controls for unobserved student characteristics associated with the receipt of financial aid, the effects of aid were likely to be confounded by omitted variable bias. In the future, different statistical techniques such as propensity score matching, regression discontinuity analysis, difference-in-differences approach, instrumental variable methods, and panel techniques should be utilized to reduce selection and omitted variable bias in investigating the effects of financial aid on student outcomes (Cellini, 2008; DesJardins & Flaster, 2013).

Additionally, one of the important limitations of this study is that it did not control for the total amount of financial aid students are awarded. This research was mainly interested in the types of different mixes of financial aid as opposed to the reduction of financial need. The majority of the financial aid literature concerning the effects of student financial aid on student outcomes focuses on the magnitude of financial aid and, to a much lesser degree, on the types of mixes that students receive. However, the analysis did not examine the extent to which financial aid packages meet student need.

Research Question 2: The influence of institutional revenue patterns on student completion

After taking into account student- and other institution-level variables, is college completion influenced by institutional revenue patterns?

Overall, the study suggests that institutional factors have a weaker association with the average chance of completion than individual characteristics. The results for the second question reveal that certain institution-level variables were useful in explaining student completion. However, from the perspective of resource dependence theory, an institution's financial context as measured by the institutional revenues from tuition and fees and state government appropriations, did not help explain differences in the probability of completion between four-year institutions.

The results indicate that institutional revenue variables, namely, high percent of revenue from tuition and fees and high percent of revenue from state government appropriations, appear to be unrelated, statistically, to the average chance of completion at four-year institutions. Although this study focuses on completion and uses more recent BPS and IPEDS data, previous studies have found that revenues generated from tuition and fees were associated with retention, persistence, or completion (Singell, 2004; St. John et al., 2005; Titus, 2006a, 2006b, 2006c). For example, these findings contradicted those of Titus who found that institutional persistence rate was related to the extent to which an institution relies on tuition as a source of revenue. The explanation may lie in how revenues were operationalized and the nature of the dependent variable. For

example, in Titus' research the revenue variable was measured as percent of revenue from tuition and it was a continuous measure. In this study, revenues were measured by two independent binary variables that represented instances when the given source amount fell into the 75th percentile distribution.

Although the structural/demographic institution-level characteristics are not of primary interest in the study, the results show that some of them are associated with degree completion. Barron's selectivity index had the strongest positive association with completion in the study's model. These findings accord closely with previous research that finds that selectivity influences students' likelihood of degree completion (Titus, 2004; Gansemer-Topf & Schuh, 2006; Kim, 2007; Oseguera & Rhee, 2009). Results also validate previous research that attending a private institution is positively related to completion (Ryan, 2004; Titus, 2004, 2006b; Kim, 2007; Oseguera & Rhee, 2009).

An interesting set of findings reveal the association of institutional mission based on Carnegie classification with student completion. The results suggest that, all else being equal, student completion rates do differ by institution type. Doctoral institutions perform much better in terms of graduating students than baccalaureate institutions. The finding that students in specialized institutions (i.e., schools of business and management, schools of art, music, and design, schools of law, schools of engineering) have lower completion rates than students at baccalaureate institutions echo the results from other studies (Horn, 2006).

Research Question 3: The influence of institutional revenue patterns on the relationship between student financial aid packages and completion

Controlling for student variables and other institutional variables, how is the relationship between college completion and first-year financial aid packages influenced by institutional revenue patterns at four-year institutions?

The first two research questions set the stage to address the third research question, which constitutes the main purpose of this project. The primary interest of the study was to investigate the link between institutional revenue patterns and the relationship between student financial aid and college completion. The study's findings highlight the differences in the financial context of institutions, with regard to the relationship between completion and financial aid packages—particularly those with high loan and high loan/high grant levels.

The results of cross-level interaction effects show that, while two interaction effects between *Package with the highest proportion of loans* x *High percent of revenue from tuition and fees* and *Package with the highest proportion of grants and loans* x *High percent of revenue from state government appropriations* produced statistically significant and negative coefficients, none of the other interactions yielded similar empirical support.

This discussion turns first to the findings associated with two statistically significant interaction variables. The first interaction term shows that the effect of a student financial aid package with the highest proportion of loans on completion is lower

at institutions with a high percent of revenue from tuition and fees, compared to institutions without a high percent of revenue from tuition and fees. This finding implies that students who take on substantial loans at institutions that are highly dependent on revenue from tuition and fees benefit less, in terms of their chances of completion, than students at institutions that are not highly dependent on revenue from tuition and fees.

A potential interpretation of these findings may deal with the distribution patterns of financial resources in institutions that are highly dependent on revenues from tuition and fees. Institutions with higher tuitions potentially have more resources to provide financial aid to students in need. They may choose to reallocate some of these revenues towards more institutional financial aid in the form of grants and/or scholarships. Or could it be that, these institutions are turning to students to capture more of their federal loan revenue (McPherson & Schapiro, 1991; Cunningham, Wellman, Clinedinst, Merisotis, & Carroll, 2001; Cellini & Goldin, 2012). This interpretation is admittedly speculative, but there is a possibility that, as institutions become more dependent on revenue from tuition and fees, more students who are able to qualify for larger federal subsidies in the form of federal grants or loans, end up relying more on loans rather than grants to finance their education. Further research is required to assess the connections between institutional revenues from tuition and fees and their impact on student completion of those who borrow extensively to attend college.

The second negative interaction variable reveals that the effect of a student financial aid package with the highest proportion of grants and loans on completion is lower at institutions that derive a high percent of revenue from state government appropriations, compared to those institutions that do not derive a high percent of revenue from state government appropriations. Put differently, in terms of their chances of

completion, students who receive high grants and loans at institutions with a high level of revenue from state government appropriations benefit less from relatively high grants and loans than students at institutions without a high level of revenue from state government appropriations.

These findings may be better understood in terms of having two different kinds of subsidies at work. Student financial aid is a student-specific subsidy while state government appropriations constitute a general institution-specific subsidy. The results therefore suggest that the impact of high student-specific subsidies on completion at institutions with high general institution-specific subsidies is lower than at institutions without high general institution-specific subsidies. This finding implies that, in terms of the chance of degree completion, the role of student-specific subsidies decreases in the presence of high general institution-specific subsidies. It is not clear why the relationship of student high subsidies and completion is mitigated at institutions with high general subsidies. The answer depends on what kind of institutions we are dealing with, where they are located, and what their students look like.

One likely explanation involves educational resources available to students at institutions with high general subsidies. It is possible that revenues from state appropriations are targeted toward expenditures in educational resources that are directly or indirectly linked to completion. Institutions can convert these financial resources, in the form of state appropriations, to educational resources for students in ways that make degree completion more likely. In fact, some research found that institutional resources per student do matter for completion at four-year institutions (Bound et al., 2009). It may be that institutions that receive substantial revenues from state government appropriations use these funds to subsidize other campus-based initiatives that could be helping students.

These institutions may be funding services and interventions designed to increase instructional quality, foster student academic and social engagement, improve student support services, and more. These practices and/or interventions may ultimately contribute to better student persistence and completion rates. Additional research is needed to understand the specific influences of institutional resource distribution in relation to educational outcomes of students who receive substantial financial aid.

Moving on to the next finding, contrary to expectations, the study found no statistically significant evidence that the presence of high percent of revenue from tuition and fees or high percent of revenue from state government appropriations had any influence on the strength of the relationship between college completion and financial aid packages with the highest proportion of grants. Thus, students who receive high grants at institutions with a high level of revenue from tuition and fees or high percent of revenue from state government appropriations and students at institutions without a high level of revenue from tuition and fees or state government appropriations, benefit equally, with regard to their chance of completion.

The absence of statistical significance in the interaction term here may be due to low variability in the range of revenues from tuition and fees among different institutions. In addition, the statistical non-significance of the relationship between college completion as of academic year 2009 and student financial aid and institutional revenues as of fiscal year 2004 may reflect chronological misalignment between these variables. Because standard multilevel models do not incorporate time-varying variables into analysis, these relationships may be better explored with more advanced techniques like multilevel event history methods (Blossfeld & Rohwer, 2002) or dynamic panel-data analysis (Hsiao, 2014), which combine time-series and cross-sectional information.

Conclusions

Several conclusions may be drawn from this research. First, controlling for other student-level variables, all types of financial aid packages are positively associated with completion at four-year institutions.

Second, after taking into account student- and other institution-level variables, institutional revenue variables, when they are measured by high percent of revenue from tuition and fees and high percent of revenue from state government appropriations, are not related to differences across institutions in the odds of student degree completion.

Third, and most importantly, the results from the study support the conclusion that the relationship between student completion and financial aid packages varies based on institutional financial context measured by revenue patterns. Specifically, the observed differences in institutional financial context influence the completion of students carrying financial aid packages with high loan and high loan/high grant levels. Namely, the findings suggest that students who take on substantial loans at institutions that are highly dependent on revenue from tuition and fees benefit less, with regard to their chances of completion, than students at institutions that are not highly dependent on revenue from tuition and fees. There results also reveal that students who receive high grants and loans at institutions with a high level of revenue from state government appropriations benefit less, with regard to their chances of completion, than students at institutions without a high level of revenue from state government appropriations.

Additionally, the analyses show that students who receive high grants at institutions with a high level of revenue from tuition and fees or high percent of revenue from state government appropriations and students at institutions without a high level of revenue from tuition and fees or state government appropriations, benefit equally, in

relation to their chance of completion. Overall, the evidence demonstrates that, controlling for student and other institutional variables, institutional financial context has an effect on the relationship between the average chance of degree completion and student financial aid packages in the form of high loans or high loans/high grants.

In sum, the study provides a unique contribution to the literature by uncovering the effect of institutional financial context on the relationship between college completion and student financial aid. The results of the study extend previous research by considering the connection between institutional revenue patterns, student financial aid packages, and college completion at the national level. Substantively, this research provides initial evidence of this linkage, not apparent in the extant literature. Unlike previous studies that only focused on the effects of institutional financial context on student educational outcomes (Bound et al., 2010; Chen, 2012; Oseguera, 2005; Ryan, 2004; Titus, 2004, 2006a, 2006b; Webber & Ehrenberg, 2010), this investigation took a step further by considering a more nuanced connection between individual and institutional characteristics in relation to student completion. Using a nationally representative dataset, the study adds to previous research by demonstrating that institutional financial context can modify the relationship between college completion and first-year financial aid packages.

Implications

This study has several implications for policy, theory, and methods. Regarding policy, the results of the study call for strengthening state financial support of higher education. The most salient policy implication stems from the results that institutional financial resources may mediate the impact of student-specific resources, i.e., financial aid, with regard to degree completion. This finding underscores the centrality of public funding of higher education if student-specific financial aid declines. Apart from other financing strategies (need- and merit-based financial programs), state appropriations to colleges and universities help reduce the cost of student attendance by providing campuses a source of revenue other than tuition and fees. Because state funding cuts reduce institutions' ability to invest in their resource base, diminished educational resources can have serious consequences for students and their families, particularly at public colleges and universities. State financial investment in higher education may become increasingly important if student-specific financial aid resources decrease. Policy-makers should consider how best to allocate scarce public funds, especially in the light of the increased efforts in their states to increase postsecondary degree completion.

With regard to theory implications, the study's theoretical framework consisting of resource dependence and financial aid theories to address whether institutional revenue patterns influence the relationship between college completion and student financial aid provided some value. Resource dependence theory served as a guiding and informing framework for this investigation, although the purpose of the research was not to test the applicability of this particular theory. It helps understand why institutions look to rebalance their revenue streams and why organizational behavior with respect to financial resources matters. However, resource dependence theory does not provide any insights

into how financial resources are expended within those institutions. To better interpret some of the findings described in Chapter 5, it needs to be augmented with other organizational theories. Theory-building qualitative studies may be fruitful in this area, enabling researchers to glean insights into how institutions distribute and leverage their resources within their respective contexts.

In terms of implications for practice, more information about the institutional context of individual institutions is required to make specific recommendations. This study was a first step towards understanding the institutional financial context related to student completion. To find best practices, new techniques such as stochastic frontier analysis can be used to identify institutions with the most successful degree completion records. Qualitative approaches can then be utilized to delve into the best practices occurring at these institutions. The resulting findings may generate relevant implications for practice in the future.

On a related note, qualitative research may also be useful to follow up on some of the speculations raised above regarding institutional spending on retention-related activities and/or interventions. Qualitative research is required to overcome some of the limitations of existing datasets that collect institutional financial data. For example, IPEDS provides limited data for institutional spending on student services at the undergraduate level because the reported expenditures for undergraduate students are combined with those for graduate students. The lack of accurate data regarding relevant institutional expenditures necessitates the use of qualitative approaches such as case studies.

As far as methods, the results demonstrate the utility of using multilevel statistical techniques to estimate how various factors predict the probability of a dichotomous

outcome, such as completion of a bachelor's degree. Multilevel models conveniently incorporate the clustered sample design into analysis. They are useful for statistically analyzing a data structure where students (level-1) are nested within institutions (level-2). Multilevel models are particularly well-suited for investigating how the relationship(s) between student-level variables vary as a function of institution-level variables.

Additionally, this research points to the challenges inherent in operationalization and measurement of variables. One obstacle involved the construction of student financial aid and institutional revenues measures. For example, the study experimented with several coding schemes because independent variables reflecting institutional revenues in the analysis were highly correlated between each other and with institutional control variable. Due to multicollinearity issues, variables reflecting institutional revenues were eventually recombined into a set of dummy-coded variables.

Recommendations for Future Research

This research builds on the broader literature that investigates how financial aspects of institutional functioning (including revenues, expenditures, endowment, etc.) influence persistence and degree completion (Bound et al., 2010; Chen, 2012; Kim, 2007; Oseguera, 2005; Rhee, 2008; Ryan, 2004; Titus, 2004, 2006a, 2006b; Webber & Ehrenberg, 2010). This project has a limited scope, since its purpose was to examine the extent to which the relationship between college completion and first-year financial aid packages is influenced by institutional revenue patterns. Nonetheless, it hints at several new directions for study.

Future research should attempt to disaggregate financial aid by type (grants, scholarships, loans) and by origin (federal, state, institutional, private sources) to see if

these sources function differently, in relation to student completion. Different types of financial aid have a different focus, benefits, and dollar values. The study used aggregated measures of financial aid in a dichotomous format. Moreover, because the sample for the study includes students at both public and private institutions, it may be appropriate to run separate models for each category. When the analysis is split by institutional type, the relative mix of revenues may reflect that category more accurately.

The moderating effects of institutional revenues on the relationship between student financial aid and college completion need to be reexamined, utilizing more advanced methodological approaches in order to enhance the accuracy of future inferences about these relationships. The study supports the use of longitudinal methods such as multilevel event history analysis to continue to untangle the influence of time-variant institutional factors on student educational outcomes. This approach will help minimize model misspecification issues and biased or spurious results.

In addition, future research interested in the effects of financial aid on student outcomes should seek to model possible changes in student financial aid packages by incorporating a longitudinal perspective as well (DesJardins et al., 2002). To better model these changes, future waves of the BPS should strive to include institutional- and state-level financial aid data for the second through the sixth years of college enrollment.

Another recommendation concerns the IPEDS Finance component data collection. Additional refinements of the IPEDS data are necessary to continue to conduct nuanced research involving institutional financial context. Fine-grained IPEDS data, more closely reflecting institutional revenues and expenditures, would be necessary to address possible directions for future research that delves more deeply into the effects of institutional financial context on educational outcomes. To that end, it is equally

important to improve the comparability of the financial data. Because most public institutions report IPEDS Finance data using Governmental Accounting Standards Board (GASB) standards and most private institutions report IPEDS Finance data using the Financial Accounting Standards Board (FASB) criteria, the data are usually not fully comparable between the two types of institutions.

In conclusion, because many institutional policies are within the control of institutional and state policy-makers, future research, in general, should continue to explore the effects of institutional fiscal behavior on student outcomes. As Pascarella and Tereznini (2005) suggested, institutional effects on student outcomes are less about what an institution *is* than about what an institution *does*.

References

- Aldrich, H. E., & Pfeffer, J. (1976). Environments of organizations. *Annual Review of Sociology*, 2, 79-105.
- Alon, S. (2005). Model mis-specification in assessing the impact of financial aid on academic outcomes. *Research in Higher Education*, 46(1), 109-125.
- Astin, A. W. (1993). *What matters in college? Four critical years revisited*. (1st ed.). San Francisco: Jossey-Bass.
- Aud, S., Hussar, W., Planty, M., Snyder, T., Bianco, K., Fox, M., Frohlich, L., Kemp, J., Drake, L. (2010). *The Condition of Education 2010* (NCES 2010-028). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.
- Bailey, T. R. (2006). *Research on institution level practice for postsecondary student success*. National Postsecondary Education Cooperative. Washington, DC.
- Bailey, T., Calcagno, J., Jenkins, D., Kienzl, G., & Leinbach, D. (2005). *The effects of institutional factors on the success of community college students*. New York: Community College Research Center, Teachers College, Columbia University.
- Bastedo, M. N., & Bowman, N.A. (2011). College rankings as an interorganizational dependence: Establishing the foundation for strategic and institutional accounts. *Research in Higher Education*, 52, 3-23.
- Baum, S., McPherson, M., & Steele, P. (Eds.). (2008). *The effectiveness of student aid policies: What the research tells us*. New York, NY: College Board.
- Baum, S., Kurose, C., & Ma, J. (2013). *How college shapes lives: Understanding the issues*. Trends in Higher Education Series. New York, NY: College Board and Advocacy & Policy Center.
- Baylor, E. (2014). *State Disinvestment in Higher Education Has Led to an Explosion of Student-Loan Debt*. Center for American Progress, Washington, D.C.
- Bean, J. P. (1980). Dropouts and turnover: The synthesis and test of a causal model of student attrition. *Research in Higher Education*, 12(2), 155-187.
- Bean, J. P. (2005). Nine themes of college student retention. In A. Siedman (Ed). *College student retention: Formula for student success* (pp.215-244). Washington, D.C.: ACE and Praeger.

- Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). Chicago, IL: University of Chicago Press.
- Berger, J. B. (2000). Organizational behavior at colleges and student outcomes: A new perspective on college impact. *Review of Higher Education*, 23(2), 177-198.
- Berger, M. C., & Kostal, T. (2002). Financial resources, regulation, and enrollment in US public higher education. *Economics of Education Review*, 21(2), 101-110.
- Berger, J., & Milem, J. (2000). Organizational behavior in higher education and student outcomes. In J. C. Smart (Ed.), *Higher Education: Handbook of Theory and Research* (Vol. 15, pp. 268-338). Bronx, NY: Agathon Press.
- Bettinger, E. (2004). How financial aid affects persistence. In C. Hoxby (Ed.), *College choices: The economics of where to go, when to go, and how to pay for it* (pp. 207–238). Chicago, IL: University of Chicago Press.
- Bettinger, E. P. (2010). *Need-based aid and student outcomes: The effects of the Ohio College Opportunity Grant*. Unpublished manuscript, Stanford University School of Education. Retrieved from <http://www.sesp.northwestern.edu/docs/need-based-aid-why.pdf>
- Bettinger, E. (2011). *Financial Aid: A Blunt Instrument for Increasing Degree Attainment*. Washington, D.C.: American Enterprise Institute.
- Blossfeld, H.P. and Rohwer, G. (2002). *Techniques of Event History Modeling: New Approaches to Causal Analysis* (2nd Ed.). New Jersey: Lawrence Erlbaum Associates.
- Bok, D. (2003). *Universities in the Marketplace: The Commercialization of Higher Education*. Princeton, NJ: Princeton University Press.
- Bound, J., & Turner, S. (2002). Going to war and going to college: did World War II and the G.I. Bill increase educational attainment for returning veterans? *Journal of Labor Economics*, 20, 784-815.
- Bound, J., & Turner, S. (2006). *Cohort Crowding: How Resources Affect Collegiate Attainment*. NBER Working Paper No. 12424. Cambridge, MA: National Bureau of Economic Research.
- Bound, J., Lovenheim, M., & Turner, S. (2007). *Understanding the Decrease in College Completion Rates and the Increased Time to the Baccalaureate Degree*. Population Studies Center Research Report 07-626, University of Michigan.
- Bound, J., Lovenheim, M., & Turner, S. (2010). Why have college completion rates declined? An analysis of changing student preparation and collegiate resources. *American Economic Journal: Applied Economics*, 2(3), 129.

- Braunstein, A., McGrath, M., & Pescatrice, D. (2000). Measuring the impact of financial factors on college persistence. *Journal of College Student Retention*, 2(3), 191-203.
- Braxton, J. M. (2000). Reinvigorating theory and research on the departure puzzle. In J. M. Braxton (Ed.), *Reworking the student departure puzzle* (pp. 257–274). Nashville, TN: Vanderbilt University Press.
- Braxton, J. M. (2004, February). *Inventory of institutional studies of college student departure*. Presentation with panel discussion at Indiana Project on Academic Success Workshop I, Indianapolis, IN. Bloomington, IN: Indiana University, Indiana Project on Academic Success.
- Bruce, D., & Carruthers, C. (2011). *Jackpot? The Impact of Lottery Scholarships on Enrollment and Earnings in Tennessee*. Working paper, University of Tennessee.
- Cabrera, A. F. (1994). Logistic regression analysis in higher education: An applied perspective. In J. C. Smart (Ed.), *Higher Education: Handbook of Theory and Research* (Vol. 10, pp. 225-256). Bronx, NY: Agathon Press.
- Cabrera, A., Castañeda, M., Nora, A., & Hengstler, D. (1992). The convergence between two theories of college persistence. *Journal of Higher Education*, 63(2), 143-164.
- Cabrera, A. E, Nora, A., & Castañeda, M. (1993). College persistence: Structural equations modeling test of an integrated model of student retention. *Journal of Higher Education*, 64(2): 123-139.
- Campbell, T. I. D., & Slaughter, S. (1999). Faculty and administrators' attitudes toward potential conflicts of interest, commitment, and equity in university-industry relationships. *Journal of Higher Education*, 70(3), 309–52.
- Carnevale, A. P. (2008.) College for All. *Change*, January/February.
- Carnevale, A. P., & Desrochers, D.M. (2003). *Standards for what? The economic roots of K16 reform*. Princeton, NJ: Educational Testing Service.
- Carruthers, C., & Ozek, U. (2013). *Losing HOPE: Financial Aid and the Line Between College and Work*. Working paper 91. National Center for Analysis of Longitudinal Data in Education Research.
- Castleman, B. L., & Long, B. T. (2013). *Looking beyond enrollment: The causal effect of need-based grants on college access, persistence, and graduation* (NBER Working Paper 19306). Cambridge, MA: National Bureau of Economic Research.
- Cellini, S. (2008). Causal Inference and Omitted Variable Bias in Financial Aid Research: Assessing Solutions. *Review of Higher Education*, 31(3), 329-354.

- Cellini, S. (2010). Financial Aid and For-Profit Colleges: Does Aid Encourage Entry? *Journal of Policy Analysis and Management*, 29(3), 526-552.
- Cellini, S. R., & Goldin, C. (2012). *Does federal student aid raise tuition? New evidence on for-profit colleges* (Working paper no. 17827). Cambridge, MA: National Bureau of Economic Research.
- Cha, P., & Patel, R. (2010). *Rewarding Progress, Reducing Debt: Early Results from Ohio's Performance-Based Scholarship Demonstration for Low-Income Parents*. MDRC.
- Chen, R. (2008). Financial aid and student dropout in higher education: A heterogeneous research approach. In J. C. Smart (Ed.), *Higher education: Handbook of Theory and Research* (Vol. 23, pp. 209-239). New York, NY: Springer.
- Chen, R. (2012). Institutional characteristics and college student dropout risks: A multilevel event history analysis. *Research in Higher Education*, 53(5), 487-505.
- Chen, R., & DesJardins, S. (2008). Exploring the effects of financial aid on the gap in student dropout risks by income level. *Research in Higher Education*, 49(1), 1-18.
- Choy, S. P. (1998). *Postsecondary financing strategies: How undergraduates combine work, borrowing, and attendance*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- Clark, B. (1998). *Creating Entrepreneurial Universities: Organizational Pathways of Transformation*. Oxford, UK: Pergamon for the IAU Press.
- Clark, B. R. (2004). Delineating the character of the entrepreneurial university. *Higher Education Policy*, 17, 355-370.
- Clotfelter, C. T. (1996). *Buying the best: cost escalation in elite higher education*. Princeton, N.J.: Princeton University Press.
- Cofer, J., & Somers, P. (2000). A comparison of the influence of debt load on the persistence of students at public and private colleges. *Journal of Student Financial Aid*, 30(2), 39-58.
- Cohodes, S. & Goodman, J. (2012, August). *First Degree Earns: The Impact of College Quality on College Completion Rates*. Working Paper RWP12-033. Harvard Kennedy School Faculty Research Working Paper Series.
- Cornwell, C. M., Lee, K. H., & Mustard, D. B. (2005). Student Responses to Merit Scholarship Retention Rules. *Journal of Human Resources*, 40, 895-917.

- Cornwell, C., Mustard, D. B., & Sridhar, D. J. (2006). The enrollment effects of merit-based financial aid: Evidence from Georgia's HOPE program. *Journal of Labor Economics*, 24(4), 761-786.
- Croninger, R. G., & Douglas, K. M. (2005). Missing data and institutional research. In P. D. Umbach (Ed.), *Survey Research. Emerging Issues. New directions for institutional research* #127 (pp. 33-50). San Francisco, CA: Jossey-Bass.
- Cunningham, A. F., Wellman, J. V., Clinedinst, M. E., Merisotis, J. P. & Carroll, C. D. (2001a). *Study of college costs and prices, 1988-89 to 1997-98*, Volume 1. Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- Curs, B. R., Singell, L. D., Jr., & Waddell, G. R. (2007). Money for nothing? The impact of changes in the Pell Grant Program on institutional revenues and the placement of needy students. *Education Finance and Policy*, 2, 228-261.
- Deming, D., & Dynarski, S. (2010). Into college, out of poverty? Policies to increase the postsecondary attainment of the poor. In P. Levine & D. Zimmerman (Eds.), *Targeting investments in children: Fighting poverty when resources are limited* (pp. 283-302). Chicago, IL: University of Chicago Press.
- DesJardins, S. L., Ahlburg, D. A., & McCall, B. P. (2002). Simulating the longitudinal effects of changes in financial aid on student departure from college. *The Journal of Human Resources*, 37(3), 653-679.
- DesJardins, S., Dundar, H., & Hendel, D. (1999). Modeling the Application Decision Process at a Land Grant University. *Economics of Education Review*, 18, 117-132.
- DesJardins, S. L., & Flaster, A. (2013). Non-experimental designs and causal analyses of college access, persistence, and completion. In L. W. Perna & A. P. Jones (Eds.), *The state of college access and completion* (pp. 190-207). New York, NY: Routledge.
- DesJardins, S. & McCall, B. (2010). Simulating the Effects of Financial Aid Packages on College Student Stopout, Reenrollment Spells, and Graduation Chances. *The Review of Higher Education*, 33(4), 513-541.
- DesJardins, S. & Toutkoushian, R. (2005). Are Students Really Rational? The Development of Rational Thought and Its Application to Student Choice. In J. C. Smart (ed.), *Higher Education: Handbook of Theory and Research* (Vol. 20, pp. 191-240). New York, NY: Springer.
- Desrochers, D., Lenihan, C., & Wellman, J. (2010). *Trends in College Spending*. Washington, DC: Delta Project on Postsecondary Costs.

- Dowd, A. C. (2004). Income and financial aid effects on persistence and degree attainment in public colleges. *Educational Policy Analysis Archives*, 12(21).
- Dowd, A. C., & Coury, T. (2006). The effect of loans on the persistence and attainment of community college students. *Research in Higher Education*, 47(1), 33-62.
- Dynarski, S. M. (2000). Hope for whom? Financial aid for the middle class and its impacts on college attendance. *National Tax Journal*, 53, 629-666.
- Dynarski, S. M. (2002). The consequences of lowering the cost of college: The behavioral and distributional implications of aid for college. *American Economic Review*, 92, 279-285.
- Dynarski, S. M. (2003). Does aid matter? Measuring the effect of student aid on college attendance and completion. *American Economic Review*, 93(1), 279-288.
- Dynarski, S. M. (2004). The new merit aid. In: Hoxby, C. (Ed.), *College Choices: The Economics of Where To Go, When To Go, and How To Pay For It* (pp. 63-97). Chicago, IL: University of Chicago Press.
- Dynarski, S. (2008). Building the Stock of College-Educated Labor. *Journal of Human Resources*, 43(3), 576-610.
- Eagan, M. K., Jr., & Jaeger, A. J. (2009). Effects of exposure to part-time faculty on community college transfer. *Research in Higher Education*, 50(2), 168-188.
- Ehrenberg, R.G. (2000). Financial forecasts for the next decade. *The Presidency*, (Spring), 30-34.
- Ehrenberg, R. G., & Sherman, D. R. (1984). Optimal financial aid policies for a selective university. *The Journal of Human Resources*, 19(2), 202-230.
- Emerson, R. (1962). Power-Dependence Relations. *American Sociological Review*, 27, 31-41.
- Gansemer-Topf, A., & Schuh, J. (2006). Institutional selectivity and institutional expenditures: Examining organizational factors that contribute to retention and graduation. *Research in Higher Education*, 47(6), 613-642.
- Geiger, R. L. (2004). *Knowledge and money: Research universities and the paradox of the marketplace*. Stanford, CA: Stanford University Press.
- Goldrick-Rab, S., Harris, D.N., Kelchen, R., & Benson, J. (2012). *Need-Based Financial Aid and College Persistence: Experimental Evidence From Wisconsin*. Wisconsin Scholars Longitudinal Study, Wisconsin Center for Education Research at the School of Education. University of Wisconsin, unpublished mimeo.

- Goldrick-Rab, S., Harris, D. N., & Trostel, P. A. (2009). Why financial aid matters (or doesn't) for college success: Toward a new interdisciplinary perspective. In Smart, J.C. (Ed), *Higher Education: Handbook of Theory and Research* (Vol. 24, p.1-45), New York, NY: Springer.
- Gross, J., Hossler, D., & Ziskin, M. (2007). Institutional aid and student persistence: An analysis of the effects of campus-based financial aid at public four-year institutions. *Journal of Student Financial Aid*, 37(1), 29-39.
- Gumport, P., & Pusser, B. (1999). University restructuring: The role of economic and political forces. In J. Smart (ed.) *Higher Education: Handbook of Theory and Research*, (Vol. 14, pp. 146-200). Bronx, NY: Agathon Press.
- Gumport, P. J., & Sporn, B. (1999). Institutional adaptation: Demands for management reform and university administration. In J. C. Smart & W. G. Tierney (Eds.), *Higher education: Handbook of Theory and Research* (Vol. 14, pp. 103-145). Bronx, NY: Agathon Press.
- Hair, Jr., J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate Data Analysis* (6th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Hamrick, F. A., Schuh, J. H., & Shelley, M. C. (2004, May 4). *Predicting higher education graduation rates from institutional characteristics and resource allocation*. Education Policy Analysis Archives, 12, 19. Retrieved from <http://epaa.asu.edu/ojs/article/view/174/300>
- Hearn, J. C. (2005, November). *Enhancing institutional revenues: Constraints, possibilities, and the question of values*. Paper presented at "The New Balancing Act in the Business of Higher Education," an invitational conference of the TIAA-CREF Institute, New York, NY.
- Heckman, J. J., Lochner, L. J., Todd, P. E. (2006). Earnings equations and rates of return: The Mincer equation and beyond. In E. A. Hanushek and F. Welch (Eds.), *Handbook of the Economics of Education* (pp. 307-458). Amsterdam: North-Holland.
- Hedeker, D., & Gibbons R. D. (2006). *Longitudinal Data Analysis*. Hoboken, NJ: John Wiley & Sons, Inc.
- Heller, D. E. (1997). Student price response in higher education: An update of Leslie and Brinkman. *Journal of Higher Education*, 68(6), 624-659.
- Heller, D. E. (1999). The Effects of Tuition and State Financial Aid on Public College Enrollment. *Review of Higher Education*, 23(1), 65-89.

- Heller, D. E. (2002). State merit scholarship programs: An introduction. In D.E. Heller & P. Marin (Eds.) *Who should we help? The negative social consequences of merit scholarships*. The Civil Rights Projects, Harvard University.
- Heller, D. E. (2006). State support of higher education: Past, present, and future. In E.P. St. John & D. Priest (Eds.), *Privatization and public universities* (pp. 11-37). Bloomington, IN: Indiana Press.
- Henry, G. T., Rubenstein, R., & Bugler, D. T. (2004). Is HOPE enough? Impacts of receiving and losing merit-based financial aid. *Educational Policy*, 18(5), 686-709.
- Herzog, S. (2005). Measuring determinants of student return vs. dropout/stopout vs. transfer: A first to-second year analysis of new freshmen. *Research in Higher Education*, 46(8), 883-928.
- Hippensteel, D. G., St. John, E. P., & Starkey, J. B. (1996). Influence of tuition and student aid on within-year persistence by adults in two-year colleges. *Community College Journal of Research and Practice*, 20, 233-242.
- Horn, L., & Pete, K. (2003). *What Colleges Contribute: Institutional Aid to Full-Time Undergraduates Attending 4-Year Colleges and Universities*. Washington, D.C.: National Center for Education Statistics, Report no. 2003-157.
- Horn, L. (2006). *Placing College Graduation Rates in Context: How 4-Year College Graduation Rates Vary With Selectivity and the Size of Low-Income Enrollment* (NCES 2007-161). U.S. Department of Education. Washington, DC: National Center for Education Statistics.
- Hossler, D., Braxton, J., & Coopersmith, G. (1989). Understanding college choice. In J. C. Smart (Ed.), *Higher education: Handbook of Theory and Research* (Vol. 5, pp. 231-288). Bronx, NY: Agathon Press.
- Hossler, D., Schmit, J., & Vesper, N. (1999). *Going to college: How social, economic, and educational factors influence the decision students make*. Baltimore, MD: Johns Hopkins University Press.
- Hossler, D. (2006). Students and Families as Revenue: The Impact on Institutional Behaviors. In D. M. Priest & E. P. S. John (Eds.), *Privatization and public universities* (pp. 109-128). Indiana University Press.
- Hossler, D., Ziskin, M., Sooyeon, K., Osman, C., & Gross, J. (2008). *Student aid and its role in encouraging persistence. The effectiveness of student aid policies: What the research tells us* (pp. 101-116). Washington, DC: College Board.

- Hox, J. J. (2002). *Multilevel Analysis: Techniques and Applications*. Mahwah, N.J.: Erlbaum.
- Hsiao, C. (2014). *Analysis of Panel Data (3rd ed.)*. Cambridge University Press.
- Hu, S., & St. John, E. P. (2001). Student persistence in a public higher education system: Understanding racial/ethnic differences. *Journal of Higher Education*, 72(3), 265-286.
- Jaquette, O., & Parra, E. E. (2014). Using IPEDS for panel analyses: Core concepts, data challenges, and empirical applications. In M. B. Paulsen (Ed.), *Higher Education: Handbook of Theory and Research* (Vol. 29, pp. 467-533). Dordrecht, The Netherlands: Springer.
- Jackson, K. W., Peecksen, S., Jang, D., Sukasih, A., & Knepper, P. R. (2005). *Integrated Postsecondary Education Data System Data Quality Study*. (Report No. 2005175). Washington, DC: National Center for Education Statistics, U.S. Department of Education.
- Johnson, B. L., Jr. (1998). Resource dependence theory: A political economy model of organizations. In J. Shafritz (Ed.), *International encyclopedia of public policy and administration* (pp. 1968-1974). New York, NY: Henry Holt and Company.
- Kane, T. J. (1995). *Rising public college tuition and college entry: How well do public subsidies promote access to college?* National Bureau of Economic Research Working Paper, No. 5164. Cambridge, MA: National Bureau of Economic Research.
- Kane, T. (1999). *The price of admission: rethinking how Americans pay for college*. Washington, DC: Brookings Institution Press.
- Kane, T. J. (2003). *A quasi-experimental estimate of the impact of financial aid on college-going*. National Bureau of Economic Research (NBER) Working Paper No. 9703. Cambridge, MA: National Bureau of Economic Research.
- Kane, T. J. (2007). Evaluating the impact of the D.C. Tuition Assistance Grant Program. *Journal of Human Resources*, 42(3), 555-582.
- Kiley, K. (2012). *Short-Term Focus, Long-Term Problems: A Survey of Business Officers*. July 27, 2012. Retrieved from http://www.insidehighered.com/news/survey/business_officer_2012
- Kim, D. (2007). The effect of loans on students' degree attainment: Differences by student and institutional characteristics. *Harvard Educational Review*, 77(1), 64-100.

- Kirshtein, R. J., & Hurlburt, S. (2012, December). *Revenues: Where does the money come from? A Delta data update, 2000-2010*. Washington, DC: American Institutes for Research.
- Kleinbaum, D. G., Kupper, L. L., Muller, K. E., & Nizam, A. (1998). *Applied Regression Analysis and Other Multivariable Methods*. Pacific Grove, CA: Duxbury.
- Knapp, L. G., Kelly-Reid, J. E., & Ginder, S. A. (2012). *Enrollment in Postsecondary Institutions, Fall 2011; Financial Statistics, Fiscal Year 2011; and Graduation Rates, Selected Cohorts, 2003–2008: First Look (Provisional Data)* (NCES 2012-174rev). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved from <http://nces.ed.gov/pubsearch>
- Kuncel, N. R., Credé, M., & Thomas, L. L. (2005). The validity of self-reported grade point average, class ranks, and test scores: A meta-analysis and review of the literature. *Review of Educational Research*, 75, 63-82.
- Leslie, L. L., & Brinkman, P. T. (1987). Student price response in higher education: The student demand studies. *Journal of Higher Education*, 58(2), 181-204.
- Leslie, L. L., & Brinkman, P. T. (1988). *The Economic Value of Higher Education*. New York, NY: American Council on Education and Macmillan.
- Leslie, L., & Rhoades, G. (1995). Rising administrative costs: On seeking explanations. *Journal of Higher Education*, 66(2), 187-212.
- Light, A. (1995). The Effects of Interrupted Schooling on Wages. *Journal of Human Resources*, 30(3), 472-502.
- Light, A., & Strayer, W. (2000). Determinants of College Completion: School Quality or Student Ability? *Journal of Human Resources*, 35(2), 299-332.
- Linsenmeier, D. M., Rosen, H. S., & Rouse, C. E. (2006). Financial aid packages and college enrollment decisions: An econometric case study. *Review of Economics and Statistics*, 88, 126-145.
- Long, B. T. (2007). *Do Loans Increase College Access and Choice? Examining the Introduction of Universal Student Loans*. New England Public Policy Center Working Paper 07-1. Boston: Federal Reserve Bank of Boston.
- Manski, C. F., & Wise, D. A. (1983). *College choice in America*. Cambridge, MA: Harvard University Press.
- McPherson, M. S., & Schapiro, M. O. (1991). *Keeping College Affordable: Government and Educational Opportunities*. Washington, D.C.: Brookings Institution.

- Moore, R., Studenmund, A., & Slobko, T. (1991). The effect of the financial aid package on the choice of a selective private college. *Economics of Education Review*, 10, 311-321.
- Mumper, M. (1996). *Removing college price barriers*. Albany, NY: SUNY Press.
- Murphy, K., & Welch, F. (2001). Wage Differentials in the 1990s: Is the Glass Half-Full or Half-Empty?," in Finis Welch, (Ed.), *The Causes and Consequences of Increasing Inequality*, Vol. 2 of Bush School Series in the Economics of Public Policy Texas A&M. Chicago, IL: University of Chicago Press.
- National Center for Education Statistics. *Beginning Postsecondary Students. (About BPS)*. (n.d.). Retrieved from <http://nces.ed.gov/surveys/bps/about.asp>
- National Center for Education Statistics. *Integrated Postsecondary Education Data System. (About IPEDS)*. (n.d.). Retrieved from <http://nces.ed.gov/ipeds/about/>
- National Center for Education Statistics. *National Postsecondary Student Aid Study. (About NPSAS)*. (n.d.). Retrieved from <http://nces.ed.gov/surveys/npsas/about.asp>
- National Center for Education Statistics. (2009). *Digest of Education Statistics, 2009*. NCES 2010-013. Washington, DC: Author.
- Olivas, M. A. (1985). Financial aid packaging policies: Access and ideology. *Journal of Higher Education*, 56(4), 462-75.
- Oseguera, L. (2005). Four and six-year baccalaureate degree completion by institutional characteristics and racial/ethnic groups. *Journal of College Student Retention*, 7(1/2), 19-59.
- Oseguera, L., & Rhee, B. S. (2009). The influence of institutional retention climates on student persistence to degree completion: A multilevel approach. *Research in Higher Education*, 50(6), 546-569.
- Pascarella, E. & Terenzini, P. (2005). *How college affects students: A third decade of research*. Vol. 2. San Francisco, CA: Jossey-Bass.
- Paulsen, M. B. (1998). Recent research on the economics of attending college: Returns on investment and responsiveness to price. *Research in Higher Education*, 39(4), 471-489.
- Paulsen, M. B. (2001). The economics of human capital and investment in higher education. In M. B. Paulsen & J. C. Smart (Eds.), *The Finance of Higher Education: Theory, Research, Policy & Practice* (pp. 55-94). Bronx, NY: Agathon Press.

- Paulsen, M. B., & St. John, E. P. (2002). Social class and college costs: Examining the financial nexus between college choice and persistence. *Journal of Higher Education*, 73(2), 189-236.
- Paulsen, M. B., & Toutkoushian, R. K. (2008). Economic models and policy analysis in higher education: A diagrammatic exposition. In J. C. Smart (Ed.) *Higher Education: Handbook of Theory and Research* (Vol. 23, pp. 1-48). Dordrecht, The Netherlands: Springer.
- Peng, C. J., So, T.-S. H., Stage, F. K., & St. John, E. P. (2002). The use and interpretation of logistic regression in higher education journals. *Research in Higher Education*, 43(3), 259-294.
- Perna, L.W. (1998). The contribution of financial aid to undergraduate persistence. *Journal of Student Financial Aid*, 28(3), 25-40.
- Perna, L.W. (2006). Toward a more complete understanding of the role of financial aid in promoting college enrollment: The importance of context. In J. C. Smart (Ed.), *Higher education: Handbook of Theory and Research* (Vol. 21, pp. 99-157). New York, NY: Springer.
- Perna, L. W., & Thomas, S. L. (2008). *Theoretical perspectives on student success: Understanding the contributions of the disciplines*. ASHE Higher Education Report (Vol. 34). San Francisco: Jossey-Bass.
- Perna, L. W., & Titus, M. A. (2004). Understanding the differences in the choice of college attended: The Role of State Public Policies. *The Review of Higher Education*, 27(4), 501-525.
- Perna, L. W., & Titus, M. (2005). The relationship between parental involvement as social capital and college enrollment: an examination of racial/ethnic group differences. *Journal of Higher Education*, 76(5), 485-518.
- Pfeffer, J. (1982). *Organizations and organizational theory*. Marshfield, MA: Pitman Publishing, Inc.
- Pfeffer, J., & Salancik, G. (1978). *The external control of organizations: A resource dependence perspective*. New York, NY: Harper & Row.
- Porter, S. R. (2000). The robustness of the graduation rate performance indicator used in the U.S. News and World Report college rankings. *International Journal of Educational Advancement*, 1(2), 145-163.
- Porter, S. R. (2006). Institutional structures and student engagement. *Research in Higher Education*, 47(5), 521-558.

- Powers, J. B. (2003). Commercializing academic research: Resource effects on performance of university technology transfer. *Journal of Higher Education*, 74, 26-50.
- Radford, A.W., Berkner, L., Wheelless, S. C., & Shepherd, B. (2010). *Persistence and Attainment of 2003–04 Beginning Postsecondary Students: After 6 Years* (NCES 2011-151). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.
- Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., & Congdon. (2011). HLM 7: Hierarchical linear and nonlinear modeling. Lincolnwood, IL: Scientific Software International.
- Rhee, B. (2008). Institutional climate and student departure: a multinomial multilevel modeling approach. *The Review of Higher Education*, 31(2), 161-183.
- Richburg-Hayes, L., T. Brock, et al. (2009). *Rewarding Persistence: Effects of a Performance-Based Scholarship Program for Low-Income Parents*. New York, NY: MDRC.
- Richburg-Hayes, L., Sommo, C., Welbeck, R. (2011). *Promoting Full-Time Attendance Among Adults in Community College: Early Impacts from the Performance-Based Scholarship Demonstration*. New York, NY: MDRC.
- Roksa, J. (2010). Bachelor's Degree Completion Across State Contexts: Does the Distribution of Enrollments Make a Difference? *Research in Higher Education*, 51, 1-20.
- Rouse, C. E. (1994). What to do after high school: The two-year versus four-year college enrollment decision. In: Ehrenberg, R. G. (eds.), *Choices and Consequences*, Ithaca, NY: ILR Press.
- Rumberger, R. W., & Thomas, S. L. (2000). The distribution of dropout and turnover rates among urban and suburban high schools. *Sociology of Education*, 73, 39-67.
- Ryan, J. F. (2004). The relationship between institutional expenditures and degree attainment at baccalaureate colleges, *Research in Higher Education*, 45(2), 97-114.
- Savoca, E. (1991). The effect of changes in the composition of financial aid on college enrollments. *Eastern Economic Journal*, 17(1), 109-21.
- Schultz, T. W. (1961). Investment in human capital. *The American Economic Review*, 51(1), 1-17.

- Scott-Clayton, J. (2011a). On Money and Motivation: A Quasi-Experimental Analysis of Financial Incentives for College Achievement. *Journal of Human Resources*, 46, 614–646.
- Scott-Clayton, J. (2011b). The causal effect of federal work study participation: Quasi-experimental evidence from West Virginia. *Educational Evaluation and Policy Analysis*, 33(4), 506-527.
- Seftor, S., & Turner, S. (2002). Back to school: federal student aid policy and adult college enrollment. *Journal of Human Resources*, 37(2), 336-352.
- Singell, D. L. (2004). Come and stay a while: Does financial aid effect retention conditioned on enrollment at a large public university? *Economics of Education Review*, 23(5), 459-471.
- Singell, D. L., & Stater, M. (2006). Going, going, gone: The effects of aid policies on graduation at three large public institutions. *Policy Sciences*, 39(4), 379-403.
- Sjoquist, D. L., & Winters, J. V. (2012). *State Merit-based Financial Aid Programs and College Attainment*. Working Paper No. 6801.
- Slaughter, S. (1995). Criteria for restructuring postsecondary education. *Journal for Higher Education Management*, 10(2), 31-44.
- Slaughter, S., & Leslie, L. (1997). *Academic capitalism: Politics, policies, and the entrepreneurial university*. Baltimore, MD: Johns Hopkins University Press.
- Slaughter, S. & Rhoades, G. (2004). *Academic capitalism and the new economy*. Baltimore, MD: Johns Hopkins University Press.
- Snijders, T. A. B., Bosker, R. J. (1999). *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. London, UK; Sage.
- Somers, P. (1995). A comprehensive model for examining the impact of financial aid on enrollment and persistence. *Journal of Student Financial Aid*, 25(1), 13-27.
- Sporn, B. (1999). Theories of organizational and higher education adaptation. In B. Sporn (Ed.), *Adaptive university structures. An analysis of adaptation to socioeconomic environments of US and European universities* (Vol. 54, pp. 24-72). Philadelphia, PA: Jessica Kingsley Publishers.
- State Higher Education Executive Officers (SHEEO) (2012). *State Higher Education Finance FY 2012*. Report, State Higher Education Executive Officers. Boulder, Colorado. Retrieved from <http://www.sheeo.org/sites/default/files/publications/SHEF-FY12.pdf>

- Stater, M. (2009). The impact of financial aid on college GPA at three flagship public institutions. *American Educational Research Journal*, 46(3), 782.
- Stinebrickner, T., & Stinebrickner, R. (2003). Understanding educational outcomes of students from low-income families: Evidence from a liberal arts college with a full tuition subsidy program. *Journal of Human Resources*, 38(3), 591-617.
- St. John, E. P. (1989). The influence of student aid on persistence. *Journal of Student Financial Aid*, 19(3), 52-68.
- St. John, E. P. (1990a). Price response in enrollment decisions: An analysis of the High School and Beyond sophomore cohort. *Research in Higher Education*, 31(2), 161-76.
- St. John, E. P. (1990b). Price response in persistence decisions: An analysis of the High School and Beyond senior cohort. *Research in Higher Education*, 31(2), 387-403.
- St. John, E. P. (1992). Workable models for institutional research on the impact of student financial aid. *Journal of Student Financial Aid*, 22(3), 13-26.
- St. John, E. P. (1994). *Prices, productivity, and investment: Assessing financial strategies in higher education*. ASHE-ERIC Higher Education Report No. 3. Washington, DC: George Washington University.
- St. John, E. P. (1998). The effects of changes in student aid policy on persistence: A case study of a private university. *Journal of Student Financial Aid*, 28(1), 7-18.
- St. John, E. P. (2003). *Refinancing the college dream: Access, equal opportunity, and justice for taxpayers*. Baltimore, MD: Johns Hopkins University Press.
- St. John, E. P. (2004). *The nexus between finances and student involvement in persistence*. Paper presented at the American Education Research Association Annual Meeting, San Diego, CA.
- St. John, E. P., Andrieu, S. C., Oescher, J., & Starkey, J. B. (1994). The influence of student aid on within-year persistence in four-year colleges. *Research in Higher Education*, 35(4), 455-480.
- St. John, E. P., Asker, E. H., & Hu, S. (2001). The role of finances in student choice: A review of theory and research. In M. B. Paulsen & J. C. Smart (Eds.), *The Finance of Higher Education: Theory, Research, Policy & Practice* (pp. 419-438). Bronx, NY: Agathon Press.
- St. John, E. P., Cabrera, A. F., Nora, A., & Asker, E. H. (2000a). How can finance research inform the reconceptualization of persistence models? In J. M. Braxton (Ed.), *Reworking the student departure puzzle*. Nashville, TN: Vanderbilt University Press.

- St. John, E. P., Hu, S., & Tuttle, T. (2000b). Persistence by undergraduates in an urban public university: Understanding the effects of financial aid. *NASFAA Journal of Student Financial Aid*, 30(2), 23-37.
- St. John, E. P., Kirshstein, R. J., & Noel, J. (1991). The effects of student financial aid on persistence: A sequential analysis. *The Review of Higher Education*, 14, 383-406.
- St. John, E. P., & Paulsen, M. B. (2001). The finance of higher education: implications for theory, research, policy, and practice. In M. B. Paulsen & J. C. Smart (Eds.), *The Finance of Higher Education: Theory, Research, Policy & Practice* (pp. 545-569). Bronx, NY: Agathon Press.
- St. John, E. P., Paulsen, M. B., & Carter, D. F. (2005). Diversity, college costs, and postsecondary opportunity: An examination of the college choice-persistence nexus for African Americans and Whites. *Journal of Higher Education*, 76(5), 545-569.
- St. John, E. P., & Starkey, J. B. (1995a). An alternative to net price: Assessing the influence of prices and subsidies on within-year persistence. *Journal of Higher Education*, 66(2), 156-86.
- St. John, E. P., & Starkey, J. B. (1995b). The influence of prices and price subsidies on the persistence of adult undergraduates. *Journal of Student Financial Aid*, 25(2), 7-19.
- Tabachnick, B. G., & Fidell, L. S. (2012). *Using multivariate statistics* (6th ed.). New York, NY: HarperCollins.
- Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd. ed.). Chicago, IL: University of Chicago Press.
- Tinto, V. & Pusser, B. (2006). *Moving from Theory to Action: Building a Model of Institutional Action for Student Success. National Postsecondary Education Cooperative*. Retrieved from http://nces.ed.gov/npec/pdf/Tinto_Pusser_Report.pdf
- Titus, M. A. (2004). Examining the influence of institutional context on persistence at four-year colleges and universities: A multilevel approach. *Research in Higher Education*, 45(7), 673-699.
- Titus, M. A. (2006a). Understanding college degree completion of students with low socioeconomic status: The influence of the institutional financial context. *Research in Higher Education*, 47(4), 371-398.

- Titus, M. A. (2006b). Understanding the influence of the financial context of institutions on student persistence at four-year colleges and universities. *Journal of Higher Education*, 77(2), 353-375.
- Titus, M. A. (2006c). No college student left behind: The influence of financial aspects of a state's higher education policy on college completion. *Review of Higher Education*, 29(3), 293-317.
- Titus, M. A. (2009). The production of bachelor's degrees and financial aspects of state higher education policy: A dynamic analysis. *Journal of Higher Education*. 80(4), 439-468.
- Tolbert, P. S. (1985). Institutional environments and resource dependence: Sources of administrative structure in institutions of higher education. *Administrative Science Quarterly*, 30, 1-13.
- Toutkoushian, R. (2001). Do Parental Income and Educational Attainment Affect the Initial Choices of New Hampshire's College-Bound Students? *Economics of Education Review*, 20, 245-262.
- Turner, S. (2004). Going to College and Finishing College: Explaining Different Educational Outcomes. In C. M. Hoxby (Ed.), *College Choices: The Economics of Where to Go, When to Go, and How to Pay For It*. Chicago, IL: Chicago University Press and NBER.
- Van der Klaauw, W. (2002). A regression-discontinuity evaluation effect of financial aid offers on college enrollment. *International Economic Review*, 43, 1249-1287.
- Webber, D. A. & Ehrenberg, R. G. (2010). Do expenditures other than instructional expenditures affect graduation and persistence rates in American higher education? *Economics of Education Review*, 29, 947-958.
- Wine, J., Janson, N., & Wheelless, S. (2011). *2004/09 Beginning Postsecondary Students Longitudinal Study (BPS:04/09)*. Full-scale Methodology Report (NCES 2012-246). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.
- Winston, G. C. (1999). Subsidies, hierarchy and peers: The awkward economics of higher education. *Journal of Economic Perspectives*, 13(1), 13-36.