Fall 9-28-2015

The Relationship Between Adjunct Faculty Staffing and College Student Retention and Graduation

Stephen R. Deutsch
stephen.deutsch@shu.edu

THE RELATIONSHIP BETWEEN ADJUNCT FACULTY STAFFING AND COLLEGE STUDENT RETENTION AND GRADUATION

by

STEPHEN R. DEUTSCH

Dissertation Committee

Rong Chen, Ph.D., Mentor
Eunyoung Kim, Ph.D.
Robert Kelchen, Ph.D.

Submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
Seton Hall University

2015

SETON HALL UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN SERVICES
OFFICE OF GRADUATE STUDIES

APPROVAL FOR SUCCESSFUL DEFENSE

Doctoral Candidate, **Stephen R. Deutsch,** has successfully defended and made the required modifications to the text of the doctoral dissertation for the **Ph.D.** during this **Fall Semester 2015.**

DISSERTATION COMMITTEE

(please sign and date beside your name)

Mentor:
Dr. Rong Chen _____ 9/28/15

Committee Member:
Dr. Eunyoung Kim _____ 9/28/15

Committee Member:
Dr. Robert Kelchen _____ 9/28/15

The mentor and any other committee members who wish to review revisions will sign and date this document only when revisions have been completed. Please return this form to the Office of Graduate Studies, where it will be placed in the candidate's file and submit a copy with your final dissertation to be bound as page number two.

ABSTRACT

The rise of non-tenure track, part-time faculty, referred to as adjuncts, has brought a significant shift to the academic workforce. The count of part-time faculty on campuses has followed an upward trend for the last few decades and now part-time faculty form half of the total faculty workforce. This begs the question, in the face of institutional policies that favor increasing the proportion of adjuncts on faculty rosters: Has the use of adjuncts negatively impacted the student experience and quality of education, leading to lower persistence and graduation rates? This dissertation examines the relationship between adjunct faculty and student outcomes measured by both retention and graduation rates. This study employs Berger and Milem's (2000) framework as the conceptual model linking an institution's structural-demographic characteristics to student outcomes. Using a national sample of baccalaureate degree granting institutions from IPEDS data, I used panel data models to estimate retention and graduation rates. My panel models include a host of input variables, with an institution's proportion of part-time faculty as the key variable. My fixed effects panel data models indicate that an institution's proportion of part-time faculty does not have a statistically significant impact on retention and graduation, controlling for other input variables.

ACKNOWLEDGEMENTS

I would like to offer thanks to all the people that contributed to this dissertation.

My most sincere thanks goes to Dr. Rong Chen, who served as my dissertation mentor. In May of 2012, I came to your office to propose an idea for my dissertation. Three years and four months later, this idea has manifested into a robust study underpinned with complex quantitative methods. Not only did you assuage each and every inquiry I made during these years, which I will admit were superfluous at times, you provided tutelage at each step of this journey. You have contributed countless hours to this study, and for that I am forever grateful.

I would also like to thank Dr. Eunyoung Kim, who served on my dissertation committee. Because you were the instructor for my Dissertation Seminar I and II, you were very involved with helping me develop the structure of this study. You have an exemplary attention to detail, which has nurtured my writing style to one that has a cognizance for lucidity.

Thanks are also in order for Dr. Robert Kelchen, for dutiful service on my dissertation committee. Some of the statistical methods I used in this study were unfamiliar, but you were always able to explain these methods in a comprehendible manner. Although you were very helpful in aiding my understanding of quantitative methods, your greatest contribution was augmenting my confidence. Your help bolstered my confidence and allowed me to proceed briskly through the data analysis.

I would like to thank Dr. Martin Finkelstein for serving as my advisor. Also, I would like to recognize the following faculty members in the Department of Education Leadership, Management and Policy that served as my course instructors: Dr. Rebecca Cox, Dr. Joseph Stetar, Dr. Jerry Trombella and Dr. Elaine Walker.

In closing, I need to thank my wife Xiangwen. This achievement was only possible with your daily encouragement and support.

DEDICATION

This dissertation is dedicated to my wife, Xiangwen Chen-Deutsch, M.D., Ph.D.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Problem Statement

The rise of non-tenure track, part-time faculty—referred to as adjuncts—has brought a significant shift to the academic workforce.[1] The ratio of part-time faculty has followed an upward trend for the last 40 years. In 1970, part-time faculty compromised 22% of total faculty in U.S. higher education (Snyder & Dillow, 2012). The proportion of part-time faculty grew to 36% in 1985 and reached 43% in 1999. The year 2011 was known as an important turning point because for the first time the number of part-time faculty surpassed the number of full-time faculty. In the Fall 2011 semester, the part-time faculty count of 761,996 represented 50.01% of total faculty (National Center for Education Statistics, 2013b). Given the aforementioned trend over the past few decades this is not surprising, and yet it is historic. Institutions operating under increasingly constrained financial environments have aggressively hired adjuncts because they are less costly than traditional tenure-track faculty. Institutions reap other benefits with adjuncts because they often can be added and discharged at will depending on term-by-term instructional needs. Few adjuncts are protected by unions: According to the 2004 National Study of Postsecondary Faculty (NSOPF) only 13% of part-time instructional faculty at 4-year institutions reported being members of a union or bargaining association

[1] In a text seeking to understand the contemporary American faculty, Schuster and Finkelstein (2006) use the terms adjunct and part-time synonymously. Schuster and Finkelstein (2006) use the term contingent synonymously with contract to capture a broader swath of faculty, including adjuncts and full-time faculty not on tenure track. This dissertation will follow Schuster and Finkelstein (2006) in the use of these terms: Adjunct and part-time will be used interchangeably and contingent will refer to faculty not on a tenure track.

as compared to 18% for full-time faculty (Cataldi, Bradburn, & Fahimi, 2005). As the demand from institutions has been insatiable, there was a corresponding supply of qualified individuals willing to teach courses as adjuncts. But an irony exists when one considers the supply side because as James Monks (2009) articulated, "this growth in the use of part-time faculty has occurred despite low pay, almost nonexistent benefits, inadequate working conditions, and little or no opportunity for career advancement" (p. 33). Despite low compensation and deprived working conditions, adjuncts are willing to accept these positions and they remain a large portion of the faculty on campuses. Monks (2009) asserted that part-time faculty have diverse motivations for pursing these positions, and he referenced NSOPF survey data that showed that the majority of part-time faculty do not want full-time positions. This likely explains the willingness of adjuncts to accept these positions. According to the results of the 2004 NSOPF, 64% of part-time faculty did not prefer a full-time position (Cataldi, Bradburn, & Fahimi, 2005). Unfortunately, the reasons for this preference are unknown because the survey instrument did not ask for a reason or include further inquiry.

Those in academe are well aware of the anecdotes that circulate about adjuncts: the transient nature of adjuncts, the lower rates of terminal degrees compared to their tenure track counterparts, the lack of scholarly research, and the concerns about a heavy teaching schedule. In Gappa and Leslie's (1993) *The Invisible Faculty*, the authors refer to part-time faculty as an invisible group who form a second-class within academia. A substantial body of literature points to the poor conditions that adjuncts face and the need for the institutions that employ them to provide greater support (Christensen, 2008;

Gappa & Leslie, 1993; Thedwall, 2008), but institutions have failed to meet this challenge.

According to the results of the 2004 NSOPF, there is a significant divide in the characteristics between adjuncts and their full-time counterparts as reflected in the following (Cataldi, Bradburn, & Fahimi, 2005):

- Only 4.2% of part-time faculty are tenured or on a tenure track as compared to 70.6% for full-time faculty.
- Only 25.3% of part-time faculty hold a doctoral or first-professional degree versus 67.9% for full-time faculty.
- Part-time faculty have an average total annual income of $52,800 as compared to $80,700 for full-time faculty.

The NSOPF study also revealed that part-time faculty spend a greater portion of their time on instruction, translating into fewer hours spent on research and administrative activities. In terms of research activities, part-time faculty had less publication activity than their full-time peers. The NSOPF provided evidence that part-time faculty are indeed characteristically different than their full-time peers. Although the NSOPF is dated, it provides the best insight into the national faculty workforce.

As the mix of faculty has shifted from one with mostly full-time tenure-track faculty to one with about half part-time and half full-time, questions have been raised about the quality of the educational experiences of students, such as: Are adjuncts really dedicated to the institution and the students that they teach? If they do not have adequate

office space and a strong presence on campus, do they have meaningful interactions with their students? If they are not actively engaged in scholarly activities, are they suitable to teach undergraduate students in research-intensive fields? These questions point to a concern that an institutional policy that relies heavily on adjunct staffing may diminish instructional quality and hence diminish the performance of students. Since students are on the front line of this change, they notice the impact immediately. A qualitative study by Cotten and Wilson (2006) provides a good view into students' perception of part-time faculty. This study used focus groups comprised of undergraduate students to explore the frequency and dynamics of student-faculty interaction. Students complained about the use of part-time faculty; specifically, students noted that part-time faculty were less accessible and had less of a campus presence as compared to full-time faculty (Cotten & Wilson, 2006). This finding of a lower interaction between students and part-time faculty was corroborated in a study by Umbach (2007) that measured faculty effectiveness. Umbach (2007) observed that contingent faculty interacted with students less frequently and underperformed in their delivery of instruction. Conversely, a National Bureau of Economic Research working paper (Figlio, Schapiro & Soter, 2013) indicates that non-tenure track faculty have a positive impact on student learning. Although the study by Figlio, Schapiro and Soter (2013) has not been fully peer reviewed, their study of a private midwestern university found that non-tenure track faculty induced students to take more classes in a given subject and those students perform better in the subsequent courses.

Thompson (2003) argued that high quality education may not be sustained "with exploitative conditions and the work of a second-class citizenry" (p. 47) that faces an

environment of limited academic freedom, which in turn leads to conformity and taking a safe approach to assessing students, such as inflating grades and using true/false exams in place of essay evaluation, in order to protect one's employment rather than to extend a student's horizon. As adjuncts continue to form a larger share of the faculty mix, there are fewer tenure-track faculty and, therefore, fewer arbitrators of quality (Thompson, 2003). Some academics interpret the increased use of adjuncts as an attack on tenure and have published works with provocative titles, such as Finkin's (2000) *The Campaign Against Tenure*. Finkin (2000) observed that the increased use of adjuncts resulted in the unintended consequence of reducing the core of tenured faculty. Benjamin (2002) argued that the reliance on part-time appointments decreased faculty involvement in student learning. Benjamin also pointed to NSOPF data that indicated that full-time faculty generally reported two to four times as many out-of-class student-related hours per class hour as was reported by part-time faculty, and this formed the basis for the argument that full-time faculty devoted proportionally more time to their students than did part-time faculty. However, the data from NCES and NSOPF was not sufficient to prove that increased reliance on part-time faculty damaged undergraduate learning (Benjamin, 2002). This begs the question: In the face of institutional policies that favor increasing the proportion of adjuncts on faculty rosters, has the use of adjuncts negatively impacted the student experience and quality of education, leading to lower persistence and graduation rates?

The problems of low persistence and graduation rates have been struggles for institutions. For the full-time, first-time, degree-seeking freshmen entering in the Fall 2010 term, only 72% continued in the Fall 2011 term (National Center for Education

Statistics, 2013b). The statistics for degree completion are perhaps even more discouraging. The most recent data available are for the cohort of first-time, full-time bachelor's degree-seeking students starting in fall 2005; for this cohort, only 39% completed their baccalaureate program from their starting institution within 4 years, and 59% graduated from their starting institution within 6 years. Researchers have been aware of these poor statistics, and they are reflected in the large body of research relating to persistence and completion. For research relating to faculty characteristics, there is an existing body of research examining the impact of adjunct and contingent faculty on student outcomes (Eagan & Jaeger, 2008; Ehrenberg & Zhang, 2005; Jacoby, 2006; Jaeger & Eagan, 2009; Jaeger & Eagan, 2011; Jaeger & Hinz, 2009; Johnson, 2011; Ronco & Cahill, 2006; Schibik & Harrington, 2004). This body of literature indicates that the use of part-time faculty has a negative impact on student outcomes.

My study provides two improvements to the existing body of literature. First, I examine both retention and graduation in a single study. Because I used data from the Integrated Postsecondary Education Data System (IPEDS), this study captured the impact of adjunct faculty on first-time, full-time freshmen retention on a national level. My other contribution was the use of a recent set of data. Although the published graduation studies used broader data sets that captured larger samples of institutions than the retention studies, the graduation studies are somewhat dated and could use improved methods. For example, Jacoby (2006) used IPEDS data to examine how adjunct faculty employment in community colleges impacted student graduation rates in the 2001 academic year. Because this study focused on a single point in time, it did not address the salient decades-long trend of increasing adjunct staffing. The study by Ehrenberg and

Zhang (2005) did appropriately capture trends by using an econometric model over a 15-year time period, but the graduation rate data were from the 1986-87 through 2000-01 academic years, which cannot inform the present situation. It is important to note that the proportion of part-time faculty at institutions was lower between 1986 through 2000 compared to the present time. Part-time faculty comprised 36% of total faculty in fall 1986 and finished at 42.5% in fall 1999[2] (Snyder & Dillow, 2012). Therefore, the data set used by Ehrenberg and Zhang (2005) cannot be used as a proxy for the current situation in which adjuncts make up half of the total faculty. With this in mind, my study addresses this gap by including a national graduation rate study that contained data for the 2007 through 2012 academic years.

Research Questions and Purpose of the Study

The purpose of this dissertation is to examine the relationship between adjunct faculty and student outcomes as measured by both retention and graduation rates. The central research questions that guide this study are as follows:

> Controlling for other institutional characteristics, do baccalaureate degree granting institutions that employ a higher proportion of adjunct faculty have lower student retention rates and graduation rates?
>
> If there is an association, to what extent does the increased proportion of adjunct faculty relate to 1-year retention and 6-year graduation rates?
>
> What other institutional characteristics are significantly related to student retention rates and graduation rates?

[2] Fall 1999 was used because data from fall 2000 are not available in the *Digest of Education Statistics 2011*.

This study employed Berger and Milem's (2000) framework for understanding the impact that organizational behavior has on student outcomes. The Berger and Milem (2000) model ties an institution's structural-demographic characteristics, such as size and selectivity, to student outcomes. Although this study examines many institutional characteristics, the key variable is the proportion of part-time faculty at an institution. Because the faculty composition of an institution is a defining institutional characteristic, the Berger and Milem (2000) model is well-suited to understand the resulting impact on student outcomes.

This study centers on a model that used panel data to estimate 1-year retention rates[3] and 6-year graduation rates.[4] A national data set from IPEDS was used with this model; only non-profit Carnegie classified baccalaureate, master's and doctoral institutions were included. The model is based on Ehrenberg and Zhang's (2005) graduation rate study, with additional variables from Chen's (2012) study on the institutional characteristics that are related to student dropout risk. The use of panel data analysis is paramount because panel data by definition combines both the spatial and temporal components of a data set. Panel data analysis allows researchers to explore the depth of cross-sectional analysis with the robustness that is inherent in time-series analysis.

[3] The rate at which students persist in their educational program at an institution, expressed as a percentage. At 4-year institutions, this is the percentage of first-time baccalaureate degree-seeking undergraduates from the previous fall who are again enrolled in the current fall (National Center for Education Statistics, 2012).
[4] The rate at which full-time, first-time, degree/certificate-seeking undergraduate students in a particular year (cohort) complete their program within 150 percent of normal time to completion (National Center for Education Statistics, 2012).

Significance of the Study

The significance of adjunct staffing is profound as institutions have been increasing the proportion of adjuncts on their faculty rosters. It could be that the policy of adjunct staffing is the driving force behind lower persistence, lower graduation rates, and lower student engagement—all issues that receive significant attention from educators and policy makers. Retention and graduation rates are abysmal, with only 72% of freshmen persisting into the second year and only 39% completing their degree programs in 4 years (National Center for Education Statistics, 2013b). With such abysmal national rates, it is obvious why so much policy is focused on improving persistence and completion rates. The body of literature that examines the impact of adjunct faculty on student outcomes seems small. This is somewhat unexpected because there is a large body of research on related topics, such as the role of student background characteristics on outcomes. What if an increase in the use of adjuncts is actually causing the weak retention rates and graduation rates? Although it may be audacious to claim that adjunct faculty have such an extensive impact on student outcomes, this study seeks to ascertain if low graduation rates and retention rates might be attributable to adjunct staffing. This study explored the extent to which the employment of adjuncts relates to student outcomes. First, I can understand at a national level, as an institution increases its proportion of adjuncts—what is the measured effect on student retention rates? I can also understand the relationship between adjunct staffing and graduation rates. A critical feature of this study is that multiple years of data will be used to help capture the important trend that adjunct staffing has increased over these years.

In summary, it is apparent that adjunct hiring has been an increasing trend for decades. The American higher education system has arrived at the point when the number of part-time faculty surpasses the number of full-time faculty. The concern that many researchers raise about part-time faculty providing a lower quality educational experience for students cannot be ignored, especially since the trend of adjunct hiring will likely continue in the years ahead. Although the trend of adjunct hiring may not abate, researchers can be cognizant of the relationship of this trend to student outcomes. Understanding this relationship is important to scholars because scholarly research tends to be focused on the students' characteristics rather than that of faculty. Although this issue is significant to scholars it is also important to help policymakers and educational administrators understand the measured impacts of staffing policies that favor adjunct hiring. Administrators that are responsible for making the decision to hire a full-time faculty position or adjunct need to be aware of the impact this decision may have for their students. According to a Delta Cost Project (as cited in Johnson, 2012) studying the costs of student attrition, attrition accounted for 19.5% of higher education costs. What this means is that among all higher education spending for a given year, 19.5% is spent on students who will not receive a degree. This is a lost investment for students and for the local, state, and federal governments that contribute appropriations. Schneider (2010) aggregated the costs incurred by first-year student attrition at 4-year universities from 2003 to 2008 and found that state subsidies through appropriations totaled $6.2 billion, state grants to students were $1.4 billion, and federal grants to students were $1.5 billion. So for first-year students who did not return for the second year at 4-year institutions, the total loss to the taxpayer was $9 billion over these 5 years. In addition to the taxpayer

cost, there are indirect costs such as the loss of income and tax revenue that are associated with the higher earnings of college graduates. For full-time students seeking a bachelor degree who started in fall 2002, but failed to graduate within 6 years, these students lost $3.8 billion in income for a single year (Schneider & Yin, 2011). Also, the federal government lost $566 million in federal income taxes, and states lost $164 million in state income taxes—this is for a single year for one cohort of students. These data underscore the financial and economic severity of poor student outcomes.

Most institutions make some types of efforts to bolster the retention of their students. This may come in the form of a committee, office, or counseling service. With so much focus on helping the student, administrators are likely not to be very focused on staffing policies or the efficacy of their instructors. If indeed adjuncts are having a substantial impact on outcomes, some focus on the part of administrators needs to be turned to them. Either administrators have to shift their hiring policies to include more full-time faculty or focus on improving the effectiveness of adjuncts.

CHAPTER II

LITERATURE REVIEW

Introduction

This chapter provides a summary of the literature relevant to this study. The purpose of this chapter is to present what the published research studies have found about the relationship of the use of adjunct faculty to student outcomes. Since this study used a quantitative research method to assess the impact of adjuncts on student retention and graduation, the focus of this review is to examine similar studies that were published in academic journals. Although the focus of this review is studies that included part-time faculty as a variable, I also included studies that examined contingent faculty. This literature review is structured in two sections, each according to the outcome measure in the study. The first section covers studies that examined the impact of adjunct faculty on retention, followed by a section that includes studies that examined degree completion. Although most of these studies focused on testing the hypothesis that adjunct faculty impact student retention or graduation, a few studies were focused on institutional characteristics, with adjunct faculty included as a predictor variable. As the review reveals, most of these studies found evidence that the use of adjunct faculty has a negative impact on student outcomes, although the current body of knowledge is inadequate to fully understand the impact of adjunct faculty on student outcomes.

Studies on the Impact of Adjunct Faculty on Retention

This section presents seven studies that examined the impact of adjunct faculty on retention. Retention was measured by within-year retention as well as within-term retention. Because dropout is the opposite of retention, dropout studies are included in

this section as well. Although the first studies (Ronco & Cahill, 2006; Schibik & Harrington, 2004) in this section lack clearly stated theoretical frameworks, subsequent studies (Chen, 2012; Eagan & Jaeger, 2008; Jaeger & Eagan, 2011; Jaeger & Hinz, 2009; Johnson, 2011) did include theoretical frameworks and used expanded models. The studies covered in this section found evidence that adjuncts had a negative impact on retention.

This literature review begins with a discussion of a study by Schibik and Harrington (2004). As explained in the first chapter, the buildup of adjunct faculty on faculty rosters has been a trend for decades. Unlike the case where the launch of the Soviet satellite *Sputnik* in 1957 set off a frenzy of scientific research initiatives in American higher education, there is no such watershed moment in the area of adjunct faculty use. Schibik and Harrington (2004) cited an obvious gap in literature—research up to the time of their study had focused on the number of adjuncts and their characteristics, rather than their impact on students. Seeking to fill this gap in the literature, Schibik and Harrington (2004) studied the relationship between faculty status and student retention at a public 4-year university. The data set included four incoming freshmen student cohorts; from the Fall 1997 through Fall 2000 terms. These freshmen had varying amounts of instruction by adjuncts, and the amount was placed in quartiles based on the percent of first semester courses taught by part-time faculty. The descriptive statistics reveal that between 40% and 56% of the students in each cohort had the majority of their courses taught by adjuncts; indicating that this institution relied heavily on adjunct instruction. To assess the impact of the adjunct instruction on student retention, Schibik and Harrington (2004) created a logistic regression model using a data

set that contained four freshmen cohorts. The logistic regression model set one-term retention as the dichotomous dependent variable with a host of independent variables. The independent variables included: SAT scores, attempted credit hours, gender, and level of exposure to adjunct instruction. The level of adjunct exposure in the model was divided into quartiles. For the students in the fourth quartile, who received the most instruction by adjunct faculty, the results of the logistic regression revealed a negative relationship between adjunct faculty exposure and student retention. Controlling for other variables, the students who received the most exposure to adjunct instruction were found to have 32% lower odds of persisting into the second semester, as compared to the odds of persisting for the reference group that had the least exposure to adjunct faculty. This is a startling finding because it demonstrates that adjunct faculty do, in fact, have a negative impact on retention at this university.

It is likely that when the Schibik and Harrington (2004) study was published, much of the discussion within the academy relied on anecdote and intuition in trying to grasp the impact of adjunct faculty on student outcomes. The findings of the Schibik and Harrington (2004) study are quite important as the research community was finally provided some published evidence that adjunct faculty use has a statistically significant impact on student outcomes.

Nevertheless, there are limitations to the Schibik and Harrington (2004) study. The limitations include: the absence of a stated theoretical framework, the absence of a model that measured adjunct exposure in a discrete manner, and the use of a relatively small set of student background characteristics as control variables. For the student background characteristics, Schibik and Harrington (2004) included SAT scores and

gender, which may be insufficient to fully capture a student's background. Ronco and Cahill (2006) expanded this study by incorporating a comprehensive set of student background characteristics.

Ronco and Cahill (2006) followed the Schibik and Harrington (2004) study and used data from a 4-year university. The data that Ronco and Cahill (2006) utilized showed a similar rate of overall course instruction by adjuncts as that in the Schibik and Harrington (2004) study, as the researchers noted that adjuncts handled 40% of the undergraduate courses at this university. Ronco and Cahill (2006) used a logistic regression model to assess retention. Also, they considered another student success indicator, GPA, and used ordinary least squares to assess this indicator. The logistic regression model was more comprehensive, as compared to the model used by Schibik and Harrington (2004), because it included the additional student background characteristics of race/ethnicity and high school GPA. Also, Ronco and Cahill (2006) included a few variables that they called *enrollment experience variables*: college of first major, whether the student lived on campus in the first year, college cumulative GPA, and types of financial aid received. In their discussion, Ronco and Cahill (2006) stated that their results uncovered little evidence for instructor type having a "widespread" (p. 11) impact on retention and student achievement. They concluded that their results show that outcomes can be predicted primarily from background and educational experience characteristics. In reviewing their logistic regression results, high school GPA and cumulative college GPA were strong predictor variables. On the other hand, all the coefficients for adjunct exposure were not statistically significant.

Like the study by Schibik and Harrington (2004), the Ronco and Cahill (2006) study has some weaknesses related to using discrete categories for level of adjunct exposure and an incomplete theoretical framework. Ronco and Cahill (2006) noted that their choice in background variables was based on the Tinto (1975) longitudinal model of retention. Although the results of their logistic regression model showed that adjunct faculty did not have a negative impact on student retention, the use of three categories for adjunct exposure is not as desirable as the use of a continuous variable, which is more precise.

The next study by Eagan and Jaeger (2008) examined first-year persistence using a data set from four public universities within a state system of higher education. Eagan and Jaeger (2008) focused on gatekeeper courses. Gatekeeper courses are introductory courses with high enrollment that are required for matriculation into an undergraduate major. Compared with the two aforementioned studies, Eagan and Jaeger (2008) had a more clearly stated theoretical framework for understanding the effects of adjunct faculty on student retention. Eagan and Jaeger (2008) pointed out that the results from a study by Bean (1990) suggested that students' overall satisfaction with their college experience becomes a motivating factor for persisting. In other words, dissatisfaction with the college experience increases the likelihood of attrition. Hence, the Eagan and Jaeger (2008) conceptual model was formed on the premise that, since part-time faculty have limited availability, students will interact with these faculty less often than their full-time counterparts, and students may become dissatisfied with the institution and exit the institution. So the logistic regression model they developed assumed that students exposed to higher levels of adjunct instruction for introductory courses would have less

interaction with their instructors and thus become less integrated into the university. Eagan and Jaeger (2008) cited numerous studies that found a significant positive relationship between student-faculty interaction and subsequent gains in outcomes, after controlling for key background characteristics. This theoretical framework is not only a vast improvement of the two prior studies that did not articulate a framework, but this framework is appropriate because adjuncts are less integrated into the campus.

Different from previous studies that have used adjunct exposure as a categorical variable, Eagan and Jaeger (2008) treated adjunct exposure as a continuous variable that was based on the percentage of courses taught by adjuncts. The results of the logistic regression are reported in three models—one for each of the three institution types being studied: doctoral extensive, doctoral intensive, and master's comprehensive. The data set included one doctoral extensive, two doctoral intensive, and one master's comprehensive university. For each of the three models, exposure to adjunct faculty had a statistically significant negative impact on second year persistence. For the doctoral extensive and doctoral intensive school data, students were found to have 20% lower odds of persisting into the second year for each percentage point increase in exposure to part-time faculty in gatekeeper courses. The effect was found to be even greater when the master's comprehensive institution data was used. Among the master's comprehensive institutions, students were found to have 37% lower odds of persisting into the second year for each percentage point increase in part-time instruction.

Eagan and Jaeger's (2008) study reveals evidence that adjunct instruction has a negative impact on student outcomes. However, there is a limitation in the study that the authors acknowledge. The theoretical framework and interpretation of the results rely on

the assumption that the adjuncts had limited interactions and less engagement with their students, but the level of faculty availability outside of the classroom was not accounted for as a variable. Eagan and Jaeger (2008) concluded that future research should examine how the level of faculty availability impacts the likelihood of students to persist.

Following this line of research, Jaeger and Hinz (2009) conducted a single-institution study. Jaeger and Hinz (2009) suggested that the question of adjunct faculty impact on student outcomes was still not conclusive, and that the one-term retention rate used by Schibik and Harrington (2004) was too short of a time span. Therefore, Jaeger and Hinz (2009) built their model with 1-year retention as the dichotomous dependent variable.

A particular strength of the Jaeger and Hinz (2009) study is the use of five incoming freshmen cohorts for the data. This resulted in 15,399 unique student cases. The results of the study indicated that as exposure to part-time faculty instruction increased, as measured by the proportion of a student's first year credits taught by part-time faculty, 1-year persistence was negatively impacted. With an odds ratio of 0.996, for each 1% increase in part-time instruction, students were found to have a 0.4% decrease in the odds of persisting. Other statistically significant factors that predicted student retention included high school GPA (odds ratio = 1.443) and gender (odds ratio of male vs. female = 1.328).

Another recent study of adjunct faculty and student retention by Jaeger and Eagan (2011) used data from six institutions within a state system of higher education. This study is similar to the earlier discussed study by Eagan and Jaeger (2008) because they

used the same theoretical framework. Furthermore, the Jaeger and Eagan (2011) study incorporated the independent variables in the model for the Eagan and Jaeger (2008) study. For their 2011 study, Jaeger and Eagan added a few predictor variables: off-campus housing, unsubsidized student loan amount, and a variable called *enrollment intensity*, which is based on the number of credits a student earned in their first year. The only variable from the earlier study that Jaeger and Eagan (2011) did not use was average class size. Another difference is that contingent faculty, in the 2011 study, was categorized into one of three variables: full-time faculty not on tenure-track, graduate assistants, and other part-time faculty. The other part time faculty category included adjunct faculty, part-time lecturers, and postdoctoral scholars.

While the Eagan and Jaeger (2008) study included three logistic regression models—one for each institution category—the Jaeger and Eagan (2011) study included instrumental variable probit regression models for four institution categories: doctoral extensive, doctoral intensive, master's, and liberal arts. There was one doctoral extensive, two doctoral intensive, one liberal arts, and two master's degree institutions. Jaeger and Eagan (2011) explained that students may not have equal probabilities of enrolling in classes with part-time faculty, and this propensity needs to be accounted for in a model. Jaeger and Eagan (2011) noted that in using standard logistic or probit regression, the results might be biased; as students with more courses taught by adjuncts may be characteristically different than peers who have fewer courses taught by adjuncts. Therefore, Jaeger and Eagan (2011) used instrumental variable analysis in two stages to control for a student's propensity to enroll in courses taught by adjuncts. The predictor variable exposure to other part-time faculty was statistically significant in each of the

four models. However, it did not have a negative impact on all institution types. At the doctoral intensive institutions, part-time faculty had a positive impact on 1-year retention. Specifically, for a 10% increase in part-time faculty instruction, a 3% increase in students' probability of persisting when controlling for the other independent variables was found. For the other three institution types a negative impact on student retention was found, and the size of the impact was similar: A 10% increase in part-time instruction had a decrease in the probability of persisting between 2% and 7%. The finding that adjuncts had a positive impact on retention at the doctoral intensive institutions was unexpected, and the authors stated that this contradicted prior research and led them to query the senior-level administrators of the two institutions. Through personal communications Jaeger and Eagan (2011) found that these institutions had unique contingent faculty policies, such as support for contingent faculty development, which was not the case for the other institutions in the study. One of these two institutions included part-time faculty in new faculty orientations and other similar programs for over 10 years. Although the overall results of this study indicate that adjunct instruction has a negative impact on student persistence, for institutions that provide specialized support to adjunct faculty, their impact on student outcomes can be positive.

Johnson (2011) studied whether contingent faculty had an impact on student grades and retention. Citing methodological problems with existing studies, Johnson (2011) used hierarchical linear modeling. To address problems that can occur with student-level aggregation of faculty characteristics, Johnson (2011) used a cross-classified model and a multiple membership model. This study used data from a single institution that enrolled about 4,000 new freshmen each year. Although data from only

one freshmen class were used, the data set was very rich because of the number of covariates. There were 3,911 observations at the student-level, 671 observations at the faculty level, and 31,199 student-faculty combinations. The results indicated that student grades were impacted by instructor type, as contingent faculty give higher grades. However, there was no relationship between a student's exposure to courses taught by contingent faculty and 1-year retention.

Johnson's (2011) study applied multi-level models, which have advantages over the models used in prior studies because of problems that can arise when aggregating data. However, there is one weakness that Johnson (2011) pointed out—using data from a single institution. Also, the data only covered a single incoming freshmen class.

The final study reviewed is by Chen (2012), who studied which institutional characteristics contributed to student dropout risk. Chen (2012) proposed a comprehensive conceptual model that drew from the important aspects of these studies: Bean (1983), Tinto (1987), Berger and Milem (2000), and Titus (2004, 2006). Chen (2012) hypothesized that student dropout risk was influenced by institutional demographics, structural characteristics, faculty, and financial resources. Following an integrated conceptual framework, the institutional characteristics included in Chen's (2012) model were categorized as: student demographics, structure, faculty resources, and financial resources. The percent of part-time faculty at an institution was included as a variable in the faculty resources category. Using data from Beginning Postsecondary Students (BPS96/01) and IPEDS, Chen (2012) created a multilevel event history model to identify the institutional characteristics associated with student dropout. The part-time faculty variable was not statistically significant, therefore, the ratio of part-time faculty at

an institution was not associated with student dropout behavior. Among the comprehensive set of institutional characteristics in Chen's (2012) model, the only statistically significant variable was institutional expenditure on student services.

A minor limitation of Chen's (2012) study is that the proportion of part-time faculty was measured for the first year of the students' enrollments, but the dropout risk was measured over 6 years. Because the proportion of part-time faculty was not subject to large fluctuations over this 6-year period, this is only a minor limitation of the study.

To summarize this section, of the seven studies reviewed, four had clear evidence that adjunct faculty negatively impact retention rates. When these studies are viewed chronologically it seems that they improved in methodology.

Studies on the Impact of Adjunct Faculty on Graduation

In this section, I review four studies that examined the impact of adjunct faculty on graduation rates. Unlike retention studies, which focused on data from a single institution or small set of institutions, graduation rate studies used broader data sets. For example, Ehrenberg and Zhang (2005) included 734 institutions in their sample, Jacoby (2006) used 1,209, and Jaeger and Eagan (2009) used 107 institutions. Calcagno, Bailey, Jenkins, Kienzl, and Leinbach (2008) used a sample of data collected longitudinally for 2,196 students at 536 different institutions. This section also includes community college studies. Jacoby (2006), Calcagno et al. (2008), and Jaeger and Eagan (2009) use data from community colleges. An issue that arises here is the varied missions of community colleges and the diverse intentions for a student's enrollment. At a 4-year university, an undergraduate student intends to complete a baccalaureate degree. But at a community

college, students have various intentions for enrollment. While some community college students seek an associate's degree, others may want job skills so that they can enter the workforce, change jobs or advance their careers (Hoachlander, Sikora, & Horn, 2003). Jacoby (2006) and Jaeger and Eagan (2009) addressed this problem by limiting their samples to students who enrolled with the intention to graduate with an associate degree or to transfer to a 4-year university. The study by Calcagno et al. (2008) used a model that included a variable for mission based on the mix of certificates and associate degrees conferred by the community college. Calcagno et al. (2008) proposed that the institutions that conferred more certificates than associate's degrees were more focused on short-term workforce development and less focused on academic transfer-oriented programs.

Ehrenberg and Zhang (2005) set out to study whether the use of part-time and non-tenure track full-time faculty impacted graduation rates. This graduation rate study differs from the studies discussed in the retention studies section in that a national sample of institutions was used. Institutional-level data from The College Board's Annual Survey of College Standard Research Compilation data file from the 1986-87 through 2000-01 academic years was used. Also, Ehrenberg and Zhang (2005) used supplemental data from the IPEDS Faculty Salary Survey and other Department of Education sources. Ehrenberg and Zhang (2005) employed an econometric model to estimate the graduation rate for full-time students who entered a particular institution, and they controlled for student background characteristics. Because the data contained a shift in the measurement of graduation rates from a 4-year to a 6-year rate, Ehrenberg and Zhang's (2005) econometric model estimated the 4-year graduation rate for the 1986-87 and 1987-88 academic years, the 5-year graduation rate for the 1988-89 through 1997-98 academic

years, and the 6-year rate for the 1998-99 through 2000-01 academic years. Again, it needs to be emphasized that this model is concerned with institutional-level characteristics, not individual student-level characteristics. So, instead of a model that used each student's SAT score and exposure to adjunct faculty to predict that student's graduation rate, this model used the average SAT score of the institution's incoming cohorts and overall percent of adjunct faculty to estimate the overall graduation rate for the institution. The Ehrenberg and Zhang (2005) model included a host of institutional and student characteristics. The institutional-level characteristics included the percentage of part-time faculty, percentage of full-time faculty not on tenure track, number of faculty, and full-time equivalent (FTE) enrollment of freshmen. The student characteristics included the average Pell grant per recipient, the proportion of Pell grant recipients, the proportion of minority students, the proportion of in-state students, the average age of entering freshmen, the average of the 25th and 75th percentile on the math SAT scores of entering freshmen, and the average of the 25th and 75th percentile on the verbal SAT scores of entering freshmen. The econometric results for the entire sample were reported and broken down these sectors: public, private, doctoral, master's, and liberal arts. The results indicated that an increase in the percentage of either part-time faculty or full-time, non-tenure track faculty was associated with a reduction in graduation rates. The impact was greater at public universities as compared to private universities: A 10 percentage point increase in the percentage of adjunct faculty at a public institution was associated with a 2.65 percentage point decrease in the institution's graduate rate (Ehrenberg & Zhang, 2005).

The next study, by Jacoby (2006), focused on community colleges. Jacoby (2006) used a sample that included all of the 1,209 public 2-year colleges in the IPEDS 2001 data set. In the published article of this study, Jacoby (2006) provided a comprehensive review of the literature on the relationship between student outcomes and part-time faculty. In this review, Jacoby (2006) seems to have been cognizant of the fact that the literature existing at that time focused on students at 4-year universities. Jacoby (2006) used the student integration framework that was commonly used in studies of 4-year universities and highlighted the fact that positive student-faculty interaction is a greater challenge at community colleges. After reviewing the existing literature, Jacoby (2006) presents a multiple regression model that tests the hypothesis that graduation rates at community college are influenced by increased reliance on part-time faculty, and controlled for a set of institution and student characteristics. The results showed that community college graduation rates decreased as the proportion of part-time faculty employed at institutions increased. Jacoby (2006) corroborated this result by creating two additional models that use alternative measures for graduation rates: the IPEDS graduation rates net of transfers and the ratio of associate degrees to FTE students. Both of the ancillary models indicated the same result as the first model: An increased ratio of adjunct faculty at community colleges has a negative impact on graduation rates.

Calcagno et al. (2008) set out to identify the institutional characteristics of community colleges that were related to successful student outcomes. A successful student outcome was defined as completion of any postsecondary credential, such as an associate or bachelor degree, or transfer to a 4-year institution. In order to test this binary outcome, Calcagno et al. (2008) used a production function method with institutional-

level and individual variables. The authors noted that, while production functions had been used by education economists for decades, this method had not been widely used to examine higher education outcomes such as persistence or degree completion. In addition to testing the binary variable of successful student outcomes, another model was used to analyze cumulative credits earned. In this supplemental analysis, cumulative credits earned formed the dependent variable in the regression model. Based on the high propensity of community college students to drop out after earning fewer than 10 credits, the distribution of credits earned was non-linear, so the researchers transformed the variable into logarithmic form. An innovative feature of this study is that the institutional characteristics of multiple institutions were considered in the model.

Merging institutional-level data from IPEDS and student-level data from NELS:88, Calcagno et al. (2008) had a final data set that was comprised of 2,196 students in 536 community colleges. This study had an extensive list of variables in the following categories: general institutional characteristics, student compositional characteristics, financial characteristics, fixed location characteristics, and student characteristics. The general institutional characteristics included enrollment, proportion of part-time faculty, and the balance between certificates and degrees awarded. The results of the Calcagno et al. (2008) study indicate that students enrolled in institutions with large proportions of part-time faculty were less likely to attain a degree or transfer. In the model that used cumulative credits earned as an outcome measure, the proportion of part-time faculty at an institution was negatively associated with the log of a student's cumulative credits earned.

The final study in this section is by Jaeger and Eagan (2009), who examined the effect of part-time faculty instruction on associate degree completion for community college students. Unlike the aforementioned three studies in this section that used national data sets, this study used data from the California community college system. The data included first-time, credit-seeking students that entered California community colleges in 2000 and 2001. These two cohorts have a total of 1.5 million students in 107 community colleges. Because this study focused on associate degree completion, Jaeger and Eagan (2009) reduced the sample of students to those who enrolled with the intention to complete an associate degree. The final analytic sample had a total of 178,985 students in 107 community colleges.

The study by Jaeger and Eagan (2009) merged data from the California community college system office with IPEDS institutional-level data. The analysis used a hierarchical linear model to explain the effects of student-level and institutional-level variables on the dichotomous outcome variable of associate degree completion. The major finding was that a 10% increase in the proportion of first-year courses taught by part-time faculty resulted in a 1% reduction in the students' likelihood of earning an associate degree. When looking beyond first-year courses to all years of enrollment, the effect is the same—a 10% increase in the overall proportion of credits earned in courses taught by part-time faculty reduced the students' likelihood of associate degree completion by 1%.

Jaeger and Eagan's (2009) study has contributed to this field of research in several ways. For one, Jaeger and Eagan's (2009) study included a comprehensive review of literature and a conceptual model drawn from their previous work: Students

exposed to greater levels of instruction from part-time faculty experience fewer meaningful interactions with those faculty members than they would with full-time instructors, resulting in less integration with the campus.

Despite the result that there is a negative relationship between associate degree completion and a student's proportion of credits taught by adjuncts, this is not the case with the institution-level variable of proportion of part-time faculty at an institution. The results of the Jaeger and Eagan (2009) study indicate that the proportion of adjunct faculty at an institution does not have an impact on associate degree completion, which, the authors point out, is inconsistent with the results in the Jacoby (2006) study. As stated before, Jaeger and Eagan (2009) used institutional-level data as Jacoby (2006) did, but added student-level characteristics that were unavailable in IPEDS data. Jaeger and Eagan (2009) posited:

> By analyzing both student-and institution-level variables, this study appropriately separated multilevel variance and suggested that the reduced likelihood in graduation rates likely has more to do with individual student exposure to part-time faculty members than it does with the overall proportion of part-timers employed by a community college. Other institution-level results provide little practical insight for administrators and policymakers in community colleges. (p. 188)

Hence, this study was able to improve on the earlier study by use of enhanced analytic methods. Overall, this study suggests that similar research can be applied to data from other states' community college systems.

In summary, the results of all four studies described in this section demonstrate that adjunct staffing has a negative impact on graduation rates. The methods used in these graduation rate studies are quite appropriate and the data sets are broad. The main weakness with these studies is that the data is dated. It would be beneficial if more recent data could be used.

Summary

The field of research examining the relationship between adjunct faculty and student outcomes has undergone several major developments and these developments have helped researchers to better understand college student retention and graduation. While the earliest studies often contained an inadequate review of literature and lacked clearly defined theoretical frameworks, subsequent studies responded to these weaknesses and offered more comprehensive reviews of literature, clearly defined theoretical frameworks, and the inclusion of more variables in the quantitative models. This trend reflects a progressive building of the knowledge base for this subject, and it was achieved in a short time frame with few studies. It is clear that the student-faculty interaction framework was the dominant conceptual framework for the studies in this review. The student-faculty interaction framework is suitable for these studies since adjuncts are employed on a part-time basis and thus are less likely to have the same campus presence as a traditional tenure track full-time faculty member. Although there is a dominant conceptual framework, the same cannot be stated for statistical methods. The studies used a plethora of methods, including multiple regression, logistic regression, econometric modeling, and hierarchical linear modeling.

In the 11 studies that assessed retention rates and graduation rates, 8 of the 11 studies found strong evidence that the use of adjunct faculty has a negative impact on important student outcomes. Although a small positive impact was found for one institutional type in the Jaeger and Eagan (2011) study, negative effects were found in the other three institution types. Hence, in conclusion, the literature reviewed does offer strong evidence that adjunct faculty use has a negative impact on student retention and graduation.

While this body of research offers compelling evidence that stakeholders in higher education should be concerned about the policy of adding adjuncts onto rosters, there are some limitations and gaps in the knowledge of this area. A key point derived from the literature review is that the retention studies generally focused on studies of single institutions or a small group of institutions. While the graduation studies used broader data sets, the data in the graduation studies are outdated for understanding the contemporary situation in which adjuncts comprise half of the total faculty. The current study will increase the understanding of the impact of adjunct staffing by considering two important student outcomes—graduation and retention—in a single study. Furthermore, this study will use an expanded model and more current data.

Although there is not a large body of research on the impact of part-time faculty, this issue cannot be ignored because adjunct hiring will continue. If students are being delivered a lower quality educational experience due to large numbers of adjuncts on faculty rosters, scholars must be able to understand and quantify this impact. As researchers, increasing our understanding of the impact of adjunct staffing is important,

but this topic is also important for practitioners. Administrators at individual institutions should be informed about the impact of their choices upon assembling faculty rosters. Also, administrators will find great value in knowing how to retain their students and ensure they eventually participate in the graduation ceremony at their school. On a national level it is important for policymakers to know the impact of adjunct faculty staffing as they take measures to deal with the suboptimal 6-year baccalaureate graduation rate.

I add to this body of literature by examining the relationship between institutional part-time staffing and student outcomes. This study used panel data to estimate retention and graduation rates using a national data set. Unlike most of the studies that have drawn on the student-faculty interaction framework, I used the Berger and Milem (2000) framework. Berger and Milem (2000) reviewed a large body of literature on organizational behavior with the aim of understanding how organizational factors impacted student outcomes. The study of organizations emerged along with industrialization in the late 1800s, but it was not until the 1950s that organizational behavior was established as a distinct branch of applied social science (Berger & Milem, 2000). Given the complex nature of organizational behavior theory, in particular the plethora of dimensions, Berger and Milem (2000) undertook the daunting task of creating a synthesized model; small enough to be easy to use, yet large enough that it covers the spectrum of theories. Berger and Milem (2000) developed a five dimensional model to classify organizational behavior in colleges and universities. The five dimensions are systemic, bureaucratic, collegial, symbolic, and political. These dimensions are well established in higher education literature, and each has inherent strengths and weaknesses.

Berger and Milem (2000) explained these dimensions as the basic building blocks of organizational types, and each varies in magnitude to build specific types of organizations.

After an exhaustive review of literature, Berger and Milem (2000) demonstrated that there is empirical evidence for a relationship between organizational behavior at colleges and student outcomes. Berger and Milem (2000) explained,

> This model describes how student entry characteristics directly affect the student peer characteristics of a particular institution, student's experience-behavioral and perceptual-in the organization, and student outcomes. Organizational characteristics, including structural-demographic features and organizational behavior dimensions (which exert a reciprocal influence on each other), affect the types of students who attend the institution, student peer group characteristics, and the behavioral and perceptual aspects of the students' experience in the postsecondary organization. Peer group characteristics are a source of direct influence on how students behave and perceive during their experience with the organizational environment of the college or university. The student experience is composed of both behaviors and perceptions which continually interact as students become more or less involved in the organizational environment of the college or university. These experiences directly affect student outcomes. (p. 307)

The key here is that student entry characteristics and organizational characteristics form input variables. In this study both were captured by an IPEDS data set. The strongest argument for fitting this model to this study of adjunct faculty is that the

proportion of full-time and part-time faculty at an institution forms an important structural-demographic base for the institution. Recall that in the first chapter, I outlined the dichotomy between adjuncts and their full-time counterparts: Adjuncts are less likely to have terminal degrees, earn less money, and produce less research. The issue of limited availability—that adjuncts are less available and less accessible to students on campus—is omnipresent in the published research studies that formed my review of the literature. Eagan and Jaeger (2008) stated that since part-time faculty have limited availability, students interact with these faculty less often than their full-time counterparts. My review of the literature revealed that the student-faculty interaction framework has been the most common framework for studies linking the impact of adjunct instruction to student outcomes (Calcagno et al., 2008; Eagan & Jaeger, 2008; Jacoby, 2006; Jaeger & Eagan, 2009; Jaeger & Eagan, 2011; Jaeger & Hinz, 2009; Johnson, 2011). However, this is not the best framework for this study because this study is not concerned with measuring the amount of engagement or interaction between students and their faculty. Furthermore, since this study will use IPEDS data, student-faculty engagement and interaction data were not collected nor available through IPEDS. Rather, the present study is concerned with institutional characteristics; particularly the proportion of adjunct faculty at an institution. Therefore, the Berger and Milem (2000) framework is more suited for this study than the student-faculty interaction model.

The predictor variables that will be used in this study are listed in Table 1.

Table 1

Independent Variables

Student Entry Characteristics
Percentage of disadvantaged minority students
Percentage of in-state students
Average of 25th and 75th percentile reading SAT scores
Average of 25th and 75th percentile math SAT scores
Percentage receiving Federal grant aid
Average Federal grant aid per recipient
Institutional Characteristics
Institutional control
Full-time equivalent enrollment
Faculty to student ratio
Percentage of part-time faculty
Expenditure on instruction
Expenditure on academic support
Expenditure on student services

The independent variables were chosen based on the variables used in Ehrenberg and Zhang's (2005) graduation rate study, with additional variables from Chen's (2012) study of the institutional characteristics that are related to attrition. I synthesized the variables in Ehrenberg and Zhang's (2005) model and the institutional-level variables in Chen's (2012) model that are available in IPEDS. My model includes the following variables from Ehrenberg and Zhang's (2005) study: residency, SAT scores, federal grant aid,[5] and percent of part-time faculty. The additional variables that I added to my model (from Chen, 2012) included: full-time equivalent enrollment, percent of disadvantaged minority students, faculty to student ratio, institutional control, expenditure on instruction, expenditure on academic support, and expenditure on student services.

[5] Ehrenberg and Zhang (2005) used Pell grant aid as a variable, but I will use Federal grant aid because Pell grant aid is not available in IPEDS for the length of my panel.

CHAPTER III

METHDOLOGY

Overview of Study

The purpose of this study was to understand the relationship between exposure to adjunct faculty and student outcomes as measured by retention and graduation rates. The present chapter explains the research methods used in this study. This chapter begins with the research questions, followed by an explanation of the conceptual model I used. Then I explain this study's data source and analytic methods. This chapter concludes with a discussion of the limitations inherent in this type of study. This study centers around two models: one uses panel data to estimate 1-year retention rates and the other model uses panel data to estimate 6-year graduation rates.

Research Questions

This study was based on the following overarching question: How does the representation of adjunct faculty affect students' educational outcomes? With this broad question in mind, this study tested the following hypothesis:

> Controlling for other institutional characteristics, do baccalaureate degree granting institutions that employ a higher proportion of adjunct faculty have lower student retention rates and graduation rates? If there is an association, to what extent does the increased proportion of adjunct faculty relate to 1-year retention and 6-year graduation rates?

Additionally, this study sought to answer this supplementary research question:

What other institutional characteristics are significantly related to student retention rates and graduation rates?

Conceptual Model

This study employed Berger and Milem's (2000) framework as the conceptual model. After an exhaustive review of literature, Berger and Milem (2000) demonstrated that there was empirical evidence for a relationship between organizational behavior at colleges and student outcomes. Figure 1 depicts how the predictor and outcome variables in this study fit Berger and Milem's (2000) model.

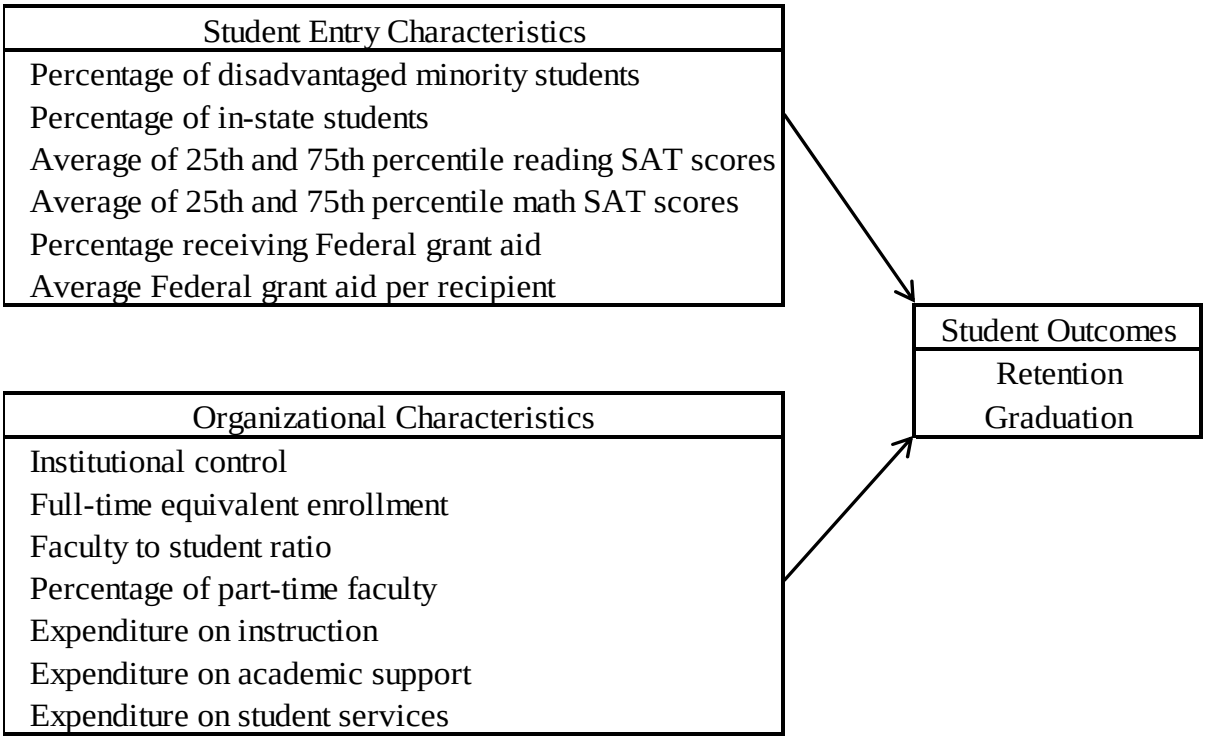

Figure 1. Adaptation of Berger and Milem (2000) model.

As shown in Figure 1, many student and organizational elements interact with each other to impact student outcomes. The key aspect of this model is that

organizational characteristics such as the mix of full-time and part-time faculty at an institution will affect student outcomes. My hypothesis, based on theories and previously cited literature, is that an institution's faculty mix forms an important structural-demographic pillar for that institution and this will have an impact on student retention and graduation rates.

Data Source and Sample

The Higher Education Act of 1965 (as cited in National Center for Educational Statistics, 2013a) requires that institutions that participate in federal student aid programs report data on enrollments, program completions, graduation rates, faculty and staff, finances, institutional prices, and student financial aid. The National Center for Education Statistics (NCES) gathers information from every college, university, and technical and vocational institution that participates in federal student financial aid programs. These data are collected through a system of surveys called the *Integrated Postsecondary Education Data System*, commonly referred to as IPEDS. IPEDS data are the data source for this study, and I extracted these data through the online IPEDS Data Center.

Only non-profit institutions granting bachelor degrees are included in this study. Data from 2-year institutions are collected by IPEDS but are excluded from this study. The intention of a student entering a 4-year university is to persist until his or her degree program is completed, however, the intention of a student entering a community college is more ambiguous. In *The American Community College*, Cohen and Brawer (2003) explained that students have various reasons for attending community colleges and among these reasons are associate degree completion, transfer to a 4-year institution,

personal interests, and attaining job skills. Because of these varied reasons for enrollment, retention rates and graduation rates may not be useful measures of student success at community colleges. Hence, this study only focused on the retention rates and graduation rates of baccalaureate degree seeking students.

In order to exclude specialized institutions, such as maritime academies and seminaries, the institutions included in this study's data set were filtered according to Carnegie Classification. Using the year 2000 edition of the Carnegie Classification (Carnegie Foundation for the Advancement of Teaching, 2001), I only included Carnegie baccalaureate, master's, and doctoral institutions. For-profit institutions were excluded from the data set because too few of these institutions had all the covariates in the model used for this study. For example, few for-profit institutions had SAT scores available in the IPEDS data source, and this variable was an important student background control variable in my model.

Graduation rate and retention rate were the dependent variables for this study. Table 1 lists the independent variables. A total of 13 independent variables were used: 6 variables for student entry characteristics and 7 variables for institutional characteristics. As explained in Chapter II, the choice of these variables was based on the graduation rate study by Ehrenberg and Zhang (2005) and Chen's (2012) study of institutional characteristics that were found to be related to attrition.

The first-year retention rate measures the 1-year retention rate for first-time, full-time freshmen that entered the prior Fall term. Table 2 displays the cohorts that were used.

Table 2

Cohorts for the Freshmen Year Retention Study

Period in Time of Reported Rate	Year Cohort Entered
Fall 2004	2003
Fall 2005	2004
Fall 2006	2005
Fall 2007	2006
Fall 2008	2007
Fall 2009	2008
Fall 2010	2009
Fall 2011	2010
Fall 2012	2011

The most recent retention rate available from the IPEDS Data Center was the rate reported for fall 2012, which is the 1-year rate for freshmen that entered in fall 2011. These data are limited to nine cohorts, which provides data for a total of 9 years. The retention rate for freshman entering in the fall 2002 was not required; it was optional for institutions to submit these data to IPEDS. Only about half of the institutions reporting first-time full-time freshmen in fall 2002 reported a retention rate in fall 2003 data collection. Institutions were first required to report retention in 2004 for freshman entering in the Fall 2003 term. Following Ehrenberg and Zhang's (2005) study that matched incoming cohorts to the graduation rate reported 4, 5, or 6 years later, I matched the incoming cohorts with the retention rate that was reported 1 year later. For example, when the retention rate reported in fall 2010 was modelled the independent variables were based on the incoming fall 2009 full-time freshmen cohort and the institutional characteristics reported for the 2009-10 academic year.

In the case of graduation rates, fewer years were observed. Graduation rates were first reported by institutions in 1997, but the submission of data was optional. It was not until 2002 that graduation rate reporting became required. Like the case for the retention model in the present study, the cohorts were matched to the graduation rate reported 6 years later. For example, when the graduation rate reported in August 2012 was modelled, the student cohort variables for the cohort entering in fall 2006 were used. For the other independent variables, the method used by Ehrenberg and Zhang (2005) was followed such that the average of the institutional characteristics variables over the graduation rate period was used. The following variables were based on a 6-year average: full-time equivalent enrollment, percent of part-time faculty, faculty to student ratio, and the three institutional expenditure variables. Using the variable that measures the percent of part-time faculty as an example, the average value of part-time faculty over a student's 6-year enrollment period was used. This average represents the characteristics and resources available to students during the 6-year time frame. Although there are 11 years of graduation rates available in IPEDS, only 6 years of the data set were used in the present study because an important control variable, SAT scores for incoming freshmen, was not available until 2001. Hence, a total of 6 years of data for graduation rates was available. Table 3 shows the cohorts for the 6-year graduation rate data.

Table 3

Cohorts for the Graduation Rate Study

Period in Time of Reported Rate	Year Cohort Entered
August 2007	2001
August 2008	2002
August 2009	2003
August 2010	2004
August 2011	2005
August 2012	2006

As the case with retention rates, the 6-year rate reported in August 2012 was the most recent rate available from the IPEDS Data Center.

In addition to matching incoming freshmen cohorts to reported retention and graduation rates and aligning institutional characteristics to the years those students were enrolled, transformation was needed for the expenditure variables. First, these expenditure variables were adjusted for inflation. I used the consumer price index published by the Bureau of Labor Statistics to adjust dollar amounts in all years to constant dollars in 2012. I used 2012 because it was the last year of data and, therefore, it seemed the most meaningful for making comparisons to present dollar amounts. Then, following Ryan's (2004) study of the relationship between institutional expenditures and degree completion, I divided the total expenditures by full-time equivalent enrollment and took the natural log of this value.

Data Analyses

Panel Data Methods

This research study used panel data regression to estimate 1-year retention rates and 6-year graduation rates. The key independent variable in the model was the percent of part-time faculty at an institution. Researchers often refer to panel data by other names,

such as pooled data, longitudinal data, or micropanel data (Gujurati, 2003). Panel data analysis has been a common statistical method in other fields, such as biostatistical research, but is a relatively recent phenomenon in higher education studies (Zhang, 2010). In the following section, the appropriateness of using such a statistical method for this study is described. There are several choices for data analysis methods, such as hierarchical linear modeling, multiple regression analysis, cross-section analysis, and time-series analysis. Panel data analysis is an ideal choice because it combines elements from two methods, cross-section analysis and time-series analysis. The cross-section method takes observations from many groups at a single point in time. In time-series analysis, observations are collected at many points in time for a single group. Panel data combines the spatial component of cross-section analysis and the temporal component of time-series analysis. Kennedy (1998) listed the advantages of panel data analysis as follows:

- allows for the control of individual heterogeneity,
- alleviates aggregation bias,
- improves efficiency by using data with more variability and less collinearity, and
- enables the testing and estimating of more complicated behavioral models.

Gujurati (2003) provided the following list of advantages using simpler terms:

- increases sample size,
- better suited to study the dynamics of change, and
- enables the study of more complicated behavioral models.

Gujurati's (2003) first point about sample size means that the degrees of freedom increase and the collinearity among variables decreases. The second and third points are based on the premise that panel data combines the benefits of both cross-section and time-series analysis.

Among the studies discussed in Chapter II, there was one cross-sectional study and one panel data study. Jacoby (2006) used cross-sectional analysis to estimate the graduation rates for all public community colleges based on data from a single year. On the other hand, Ehrenberg and Zhang (2005) estimated graduation rates, but employed panel data to capture the data for 15 years, thus 15 points in time. The advantage of using panel data over cross-section data is the ability to capture temporal impact. Adjunct hiring has been accelerating and this study sought to capture this aspect. Therefore, this study followed Ehrenberg and Zhang's (2005) methodology by using more recent data— the use of an updated data set is critical when one considers that adjunct faculty represented a smaller percentage of the academic workforce when Ehrenberg and Zhang (2005) conducted their study. Ehrenberg and Zhang (2005) used graduation rate data for students entering as freshmen between 1982 and 1994, whereas this study used graduation rate data for students entering as freshmen between 2001 and 2006. Additionally, this study included a parallel retention study using a national sample of institutions. Although Chen (2012) used a sample of 5,762 students at 400 institutions, none of the other studies highlighted in the literature review examined the impact of adjunct faculty on retention rates using panel data and a national sample of institutions.

The most basic equation for panel data is:

$$y_{it} = \propto + \beta X_{it} + \varepsilon_{it} \quad (1)$$

In explaining these terms, it is best to put this in the context of a model that estimates graduation rates. In such a case, y_{it} is the graduation rate for institution *i* at time *t*. The intercept is $\propto$ and β is the coefficient for the independent variable X. In this study graduation and retention rates were fitted using a host of independent variables. The error term, ε, can be broken down into two components:

$$\varepsilon_{it} = a_i + u_{it} \quad (2)$$

In this equation a_i captures the subject-specific effect that does not vary over time and u_{it} captures time-varying error (Zhang, 2010).

Now that the basis for using panel data has been explained, the various models within panel data analysis must be considered. The two most common panel data models used in empirical research are fixed effects and random effects regression (Zhang, 2010). Researchers use fixed effects models to examine group differences in intercepts, assuming the same slopes and constant variance across units (Park, 2009). Random effects models are used by researchers to examine variance components for units and error, assuming the same intercept and slope. A key question that faces researchers is which model to choose. There is a formal test, called the Hausman specification test, which determines the optimal model choice for a given data set. The Hausman specification test determines whether a_i is correlated with the predictor variables (Zhang, 2010). This is done through hypothesis testing: If the null hypothesis that the individual effects are uncorrelated with the other independent variables in the model is not rejected, then a random effects model is the optimum choice.

In addition to the Hausman specification test, there are many suggested guidelines that researchers can use to choose between fixed and random effects models. Dougherty (2007) offered a method to choose among fixed or random effects models based on the sample. That is, if the observations are not a random sample from a given population, the fixed effects method should be used. Yaffee (2003) corroborated with this choice by positing that the fixed effects model is appropriate in cases where there are significant differences in the cross-section data but not significant temporal effects. Alternatively, Zhang (2010) stated that the choice relies solely on the assumption as to whether the independent variables are uncorrelated with a_i, as shown in equation 2, the component of the error term that captures the subject-specific effect that does not vary over time. Fixed effects models yield unbiased and consistent estimates, but do not produce estimates for time-invariant variables. Random effects models do provide estimates for time-invariant variables in addition to time-variant variables, but this method presents a weakness because the unbiasedness of the estimates hinges on the assumption that individual heterogeneity is uncorrelated with the independent variables. Zhang (2010) further stated that researchers often prefer random effects models because they want to obtain the effects of time-invariant variables but this is not a sufficient justification for using random effects models.

Based on the suggestions offered by Dougherty (2007) and Yaffee (2003), a fixed effects model was appropriate for the present study because (a) it includes all IPEDS cases that have available data; and (b) a particular institution will not have very large shifts in persistence/graduation rates from year to year, but there will be large disparities between the rates of individual institutions. In their study examining the relationship

between the use of part-time faculty and student graduation rates, Ehrenberg and Zhang (2005) used a fixed effects model. Although the fixed effects model was the choice for the present study, I also ran a random effects model as a robustness check.

Analytic Plan

The statistical package STATA was used to carry out the statistical analysis for this study. The first step involved compiling a data set from the online IPEDS Data Center. The data set included 15 variables for 9 points in time for each institution. After compiling this data set, STATA was used to perform descriptive analyses to determine if there were data errors. There were missing values in the data set and interpolation was used to produce estimates for the missing values. Chen (2012) followed Zhang and Ness (2010) who used interpolation to impute missing values in panel data. For example, if the value for year 2001 is missing, the average of the values in 2000 and 2002 would be used to replace the missing value for 2001 (Zhang & Ness, 2010). Following the process of imputing missing values, I recoded variables that were categorical, such as institutional control. At this point the data set was prepared for panel data analysis and two models were run, a fixed effects model that measured retention rates and a second fixed effects model that measured graduation rates. The results of these two models would determine if the faculty mix of an institution had a statistically significant impact on student retention and graduation.

As part of a sensitivity analysis, random effects models were produced for the two data files. After running the random effects model, I conducted a Hausman specification test to ascertain which model was optimal. The Hausman test in STATA is based on a null hypothesis that the individual effects are uncorrelated with the other predictor

variables in the model. If this null hypothesis is not rejected, the random effects model is the optimal model. For the retention data file, the Hausman test resulted in a *p*-value less than 0.001, therefore, the null hypothesis was rejected and support was provided for the fixed effects model. The same scenario was observed for the graduation file—the Hausman test produced a *p*-value less than 0.001, so the null hypothesis was rejected, which means the fixed effects model was the optimal model. So for both retention and graduation, the fixed effects model was the optimal choice.

I conducted some additional analyses to gain more insight into the part-time faculty variable in the panel data models. I ran a kernel density plot of the part-time faculty variable to illustrate the distribution of this variable. I also generated a correlation table to understand the correlation between the part-time faculty variable and the other covariates in the panel model. Although the part-time faculty variable is the key independent variable of this study, the panel model results also include information on the other independent variables included in the data set.

Just as Ehrenberg and Zhang (2005) presented results in several subsample categories, I also ran the panel model according to the two institutional control categories in this study's data sets: public and private. Following the sequence of data analysis for the entire sample, I also ran kernel density plots to understand the distribution of part-time faculty at public and private institutions. The final step in my data analysis was an interaction effects test. In a study of financial aid and dropout risk, Chen and DesJardins (2008) used an interaction term to examine the variations in financial aid effects by income group. In applying the interaction test to this study, I created an interaction term between part-time faculty and institutional control. This interaction term determined

whether the relationship between part-time faculty staffing and the outcome measures differed across the two institution categories.

Limitations

The limitations of this study mainly relate to using IPEDS for the source of data. First, an important aspect of adjuncts is their intentions. Do adjuncts aspire to become full-time tenure track faculty members? An adjunct could be struggling to earn a living by teaching several courses at several different institutions. On the other hand, an adjunct could be a full-time professional in the workforce that taught the same night course for 10 years for the simple pleasure of sharing knowledge. There are adjuncts that are retired from tenure track positions and may teach a course as an adjunct to help fill an otherwise idle day as a retiree. The review of the literature did not find a study that dealt with adjunct intentions, but it would be a meaningful variable to study because an adjunct's intentions could be related to their effectiveness. Unfortunately, this is not included in IPEDS data. Although adjunct intention is a survey item in the National Study of Postsecondary Faculty (NSOPF), due to the disparate nature of this survey, it could not be merged with my IPEDS data set.

Similar to the case of adjunct intentions, little is known about the level of experience of the adjuncts in the reviewed studies. As covered in the review of literature, Ronco and Cahill (2006) were somewhat apprehensive about treating adjuncts as a homogeneous group. Also, Jaeger and Eagan (2011) cited the same limitation, with specific mention that the length of service of part-time faculty was missing from their data set. None of the studies in the literature review contained this important piece of

information. Just as was the case with adjunct intention, adjunct experience is something that is not available in IPEDS data.

The IPEDS retention and graduation rates only focus on the incoming student cohort that begin as first-time, full-time freshmen, and whether the students in that cohort persist or graduate from the initial institution. So in the case of a student that leaves his or her first institution, that student is no longer tracked. Therefore, the retention and graduation rates at a particular university will understate the persistence and graduation rates as students leaving one institution may enroll and graduate from another university. This is a disadvantage of using IPEDS data. The National Student Clearinghouse offers a tool called *StudentTracker*, which, as the name implies, allows university administrators to track the students that left their institution and discover where these students went to continue their studies. But, like the case with the NSOPF data, the data in StudentTracker cannot be linked with IPEDS data.

The key independent variable in the models for this study is the proportion of part-time faculty at each institution. It would be ideal to have a variable that indicates the amount of exposure students have to part-time faculty. A suitable measure for this would be the percentage of courses taught by part-time faculty at each institution. Unfortunately, such a measure is not a survey item in IPEDS, hence, this study relied on the proportion of part-time faculty at each institution. Not knowing the portion of courses taught by adjuncts is a limitation of this study.

Another limitation of this study involves the number of years of data. Although some of the studies in the literature review used data from a single academic year, this

study uses data from several years. Specifically, this study considered 9 years of retention rate data and 6 years of graduation rate data. Although this is an obvious improvement over single year studies, it would be nice to have additional years of observations. As mentioned previously, this limitation was the result of variable availability in IPEDS data. The multi-year study by Ehrenberg and Zhang (2005) avoided this limitation by using data from The College Entrance Examination Board's Annual Survey of College Standard Research Compilation. The data file of the College Board provided 15 years of graduation rate data for their study.

The final limitation of this study involved the use of standardized test scores. Although institutions report ACT and SAT scores to IPEDS, only SAT scores were used as variables. For some institutions, a greater number of students in an entering cohort take the ACT. Using the SAT score could have resulted in higher scores for institutions for which only a small percentage of students took the SAT. However, because I am using a fixed effects model I am partially controlling for the differences in the type of students who take the SAT at these institutions, thereby limiting the possible impact. An additional limitation involved with the use of standardized test scores is the omission of some open-access institutions. Institutions with an open-access admission policy may not report SAT scores to IPEDS, and therefore, these institutions could not be included in my panel models. Related to this limitation is the omission of for-profit institutions. In my research design, I did not include for-profit institutions because too many did not have a full panel of covariates for my panel models, particularly absent were SAT scores.

CHAPTER IV

RESULTS

Introduction

This chapter details the results of my data analyses. As explained in Chapter III, this study examines the relationship between the use of adjunct professors and college student success by using two primary models; one to estimate 1-year retention rates for cohorts of first-time, full-time freshmen, and another model to estimate 6-year graduation rates for cohorts of first-time, full-time freshmen. Because these models used different cohorts, fall 2003 through fall 2011 for retention and fall 2001 through fall 2006 for graduation, and the graduation rate model used an average value for six institutional variables over a 6 year period, there are two separate data files.

Data Files

Using individual variable files from the online IPEDS Data Center, I assembled a master panel data file. There were missing values in some of these panels, and I used the STATA command, *ipolate*, to interpolate values. Interpolation was used to fit missing values for all of the independent variables except for institutional control. The institutional control variable is an institution's control for the first year of the panel and remains constant throughout the remainder of the panel. The dependent variables in this study, retention and graduation rates, were not interpolated; so only values submitted to IPEDS were used as outcome variables. Table 4 shows the count of interpolated values in the retention data file.

Table 4

Fitted Values in Retention Sample

Variable	Total Number of Cases	Number of Cases Imputed	Percent of Cases with Imputed Values
Outcome:			
Freshmen year retention rate	9,176	0	0%
Student Entry Characterisitcs:			
Percentage of disadvantaged minority students	9,176	673	7%
Percentage of in-state students	9,176	1,571	17%
Average of 25th and 75th percentile reading SAT scores	9,176	1,049	11%
Average of 25th and 75th percentile math SAT scores	9,176	1,007	11%
Percentage receiving Federal grant aid	9,176	673	7%
Average Federal grant aid per recipient (in thousands)	9,176	675	7%
Institutional Characteristics:			
Institutional control	9,176	0	0%
Full-time equivalent enrollment (in thousands)	9,176	673	7%
Faculty to student ratio	9,176	2,400	26%
Percentage of part-time faculty	9,176	2,447	27%
Natural log of expenditure on instruction per FTE	9,176	679	7%
Natural log of expenditure on academic support per FTE	9,176	679	7%
Natural log of expenditure on student services per FTE	9,176	679	7%

The two variables with the highest percentage of fitted values are faculty to student ratio and percent of part-time faculty. This occurrence is attributed to the reporting requirements for the fall staff component of the IPEDS survey. Fall staff reporting is only required in alternating years in the IPEDS data collection cycle. Institutions may optionally submit data in the even-numbered years, for example fall 2004 and fall 2006, but this is not a requirement. For this reason, many values for the count of faculty were missing in the even-numbered years, and interpolation was used to fit the values. This same issue applies to the percent of in-state students, as residency of first-year students is only required in even-numbered years.

The master panel file includes four financial variables: average amount of federal grant aid per recipient, expenditure on instruction per FTE, expenditure on student services per FTE, and expenditure on academic support per FTE. Each of these financial variables were adjusted for inflation according to the Bureau of Labor Statistics (2014) consumer price inflation index (CPI) (see Table 5).

Table 5

CPI Adjustment Table

Year	Factor
2002	1.2762
2003	1.2478
2004	1.2154
2005	1.1756
2006	1.1389
2007	1.1073
2008	1.0664
2009	1.0702
2010	1.0529
2011	1.0207
2012	1.0000

The factors in Table 5 were obtained using the Bureau of Labor Statistics' online CPI calculator, which uses the average CPI for a given calendar year (Bureau of Labor Statistics, 2014). All values for the four financial variables were transformed into constant 2012 dollars.

At this point, the master panel file was bifurcated into two panel files to facilitate the study of each outcome. A file was created for the retention study that included incoming cohort data from fall 2003 through fall 2011 and retention data from fall 2004

through fall 2012. In order to facilitate panel data analysis in STATA, the case records were assembled in a manner that matched the incoming cohort data to the outcome reported in the following year. For example, the student cohort variables of the incoming freshmen cohort in the Fall 2011 term is on the same case record as the retention rate reported in the Fall 2012 term. The graduation rate study required a separate file as the variables in the institutional size, faculty, and expenditure categories were averaged over a 6-year time frame. The graduation file included incoming cohort data for the Fall 2001 through Fall 2006 cohorts, with average values for the variables in the institutional size, faculty, and expenditure categories for the incoming year and subsequent 5 years. These cohort and institutional characteristics values were matched with the 6-year graduation rate for the cohort. In the next step any panel records in the two files that contained missing values were removed. Although interpolation was used to fit missing values, there were still cases in which a value could not be interpolated. For example, if an institution did not submit financial expenditure variables for the length of their panel, interpolation would not be able to fit a value. The final step in each file was to log transform the expenditure values. The final result of this panel data file assembly process was two complete panel data files that did not contain any missing values. The retention file contained 9,176 records and the graduation file contained 5,695 records.

Descriptive Statistics

The final retention file contained 9,176 observations for 1,164 institutions. The descriptive statistics are displayed in Table 6.

Table 6

Descriptive Statistics for Retention File

Variable	Mean Value	Standard Deviation
Outcome:		
Freshmen year retention rate	0.77	0.11
Student Entry Characterisitcs:		
Percentage of disadvantaged minority students	0.20	0.21
Percentage of in-state students	0.67	0.25
Average of 25th and 75th percentile reading SAT scores	535	66
Average of 25th and 75th percentile math SAT scores	540	69
Percentage receiving Federal grant aid	0.32	0.16
Average Federal grant aid per recipient (in thousands)	4.47	1.12
Institutional Characteristics:		
Institutional control: private (0=public, 1=private)	0.64	0.48
Full-time equivalent enrollment (in thousands)	6.58	8.23
Faculty to student ratio	6.07	3.32
Percentage of part-time faculty	0.38	0.20
Natural log of expenditure on instruction per FTE	9.11	0.50
Natural log of expenditure on academic support per FTE	7.63	0.71
Natural log of expenditure on student services per FTE	7.87	0.66

For the 9,176 observations across 1,164 institutions the average was 7.9 years of observations for each institution. The average 1-year retention rate for the panel sample was 77%. Institutional control has been recoded as 0 for public institutions and 1 for private institutions. The average value of 0.64 indicates that 64% of the panel records were from private institutions. The faculty to student ratio, expressed in full-time faculty per 100 FTE, had an average value of 6.07 or 6.07 full-time faculty per 100 FTE students.

The independent variable of greatest interest for this study, percent of part-time faculty, was found to have an average value of 0.38 for the data set.

Unlike the retention data file that contained data from nine incoming cohorts, the final graduation panel file covered six incoming cohorts. As a result, there were fewer observations in the panel sample for graduation rates. The final graduation file contained 5,695 observations for 1,119 institutions. The descriptive statistics for the graduation sample can be seen in Table 7.

Table 7

Descriptive Statistics for Graduation File

Variable	Mean Value	Standard Deviation
Outcome:		
Six-year graduation rate	0.57	0.18
Student Entry Characterisitcs:		
Percentage of disadvantaged minority students	0.18	0.21
Percentage of in-state students	0.66	0.25
Average of 25th and 75th percentile reading SAT scores	538	65
Average of 25th and 75th percentile math SAT scores	541	68
Percentage receiving Federal grant aid	0.29	0.16
Average Federal grant aid per recipient (in thousands)	4.01	1.04
Institutional Characteristics:		
Institutional control: private (0=public, 1=private)	0.66	0.47
Full-time equivalent enrollment (in thousands)	6.38	8.01
Faculty to student ratio	6.15	3.27
Percentage of part-time faculty	0.38	0.19
Natural log of expenditure on instruction per FTE	9.13	0.50
Natural log of expenditure on academic support per FTE	7.65	0.69
Natural log of expenditure on student services per FTE	7.90	0.65

The average graduation rate for the panel is 57%. The input variables closely aligned with the values in the retention file; the average value for part-time faculty was 38% in both the retention and graduation files.

Retention Panel Data Model

Table 8 presents a summary of STATA output for the retention fixed effects model.

Table 8

Retention Fixed Effects Model Output

Variable	Coefficient	Sig.
Percentage of part-time faculty	-0.0089	
Percentage of disadvantaged minority students	-0.1198	***
Percentage of in-state students	0.0236	*
Average of 25th and 75th percentile reading SAT scores	0.0001	
Average of 25th and 75th percentile math SAT scores	0.0001	**
Percentage receiving Federal grant aid	-0.0005	
Average Federal grant aid per recipient (in thousands)	0.0017	*
Full-time equivalent enrollment (in thousands)	0.0027	***
Faculty to student ratio	-0.0003	
Natural log of expenditure on instruction per FTE	0.0037	
Natural log of expenditure on academic support per FTE	-0.0043	
Natural log of expenditure on student services per FTE	0.0196	***
Cohort		
Fall 2004	-0.0033	
Fall 2005	-0.0067	***
Fall 2006	-0.0060	**
Fall 2007	-0.0047	*
Fall 2008	-0.0039	
Fall 2009	-0.0027	
Fall 2010	-0.0021	
Fall 2011	-0.0021	
Constant	0.5070	***
$corr(u\_i, Xb) = 0.3334$; $rho = 0.8023$; $Prob > F = 0.0000$		

Note. * for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

The variable institutional control was excluded from Table 8 because time-invariant variables are always excluded from fixed effects models. This model has a *p*-value less than 0.001 for probability > *F*, which indicates that the model is valid. Among the independent variables from the IPEDS file, 6 of the 13 variables were found to be statistically significant at the 0.05 level. The variable part-time faculty was found to have a coefficient of -0.0089, which indicates that for each 1% increase in the proportion of part-time faculty at an institution, the retention rate declines by 0.89%. However, the

output from the model indicated that the variable part-time faculty was not statistically significant. Given that the part-time faculty variable was not statistically significant, it would seem that the proportion of part-time faculty at an institution is not significantly related to the institution's retention rate when the other input variables in the model are controlled for. In order to take a deeper look at part-time faculty in this retention model, a kernel density plot of part-time faculty across all institutions was generated (see Figure 2).

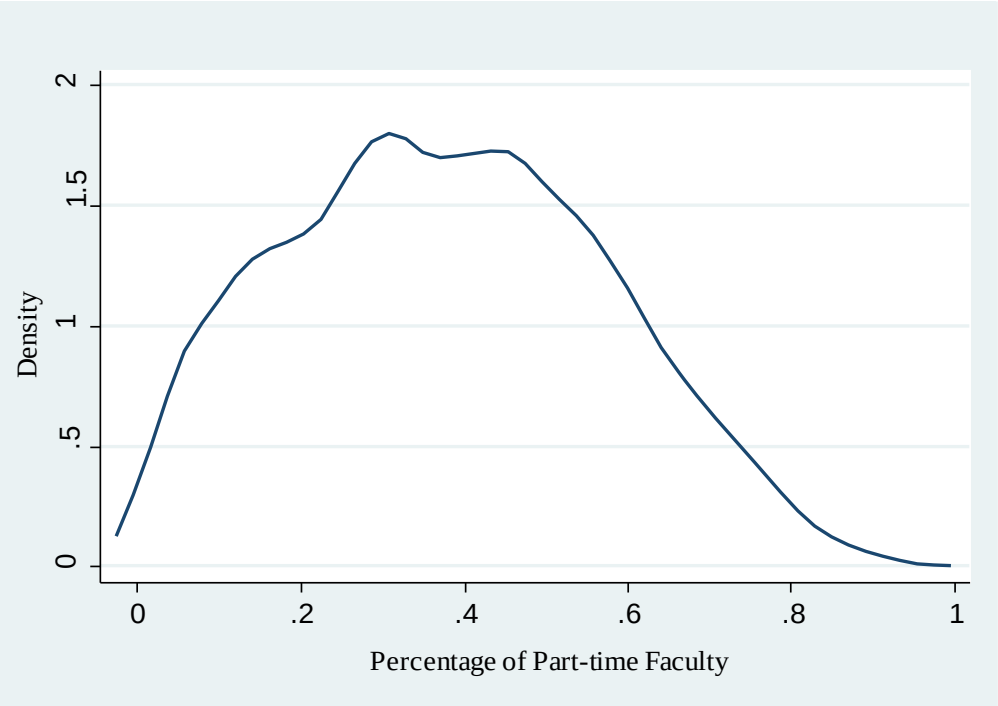

Figure 2. Kernel density plot of part-time faculty variable in retention file.

The descriptive statistics (see Table 6) yielded a mean value of 0.38 and a standard deviation of 0.20 for the part-time faculty variable across all institutions in the retention file. The kernel density plot (see Figure 2) displays a fairly normal distribution of part-time faculty across institutions.

I also conducted a correlation analysis to understand how the part-time faculty variable is correlated with the other covariates in the model (see Table 9).

Table 9

Correlation of Part-time Faculty in Retention File

Variable	Correlation
Percentage of part-time faculty	1.00
Percentage of disadvantaged minority students	0.01
Percentage of in-state students	0.14
Average of 25th and 75th percentile reading SAT scores	-0.33
Average of 25th and 75th percentile math SAT scores	-0.34
Percentage receiving Federal grant aid	0.17
Average Federal grant aid per recipient (in thousands)	-0.06
Institutional control	0.24
Full-time equivalent enrollment (in thousands)	-0.23
Faculty to student ratio	-0.42
Natural log of expenditure on instruction per FTE	-0.33
Natural log of expenditure on academic support per FTE	-0.28
Natural log of expenditure on student services per FTE	0.04

All of the correlation values calculated are fairly modest, with the highest absolute correlation value at 0.42 for the faculty to student ratio. Such modest values support the case that the fixed effects panel model was well-suited to assess the part-time faculty variable.

Although the part-time faculty variable is the crux of this study, the other input variables provided insight into what drives retention. The variable with the greatest absolute coefficient value was found to be percent of disadvantaged minority students, which includes students in the following race/ethnicity categories: American Indian or

Alaskan Native, Black or African American, and Hispanic or Latino. For each percent increase that an incoming cohort of freshmen was composed of students from disadvantaged minorities, the retention rate for the institution was found to decline by 12% (beta = -0.1198, $p < 0.001$). The next notable variable was found to be the percent of in-state students. For each percent increase in in-state students, the retention was found to increase by 2.4% (beta = 0.0236, $p < 0.05$). An increase in FTE is associated with a higher retention rate. Specifically, each 1,000 increase in FTE corresponds to a 0.27% increase in retention (beta = 0.0027, $p < 0.001$). The variable percent of students receiving federal grant aid was not found to be statistically significant, but the variable average amount per recipient was found to be statistically significant, albeit with a small coefficient. Each $1,000 increase in the average amount of aid was found to correspond to a 0.17% increase in retention (beta = 0.0017, $p < 0.05$). An increase in SAT math scores was found to be associated with higher retention: A 100 point increase in the average of the 25th and 75th percentiles of the SAT math score was found to be associated with a 1% increase in the retention rate (beta=.0001, $p < 0.01$). Among the three expenditure variables, only the student services expenditure variable was found to be statistically significant. An increase in spending was found to correspond with higher retention. A 1 point increase in the natural log of student services expenditure per FTE was found to be associated with a 1.96% increase in retention (beta = 0.0196, $p < 0.001$).

Time fixed effects were included in the model, as represented by the eight cohorts (see Table 8). Although initially the plan was to include time effects in the models, I conducted a hypothesis test to ascertain if time fixed effects should be included in my model. I conducted this joint hypothesis test:

Null hypothesis: All time fixed effects = 0

Alternative hypothesis: At least one of the time fixed effects <> 0

The test resulted in a *p*-value of less than 0.05 for prob > *F*, and the null hypothesis that all time fixed effects are equal to zero was rejected and, therefore, the time fixed effects was included in the model. The eight cohorts (see Table 8) all were found to have negative coefficients, which means that the retention rates for these cohorts were lower relative to the reference group of freshmen that entered in the Fall 2003 term. For example, compared to the Fall 2003 cohort, the Fall 2006 cohort was found to have a 0.60% decrease in retention (beta = -0.0060, $p < 0.01$). However, since only three of the eight cohort years were found to be statistically significant at the 0.05 level, the overall impact of time effects was considered limited.

Referring back to the adaptation of the Berger and Milem (2000) framework (see Figure 1), the input variables were classified into two categories: student entry characteristics and organizational characteristics. In the Berger and Milem (2000) framework, student and organizational elements interact with each other to impact student outcomes. The results (see Table 8) were found to provide support for applying the Berger and Milem (2000) framework to this study. There are a total of 12 control variables, with six variables in the student characteristics category and six variables in the organizational characteristics category. The results indicate that four of the student entry characteristics variables are statistically significant and two of the organizational characteristics variables are statistically significant. Although this is not an equal balance of statistically significant variables between the two variable categories, this distribution

indicates that the conceptual framework fits well to this study's model because each variable category includes a mix of significant and statistically insignificant variables.

I examined retention according to institutional category; public and private. There were 3,282 public institutions and 5,894 private institutions in the retention file. Table 10 displays the results of the fixed effects panel model for each institution category.

Table 10

Retention Fixed Effects Model Output by Institution Category

	Public		Private	
Variable	Coefficient	Sig.	Coefficient	Sig.
Percentage of part-time faculty	-0.0138		-0.0093	
Percentage of disadvantaged minority students	-0.0596	**	-0.1340	***
Percentage of in-state students	-0.0090		0.0337	*
Average of 25th and 75th percentile reading SAT scores	0.0002	***	0.0000	
Average of 25th and 75th percentile math SAT scores	0.0002	***	0.0001	
Percentage receiving Federal grant aid	0.0053		-0.0007	
Average Federal grant aid per recipient (in thousands)	-0.0015		0.0024	*
Full-time equivalent enrollment (in thousands)	0.0005		0.0055	**
Faculty to student ratio	-0.0004		0.0001	
Natural log of expenditure on instruction per FTE	-0.0072		0.0008	
Natural log of expenditure on academic support per FTE	0.0098	*	-0.0106	**
Natural log of expenditure on student services per FTE	0.0117	*	0.0214	***
Cohort				
Fall 2004	-0.0037		-0.0034	
Fall 2005	-0.0062	*	-0.0074	**
Fall 2006	-0.0062	*	-0.0061	*
Fall 2007	0.0009		-0.0072	**
Fall 2008	0.0087	**	-0.0095	**
Fall 2009	0.0116	**	-0.0082	*
Fall 2010	0.0081	*	-0.0060	
Fall 2011	0.0025		-0.0031	
Constant	0.4595	***	0.6015	***
Public: $corr(u\_i, Xb) = 0.3916$; $rho = 0.8466$; $Prob > F = 0.0000$				
Private: $corr(u\_i, Xb) = 0.2607$; $rho = 0.8057$; $Prob > F = 0.0000$				

Note. * for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

Although the coefficient is negative for the part-time faculty variable in both sectors, this variable is not statistically significant for both sectors. Therefore, when the sample is modeled in categories according to institutional control, and modeled for the whole sample, part-time faculty is not statistically significant for all three models. Figure 3 displays the kernel density plot of the part-time faculty variable by institutional control.

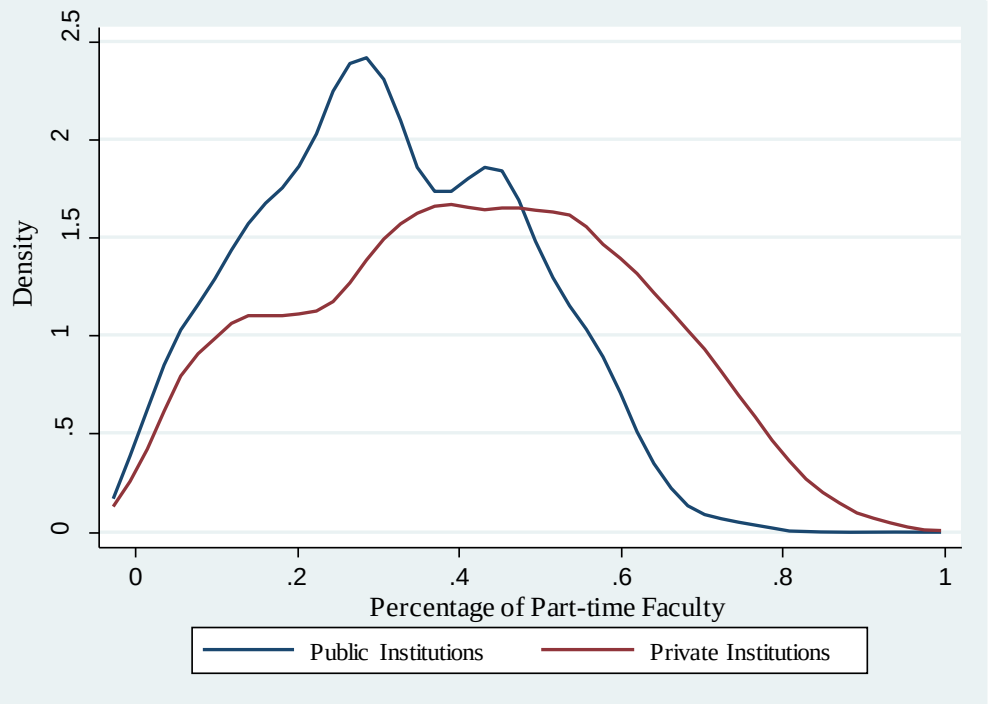

Figure 3. Kernel density plot of part-time faculty variable in retention file by category.

Based on the kernel density plot, part-time faculty form a higher percentage of the faculty mix at private institutions. This variable more closely resembles a normal distribution at private institutions compared to public institutions.

In order to understand how part-time faculty may have differing impacts on retention based on institutional control, I ran the fixed effects model with an interaction term (see Table 11).

Table 11

Retention Fixed Effects Model Output with Interaction Term

Variable	Coefficient	Sig.
Interaction of part-time faculty and institutional control	-0.0032	
Percentage of part-time faculty	-0.0064	
Percentage of disadvantaged minority students	-0.1198	***
Percentage of in-state students	0.0236	*
Average of 25th and 75th percentile reading SAT scores	0.0001	
Average of 25th and 75th percentile math SAT scores	0.0001	**
Percentage receiving Federal grant aid	-0.0005	
Average Federal grant aid per recipient (in thousands)	0.0017	*
Full-time equivalent enrollment (in thousands)	0.0027	***
Faculty to student ratio	-0.0003	
Natural log of expenditure on instruction per FTE	0.0036	
Natural log of expenditure on academic support per FTE	-0.0043	
Natural log of expenditure on student services per FTE	0.0196	***
Cohort		
Fall 2004	-0.0033	
Fall 2005	-0.0067	***
Fall 2006	-0.0060	**
Fall 2007	-0.0047	*
Fall 2008	-0.0039	
Fall 2009	-0.0026	
Fall 2010	-0.0020	
Fall 2011	-0.0021	
Constant	0.5074	***
$corr(u\_i, Xb) = 0.3327;\ rho = 0.8025;\ Prob > F = 0.0000$		

Note. * for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

The interaction term between part-time faculty and institutional control has a *p*-value of 0.844, therefore this interaction variable is not statistically significant. This means that relationship between part-time faculty and retention rates did not differ significantly between public and private institutions.

In summary, the variable, part-time faculty, was not found to be statistically significant for the overall sample, nor was this variable significant in the subsample models that were limited to a single institutional control category. Also, the impact of part-time faculty was not found to be different between public and private institutions. However, for the control variables (see Table 10), there are some notable differences as compared to the results for the entire sample. The variable with the greatest absolute coefficient value in the overall sample, percent of disadvantaged minority students, exhibited a different impact for public and private institutions. At public institutions, the retention rate was found to decline by 6% for each point increase that an incoming cohort of freshmen was composed of students from disadvantaged minorities (beta = -0.0596, $p < 0.01$). But at private institutions, the impact was found to be greater, with a 13% decline in the retention rate (beta = -0.1340, $p < 0.001$). While the variable disadvantaged minority students was found to have a varying degree of impact based on institutional control, some variables that were statistically significant in the overall sample exhibited statistical significance for one sector, but no statistical significance for the other sector. SAT Math scores was found to be statistically significant in the overall sample model (see Table 8), but was not found to be statistically significant for the subsample model of private institutions (see Table 10). Conversely, the variables for in-state residency, average federal grant aid, and FTE were found to be statistically

significant in the overall sample, but not statistically significant for the subsample of public institutions.

Graduation Panel Data Model

Table 12 displays the summary of STATA output for the graduation fixed effects model.

Table 12

Graduation Fixed Effects Model Output

Variable	Coefficient	Sig.
Percentage of part-time faculty	-0.0158	
Percentage of disadvantaged minority students	-0.1368	***
Percentage of in-state students	0.0131	
Average of 25th and 75th percentile reading SAT scores	0.0002	***
Average of 25th and 75th percentile math SAT scores	0.0001	
Percentage receiving Federal grant aid	-0.0197	
Average Federal grant aid per recipient (in thousands)	-0.0013	
Full-time equivalent enrollment (in thousands)	0.0070	***
Faculty to student ratio	-0.0004	
Natural log of expenditure on instruction per FTE	0.0184	
Natural log of expenditure on academic support per FTE	0.0157	
Natural log of expenditure on student services per FTE	0.0079	
Cohort		
Fall 2002	0.0038	
Fall 2003	0.0064	*
Fall 2004	0.0069	*
Fall 2005	0.0029	
Fall 2006	0.0070	*
Constant	0.0485	
$corr(u\_i, Xb) = 0.2481$; $rho = 0.8931$; $Prob > F = 0.0000$		

Note. * for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

With a *p*-value of less than 0.001 for prob > *F*, this model was found to be valid. Among the independent variables from the IPEDS file, only three were found to be statistically significant at the 0.05 level. Although the coefficient for the part-time faculty variable was found to be negative, this variable was not found to be statistically significant and, therefore, the proportion of part-time faculty at an institution was not found to have an impact on the graduation rate of that institution when other input variables were controlled. Figure 4 shows the kernel density plot for the part-time faculty variable.

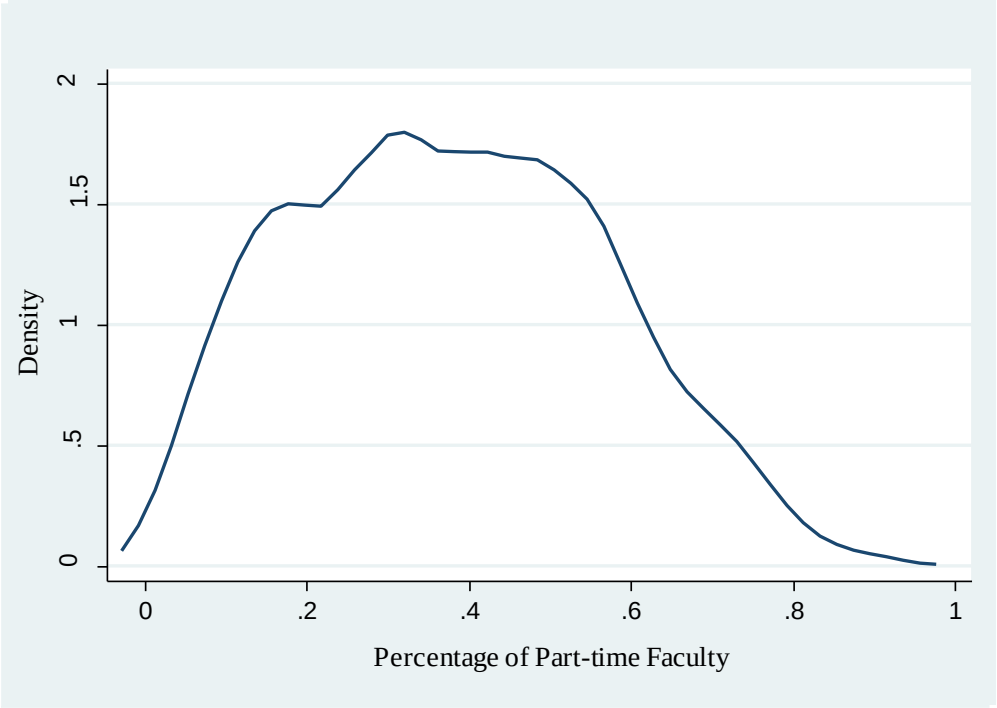

Figure 4. Kernel density plot of part-time faculty variable in graduation file.

Like the kernel density plot for the retention file (see Figure 2), the kernel density plot for the graduation file resembles a fairly normal distribution of part-time faculty across institutions. These distributions were found to be similar, and this is expected because the retention file and graduation file used the same sample of institutions. As explained

earlier in this chapter, the graduation file contained fewer cohorts and thus had fewer observations as compared to the retention file. For this reason, the density plots are similar, but not the same between the retention file and graduation file. Table 13 displays the results of the correlation analysis between the part-time faculty variable and the other covariates in the graduation file.

Table 13

Correlation of Part-time Faculty Variable in Graduation File

Variable	Correlation
Percentage of part-time faculty	1.00
Percentage of disadvantaged minority students	-0.01
Percentage of in-state students	0.15
Average of 25th and 75th percentile reading SAT scores	-0.34
Average of 25th and 75th percentile math SAT scores	-0.36
Percentage receiving Federal grant aid	0.18
Average Federal grant aid per recipient (in thousands)	-0.10
Institutional control	0.25
Full-time equivalent enrollment (in thousands)	-0.24
Faculty to student ratio	-0.45
Natural log of expenditure on instruction per FTE	-0.36
Natural log of expenditure on academic support per FTE	-0.30
Natural log of expenditure on student services per FTE	0.02

These correlation values are modest, with the highest absolute correlation value at 0.45. Just like the case with the retention study, these correlation values augment the case that the fixed effects panel model is appropriate for examining the impact of part-time faculty staffing on student graduation rates.

The focus of this study was part-time faculty, however, meaningful inferences can be drawn from the other variables in the model. The variable with the greatest absolute coefficient value was found to be the percent of disadvantaged minority students. For each percent increase that an incoming cohort of freshmen was composed of students from disadvantaged minorities, the graduation rate for an institution declined by 14% (beta = -0.1368, $p < 0.001$). Only two additional statistically significant predictors were found for the model: FTE and SAT reading scores. Each 1,000 increase in FTE was found to correspond to a 0.70% increase in graduation rates (beta = 0.0070, $p < 0.001$). A 100 point increase in the average of the 25th and 75th percentiles of the SAT reading score was found to be associated with a 2% increase in graduation rates (beta = 0.0002, $p < 0.001$).

The retention results revealed a fair balance of statistically significant and insignificant variables among the two input variable categories (see Figure 1). For the graduation model, this balance is difficult to observe because only three statistically significant input variables were found in the fixed effects model. There were two statistically significant student entry variables and one significant organizational variable, and this finding provides support for the Berger and Milem (2000) framework being well-suited to this graduation panel model.

Just as a hypothesis test was conducted to justify the addition of time fixed effects for the retention model, the same procedure was followed for the graduation model. The test resulted in a *p*-value of less than 0.05 for prob > *F*, which indicated that time fixed effects should be included in the model. The time fixed effects are represented for the five cohorts shown in Table 12. The reference cohort is the freshmen cohort that entered

in the Fall 2001 term. Because the coefficients for the cohorts were found to be positive, the graduation rate was higher for these cohorts relative to the reference group that entered in 2001. However, since the coefficients were found to be relatively small and only three of the five cohort variables were found to be statistically significant at the 0.05 level, the time effects are believed to have had a muted impact.

A fixed effects panel model for the graduation sample was run for the two institutional control categories: public and private. The graduation file contained 1,943 public institutions and 3,752 private institutions (see Table 14).

Table 14

Graduation Fixed Effects Model Output by Institution Category

Variable	Public Coefficient	Sig.	Private Coefficient	Sig.
Percentage of part-time faculty	-0.0357		-0.0156	
Percentage of disadvantaged minority students	-0.2041	***	-0.1215	***
Percentage of in-state students	-0.0148		0.0253	
Average of 25th and 75th percentile reading SAT scores	0.0002	*	0.0002	**
Average of 25th and 75th percentile math SAT scores	-0.0002	*	0.0002	*
Percentage receiving Federal grant aid	0.0008		-0.0276	*
Average Federal grant aid per recipient (in thousands)	0.0005		-0.0019	
Full-time equivalent enrollment (in thousands)	0.0049	**	0.0065	*
Faculty to student ratio	-0.0024		0.0011	
Natural log of expenditure on instruction per FTE	0.0127		0.0009	
Natural log of expenditure on academic support per FTE	0.0426	**	0.0026	
Natural log of expenditure on student services per FTE	0.0192		0.0001	
Cohort				
Fall 2002	0.0020		0.0052	
Fall 2003	0.0103	**	0.0055	
Fall 2004	0.0098	*	0.0064	
Fall 2005	0.0099	*	0.0010	
Fall 2006	0.0121	*	0.0060	
Constant	-0.0708		0.3661	
Public: $corr(u\_i, Xb) = 0.2530$; $rho = 0.9249$; $Prob > F = 0.0000$				
Private: $corr(u\_i, Xb) = 0.6068$; $rho = 0.8615$; $Prob > F = 0.0000$				

Note. * for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

Although the coefficients are negative for the part-time faculty variable in each institution category, the part-time faculty variable remains statistically insignificant for both categories. Therefore, as similar to the case for the retention models, the variable part-time faculty was found not to be statistically significant in the model containing the entire sample and in the models limited to a single institutional control category. Figure 5 displays the kernel density plot of the part-time faculty variable by institutional control.

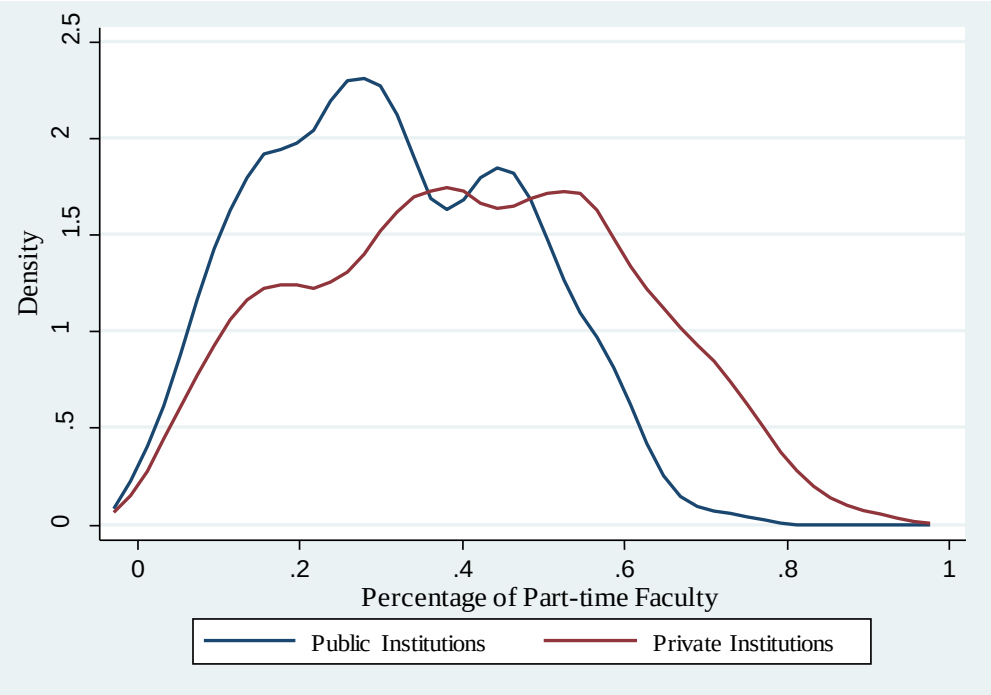

Figure 5. Kernel density plot of part-time faculty variable in graduation file by category.

This kernel density plot illustrates that part-time faculty formed a higher percentage of the faculty at the private institutions in this study. The sample of private institutions has a distribution that more clearly resembles a normal distribution as compared to the sample of public institutions.

Next, I ran a fixed effects model with an interaction term to determine if there was a difference between the impact of part-time faculty at public and private institutions (see Table 15).

Table 15

Graduation Fixed Effects Model Output with Interaction Term

Variable	Coefficient	Sig.
Interaction of part-time faculty and institutional control	-0.0090	
Percentage of part-time faculty	-0.0086	
Percentage of disadvantaged minority students	-0.1368	***
Percentage of in-state students	0.0131	
Average of 25th and 75th percentile reading SAT scores	0.0002	***
Average of 25th and 75th percentile math SAT scores	0.0001	
Percentage receiving Federal grant aid	-0.0197	
Average Federal grant aid per recipient (in thousands)	-0.0013	
Full-time equivalent enrollment (in thousands)	0.0069	***
Faculty to student ratio	-0.0004	
Natural log of expenditure on instruction per FTE	0.0182	
Natural log of expenditure on academic support per FTE	0.0156	
Natural log of expenditure on student services per FTE	0.0078	
Cohort		
Fall 2002	0.0038	
Fall 2003	0.0064	*
Fall 2004	0.0069	*
Fall 2005	0.0029	
Fall 2006	0.0070	*
Constant	0.0508	
$corr(u\_i, Xb) = 0.2365;\ rho = 0.8941;\ Prob > F = 0.0000$		

Note. * for $p < 0.05$, ** for $p < 0.01$, *** for $p < 0.001$

The interaction term between part-time faculty and institutional control was not found to be statistically significant. This indicates that the relationship between part-time faculty and graduation rates was not different based on institutional control.

Just as observed in the retention study, the variable part-time faculty was not found to be statistically significant for the overall graduation rate sample, nor was this variable significant in the models for public and private institutions. Also, the impact of part-time faculty was not found to be different between public and private institutions. But, there are some differences in the control variables between the subsample results and

the results from the entire sample. The variable with the greatest absolute coefficient value in the overall sample, percent of disadvantaged minority students, was found to have different impacts relative to institutional control. At public institutions, the graduation rate was found to decline by 20% for each point increase that an incoming cohort of freshmen was composed of students from disadvantaged minorities (beta = -0.2041, $p < 0.001$). But at private institutions, this impact was found to be less severe, with a 12% decline in the graduation rate (beta = -0.1215, $p < 0.001$). Although the variable disadvantaged minority students was found to have different degrees of impact relative to institutional control, there are two variables in these models that were found to be statistically significant for one sector and not statistically significant for the other sector. The variable expenditure on academic support was found to be statistically significant in the model of public institutions, but it was not statistically significant in the model of private institutions. Conversely, students receiving federal grant aid was not found to be significant for the model of public institutions, but was significant for the model of private institutions.

CHAPTER V

CONCLUSION

Summary of Findings

This study examined the relationship between adjunct faculty staffing and student outcomes. This topic is timely because the decades-long trend of adding part-time faculty to rosters has resulted in a faculty workforce that is half part-time and half full-time. In the face of institutional policies that favor increasing the proportion of adjuncts on faculty rosters, there is concern that adjuncts may have a negative impact on student learning and outcomes. Being that student persistence and graduation rates are suboptimal at the present time and directly result in financial and economic costs, it is critical that researchers understand if there are any negative implications for using adjuncts.

In this study, the Berger and Milem (2000) framework was used to tie student entry characteristics and organizational characteristics to student outcomes. Within this framework, panel data analysis was used to produce statistical models that fit values for student retention rates and graduation rates. Initially, I proposed to use a fixed effects model, and a random effects model was conducted as part of a robustness check. After running both models, I ran a Hausman specification test, which confirmed my proposal; that the fixed effects model was the ideal choice for this study's data set. The Hausman tests for each study, retention and graduation, indicated that the fixed effects model was the optimal choice. This result supported the guidelines offered by Dougherty (2007) and

Yaffee (2003), and was also implemented by Ehrenberg and Zhang (2005) in their model that estimated institutional graduation rates.

The central research questions that guided this study are,

1. Controlling for other institutional characteristics, do baccalaureate degree granting institutions that employ a higher proportion of adjunct faculty have lower student retention rates and graduation rates? If there is an association, to what extent does the increased proportion of adjunct faculty relate to 1-year retention and 6-year graduation rates?

2. What other institutional characteristics are significantly related to student retention rates and graduation rates?

The fixed effects panel data models for student retention rates and graduation rates indicate that the proportion of part-time faculty at an institution does not have a statistically significant impact on retention and graduation, when other input variables are controlled. The broad conclusion drawn from the literature review was that adjuncts had a negative impact on student outcomes. The results of this study suggest that the relationship between part-time faculty and student outcomes is not definitive, and researchers should continue to explore this area of research. An important distinction of this study is that it did not explore cause and effect, but rather the relationships between variables. Specifically, this study explored the relationship between adjuncts and student outcomes, and it was not intended to infer causality. There is a possibility that, in this study, unobservable factors were at play, such as adjunct experience and quality of instruction, which form the basis for causality. The finding that there was an

insignificant relationship between part-time faculty and student outcomes may mean these unobservable factors were involved. Some possible examples of unobserved factors include teaching experience and quality of instruction—variables for these two factors were not available for a national sample of institutions and hence could not be part of the models.

The models do provide insight into which characteristics are associated with retention rates and graduation rates. The proportion of disadvantaged minority students at an institution was found to have a negative impact on both graduation and retention rates. FTE has some overlap between models: An increase in FTE was found to have a positive impact on retention at private institutions and a positive impact on graduation at both private and public institutions. An increase in SAT reading scores was found to have a small positive impact on graduation, whereas an increase in SAT math scores was found to have a small positive impact on retention at public institutions. This study also reveals that incremental increases in expenditure on student services has a positive impact on retention.

When these same models are run in subsamples limited to a single institutional control category, public or private, part-time faculty remained statistically insignificant for both retention and graduation in each sector. Additionally, when an interaction term between part-time faculty and institutional control was included in the fixed effects model, this interaction term was not statistically significant for either retention or graduation. The interaction model results suggest that part-time faculty have the same effect on student outcomes at both private and public institutions. The subsample models support a significant finding that was observed in the full model—an institution's

proportion of disadvantaged minority students remains the variable with the strongest impact on student outcomes; however the subsample models show the impact has varying degrees of effect based on private versus public control.

Implications for Research

This study contributes to the literature that examined the impact of adjunct faculty on student outcomes in several ways: combining retention and graduation into a single study, using a recent data set, capturing the temporal component of institutional changes, fitting an improved conceptual model, and providing insight into other institutional characteristics. For researchers that study adjunct faculty and student outcomes, this study can create new perspectives on conceptual frameworks, input variables, and statistical analysis.

Although the student-faculty interaction framework has been the most common framework for studies linking the impact of adjunct instruction on student outcomes (Calcagno et al., 2008; Eagan & Jaeger, 2008; Jacoby, 2006; Jaeger & Eagan, 2009; Jaeger & Eagan, 2011; Jaeger & Hinz, 2009; Johnson, 2011), it was not used as the conceptual model for this study. Rather, this study employed Berger and Milem's (2000) framework as the conceptual model. The primary reason for using Berger and Milem's (2000) framework was that this study focused on characteristics of an institution, particularly the proportion of part-time faculty at institutions. Researchers that conduct future institutional characteristics studies that examine faculty and student outcomes may also benefit from using Berger and Milem's (2000) framework over alternative frameworks.

In building a list of variables for this study, I created a model that merged the variables used in Ehrenberg and Zhang's (2005) panel data study on graduation rates and Chen's (2012) institutional characteristics study. The result was a robust model that included 13 input variables. Since Ehrenberg and Zhang's (2005) study is the only similar study in the literature that used panel data, it is worth noting the similarities and differences between their model and my model. Ehrenberg and Zhang (2005) used 11 input variables. Using these 11 variables as a base in the present study, I merged these variables with some of the variables in Chen's (2012) study. This had the advantage of excluding some of the variables that were found to be statistically insignificant in Ehrenberg and Zhang's (2005) study, while using variables that were found to be statistically significant in Chen's (2012) study. Perhaps the greatest contribution from Chen's (2012) study was the inclusion of variables for institutional expenditures. Although Ehrenberg and Zhang's (2005) study did have a variable for average Pell grant amount per recipient, their model did not include any variables for institutional expenditures. Institutional expenditures are important control variables when studying student outcomes because these expenditures may serve as surrogate measures for resource allocation in instruction, academic support, and student services. Hence, future institutional characteristics studies should include expenditure variables as control variables.

Because this study uses variables from both Ehrenberg and Zhang's (2005) study and Chen's (2012) study, it is important to examine the results of these studies and understand how their results compare to the results in the present study. The key finding in Ehrenberg and Zhang's (2005) study is that increased use of part-time faculty

adversely affected student graduation rates. This impact on graduation rates was present in the overall sample of institutions and also in the subsample categories of public, private, doctoral, master's, and liberal arts institutions. This result was not corroborated in the present study, as the results indicate that the proportion of part-time faculty at an institution was not associated with a statistically significant decrease in graduation rates. The result in the present study was based on a model that included all institutions, and the subsample models that are limited to a single institutional control category. The results of the present study also differ on the variable underrepresented minority students. The graduation rate model output indicates that this variable was associated with a strong negative impact on graduation rates, whereas the model output by Ehrenberg and Zhang (2005) listed this variable as not having a statistically significant impact on graduation rates. Their results are similar to my results for SAT reading scores, as both studies found that an increase in SAT reading scores had a small positive impact on graduation rates.

Although Ehrenberg and Zhang's (2005) study and the present study have in common the use of panel data analysis, the model in the present study produced different results. This can largely be explained by the present study having a different design with an expanded model, and the use of a more recent data set. Ehrenberg and Zhang's (2005) study was published 10 years ago, so the data used in their models are somewhat dated. The first cohort for Ehrenberg and Zhang's (2005) study was the freshmen cohort entering in fall 1982, whereas the first cohort in the present study was students who entered in fall 2001. This is a large discrepancy considering how universities are structurally different between these two points in time. The average proportion of part-

time faculty in the retention file for this study was 38% (see Table 6). The same rate of 38% is listed in Table 7 for the graduation study. Although a congruous measure is not provided by Ehrenberg and Zhang (2005), one can derive an estimate based on a table that contains the percent of full-time faculty for each cohort year. For the sample period, the percent of full-time faculty was highest at 73.45% in 1986 and lowest at 68.17% in 2000 (Ehrenberg & Zhang, 2005, p.650). Based on these full-time faculty percentages, it would be reasonable to assume a 30% average as an approximate estimate for part-time faculty composition in their data set. In comparison to the data set used for the present study, with an average value of 38%, there is an argument that this topic should be explored with fresh data as part-time faculty are now a larger portion of the faculty workforce. Although not as significant as the date range, the present study has the benefit of a larger sample. Ehrenberg and Zhang (2005) had 4,966 observations for 734 institutions, whereas the graduation model of the present study had 5,695 observations for 1,119 institutions.

When taking into consideration the structural differences in the list of variables and data in the present study and comparing them to Ehrenberg and Zhang's (2005) study, it is understandable that the results of the present study do not mirror those found by Ehrenberg and Zhang (2005). Although Ehrenberg and Zhang (2005) used a national sample of 734 institutions, the IPEDS dataset used in the present study contained 52% more institutions. Another key aspect of the data set of the present study is the composition of part-time faculty. As the present study used a more recent data set, it reflected recent trends in faculty composition. The accumulation of part-time faculty at institutions could have been met with tactical responses in recruitment, training, and

engagement as guidelines have emerged for this purpose (Baron-Nixon, 2007; Lyons, 2007). For institutions that adopt such practices to better engage adjuncts, perhaps this has led adjuncts to make marginal improvements in instructional effectiveness, and this could explain why adjunct faculty were not associated with negative impacts on student outcomes. This is an important aspect of conducting research on a prominent topic—as a topic enters the spotlight, such as the expansion of adjuncts on campuses—institutions may respond with new initiatives and policy changes. For researchers, it is critical to choose the most recent data available when conducting studies that seek to understand the contemporary environment in higher education.

For the case of Chen's (2012) study, there are more parallels to the results in this study. Chen (2012) examined institutional characteristics that contributed to student dropout risk. Her study served a critical role in the formation of the list of variables for my models. The Chen (2012) study was the basis for adding institutional expenditure variables to my models. The model used by Chen (2012) revealed that the percent of part-time faculty was not significantly related to student dropout behavior. Among the institutional expenditure variables, only student services expenditure was statistically significant. The Chen (2012) study suggests that students in institutions that have higher student service expenditure levels are less likely to drop out of their first institution. Academic support expenditure and instruction expenditure were not statistically significant in Chen's (2012) study. My retention study reveals the same results as Chen's (2012) study for the part-time faculty variable and the three expenditure variables. The variable part-time faculty is not statistically significant in my retention model and the only expenditure variable that is statistically significant is expenditure on student services.

Similar to the findings in Chen's (2012) study, I found that an increase in student services expenditure is associated with higher retention rates.

In this study, only expenditure on student services was found to be significantly significant on student retention rates. The other two expenditure variables were not statistically significant in the retention study and all expenditure variables were not statistically significant in the graduation study. These results do not reduce the importance of expenditure variables having been included in my panel models because these variables served as important control variables. Researchers conducting similar studies using institutional characteristics should include expenditure variables and also explore expanding their own models. Just as I expanded the model used by Ehrenberg and Zhang (2005), researchers conducting similar studies should consider adding variables to their models based on revelations in future research studies. Additionally, new variables not previously available in national datasets will become available to researchers in the future. As an example, IPEDS may begin to collect a variable for percent of first-generation students in entering freshmen cohorts; such a variable would be relevant to a study of student outcomes. As mentioned in the limitations section of this dissertation, the teaching experience and intentions of adjunct faculty are missing from the model used in the present study due to data unavailability. If these variables become available in future data sets, new studies that incorporate these variables may reveal new perspectives in this area of research.

Perhaps the most important contribution of this study is the examination of both retention and graduation for a similar time period in a single study. Looking at these two measures gives a more detailed exploration on how adjuncts may be associated with

student outcomes. Future studies should look at both of these outcome measures in a single study. Of course, a future study does not have to be limited to examining two outcome measures, as other measures can be added.

The use of panel data analysis, although not ubiquitous in this area of higher education research, can be a useful tool for researchers to capture changes over time. Since panel data analysis captures the temporal component of a data set, researchers can incorporate institutional changes over time in their models. The change I was focused on capturing was how the proportion of part-time faculty at an institution changed over time, and how this change impacted student outcomes. A study that only captures a single point of in time, such as cross section analysis, may miss crucial changes that result in policy responses from institutions. For instance, institutions may add resources to better integrate their adjuncts, and this may result in improved student performance and outcomes. Such policy changes and the results that ensue may not be captured in data from a single point in time. An additional advantage of using panel data analysis is the increased sample size. The use of data from multiple years increases the number of cases in a study, and this increase helps build a more complete model. This particular aspect of panel data analysis could help researchers expand their number of cases for samples that prove to be too small to draw meaningful conclusions.

Although the focus of this study was part-time faculty staffing, the model used in the present study included many control variables that served as important supplementary indicators of the institutional characteristics associated with retention and graduation. Other researchers will continue to add to this area of research because the mission to

better understand how institutions can be more successful in graduating students will continue.

A final point to consider is that not all studies have found a negative relationship between percent of adjunct faculty and student outcomes. Although the literature reviewed in Chapter II suggests that adjunct faculty staffing has a negative impact on student outcomes, not every study found this impact to be statistically significant. Four of the seven retention studies found that adjunct faculty have a negative impact on student outcomes, while all four graduation studies found that adjunct faculty have a negative impact on student outcomes. The results of the present study indicate that adjunct staffing did not have a statistically significant impact on retention and graduation. The reasons offered to explain why these results differed from those of Ehrenberg and Zhang (2005) also can be used when evaluating the published literature in this area of research: different designs, different data sets, and structural changes in the proportion of adjuncts over time. A broad theme of the literature review is that earlier studies contained weaknesses that were followed by studies addressing these weaknesses. Subsequent studies offered more comprehensive reviews of the literature, clearly defined theoretical frameworks, and expanded lists of variables. This dissertation follows this trend and represents another progressive step in expanding the knowledge base for this area of research. The results of this study serve as a harbinger that more research is needed before a definitive conclusion can be drawn about whether adjuncts have a negative impact on student outcomes.

Implications for Practice

The overarching purpose of this study was to ascertain if adjunct faculty impact student retention and graduation rates in a negative way. The results of this study suggest that institutions that have a higher proportion of part-time faculty do not have a corresponding decrease in retention and graduation, controlling for other variables. This result is meaningful for university administrators who are tasked with assembling faculty rosters. Administrators have been adding more adjuncts to their faculty rosters and, therefore, have been increasing their reliance on adjuncts for instructional duties. Despite the findings of this study, anecdotes will continue to circulate on campuses claiming that adjuncts provide a lower quality educational experience to students as compared to their full-time peers. Although this study was not focused on the underlying educational experience of undergraduate students, the findings of this study suggest that part-time faculty are not the sole cause of suboptimal student outcomes.

In addition to the independent variable part-time faculty, there were additional variables that were not significant in either the retention or the graduation rate studies. These include: percent receiving federal grant aid, faculty to student ratio, natural log of expenditure on instruction per FTE, and natural log of expenditure on academic support per FTE. The variable percent of federal grant aid was not significant in either the retention or the graduation rate studies, but the variable average grant aid per recipient was statistically significant in the retention study. Because the subsample results indicate that average grant aid is only significant for private institutions, this serves as a signal to federal policymakers that increasing amounts of grant aid have an impact on student persistence in private institutions. Since the values in my model are in constant 2012

dollars, the importance of increasing grant aid budgets to outpace the rate of increase in the consumer price index is highlighted.

The faculty to student ratio variable was found to indicate that institutions with a greater number of students per faculty member did not exhibit lower retention and graduation rates. This result should not be interpreted to suggest that large increases in this ratio would not have any impact on outcomes, but, like the case with the proportion of part-time faculty, it offer some reassurance that slight increases are not associated with lower student retention and graduation. Two expenditure variables, instruction and academic support, were found not to be significant in both studies. Only student services expenditure was positively related to retention. Although considerable attention is focused on financial resources, when viewing these variables as a group it can be rationalized that finances alone are not very important in student outcomes.

There are two variables that were found to be statistically significant in both the retention and graduation studies: percentage of disadvantaged minority students and FTE. With the SAT score variables, the reading SAT score variable was found to be significant in the graduation model only, whereas the math SAT score variable was only found to be significant in the retention model. According to the panel data models, the strongest predictor for retention and graduation is the percent of disadvantaged minority students within an incoming freshmen cohort. A single percent increase in this variable corresponded to a 12% reduction in the 1-year retention rate and a 14% reduction in the 6-year graduation rate. Among the 13 independent variables in the models, none approached the magnitude of impact that disadvantaged minority status had on student

outcome measures. This confirms the large gap that persists in outcomes among different racial and ethnic groups.

As FTE increases, retention rates increase for private institutions. For graduation rates, an increase in FTE was found to be associated with higher graduation rates for both private and public institutions. This result was also found in graduation studies by Ryan (2004) and Scott, Bailey, and Kienzl (2006). Ryan (2004) suggested that this result might have been due to economies of scale; larger institutions are able use expenditures more efficiently, spending less on a per-student basis. Ryan (2004) also suggested that larger institutions may offer a better variety and higher level of academic and support services that enhance persistence and degree completion. The finding in the present study that institution size has a positive impact on graduation can offer reassurances to administrators at larger institutions, especially state flagship institutions, which are among the largest institutions, that their large size has some advantages in providing beneficial resources to students. And for institutions that strategically aspire to increase enrollment, this finding provides support that there are benefits to growth.

Freshmen applicants, parents, and administrators are often fixated on standardized test scores. The results of the present study indicate that standardized test scores are associated with a positive impact on outcomes, but the impact is very small. This should serve as a reminder that standardized test scores should not be the only consideration when evaluating an incoming cohort of freshmen.

To summarize, although this study did not find a significant relationship between adjunct faculty and student outcomes, this does not mean that institutions should

overlook this growing group. Institutions should strive to engage and support their adjunct faculty, but the results of this study confirm that helping underrepresented minority students is an area of greater need. Administrators and policymakers should continue to expand resources that assist these students, so they can attain successful completion of their studies. As explained in Chapter I, subpar outcomes result in a direct financial and economic impairment to students and their families, and to the local, state, and federal governments that make contributions to students, institutions and the higher education system. If administrators and policymakers use results from academic studies such as this dissertation to make data-driven policy decisions, perhaps the tide can be reversed and national retention and graduation rates will improve. Such an improvement in student outcomes serves to benefit all constituents in our society.

Suggestions for Future Research

There are several ways this field of research can be improved: a study of 2-year institutions, a study of tenure-ineligible faculty and graduate teaching assistants, the modelling of 4-year and 5-year graduation rates, expanded institutional expenditure variables, using other outcome measures, and qualitative research.

This study only included institutions that grant baccalaureate degrees. A future study could use the model in this study to examine outcomes at community colleges. In the literature review, there were three studies that used data from community colleges (Calcagno et al., 2008; Jacoby, 2006; Jaeger & Eagan, 2009). A future study could use 1-year retention, transfer to a 4-year institution, or associate degree completion rates as dependent variables.

The variable in this study that was of the greatest interest, percent of part-time faculty, was derived by dividing the count of part-time faculty at an institution by the count of total faculty at that institution. There is another faculty group that can be explored in a future study; full-time faculty that are not on a tenure track. Like adjuncts, this group forms a significant portion of the faculty workforce. For the 1,164 institutions in the present retention study, in the Fall 2011 semester these institutions reported that, on average, 30.2% of their full-time faculty were not on a tenure-track. Ehrenberg and Zhang (2005) included a variable for full-time faculty that are not on tenure-track in their model. For the present study, I did not include this as a variable because this study centered on studying part-time faculty. A future study could mirror the model developed in this study, but substitute the part-time faculty variable with the proportion of total faculty that are tenure-ineligible.

Graduate teaching assistants represent another part of the instructional workforce that could be incorporated as a variable in a future study. Because the use of graduate teaching assistants varies according to institutional control and size, a future study could focus on specific Carnegie classifications. For example, studying the impact of graduate teaching assistants may be most relevant for a study of large, public, research-intensive institutions.

For my graduation rate study, I used the 6-year baccalaureate graduation rate. A future study could consider modeling the 4-year and 5-year graduation rates. Although these outcome measures may be used less frequently as benchmarks, as compared to the ubiquitous 6-year graduation rate, the 4-year and 5-year graduation rates are available through IPEDS.

The models used in the present study included three variables for institutional expenditures: instruction, academic support, and student services expenditures. These variables are based on Chen's (2012) study of student dropout risk and are supported by prior studies and theories. It could be argued that increasing administrative spending is related to a rise in adjunct staffing which results in lower student persistence. Although there is no theoretical or empirical evidence to support that a linkage exists between administration spending and student persistence, it could be explored in a future study using structural equation modeling (SEM). A future study could employ SEM to evaluate if there is a relationship among student persistence, administrative spending and part-time faculty staffing.

In the present study, I chose to model retention and graduation as outcome measures. Although these two outcome measures are omnipresent in academic studies, a future study can evaluate other outcome measures. For example, Umbach (2007) studied the impact of adjunct faculty on undergraduate education by measuring faculty effectiveness. Faculty effectiveness was defined as faculty behaviors that engaged students in good practices. Umbach (2007) found that, in general, contingent status is negatively related to faculty job performance. This study revealed some eye-opening observations; for instance, contingent faculty underperform in their delivery of instruction and they interact with students less frequently (Umbach, 2007). Another example is the study from Bettinger and Long (2010). Bettinger and Long (2010) used longitudinal data from students who began at a public college in Ohio and measured the impact of using adjunct instructors on student outcomes. Bettinger and Long (2010) used subsequent course enrollments and choice of major as student outcomes. An example of

their findings is that in areas where vocational experience is beneficial to the academic area, adjuncts could increase the students' interest in the subject as shown by students' taking more credits in that subject area throughout their schooling. The measures that Bettinger and Long (2010) used, subsequent course enrollments and choice of major, are legitimate student outcomes but are not omnipresent in this body of research on adjunct faculty. A future study could incorporate or center on such alternative outcome measures to examine the impact adjunct staffing may have on students.

Although the present study and literature review were focused on quantitative studies, there are possibilities for qualitative studies in this area. In Chapter I, I referenced the qualitative study by Cotten and Wilson (2006). In order to explore the frequency and dynamics of student-faculty interaction, Cotten and Wilson (2006) used nine focus groups of undergraduate students that were conducted for between 1 and 2 hours. Although the study was focused on student-faculty interactions, the issue of part-time faculty surfaced in the focus groups. One student had this to say: "It's hard to even get a higher education feeling at [this university]. The bottom line is there are not enough full-time professors" (Cotten & Wilson, 2006, p. 504). Here is another salient quote from the study: "Where are they? They're not here. I don't think I have a professor this semester that's full-time faculty; they're all part-time. They show up, teach a class, then run away as soon as they can" (Cotten & Wilson, 2006, p. 504). Cotten and Wilson (2006) pointed out that student perception of part-time faculty use has implications for faculty availability and faculty campus presence. This is an attention-grabbing observation and serves as a reminder that qualitative research can offer insight into exploring the implications of using adjunct faculty.

The options for a future qualitative study in this area of research are virtually unlimited. One approach would be to directly interview adjuncts, which was done in a qualitative study by Dolan (2011). Dolan (2011) examined the experiences of 28 adjuncts to understand their motivation, and how it impacted the quality of their instruction in the classroom. In addition to interviewing adjuncts, a future qualitative study could also include survey data from full-time faculty and students. Allison-Jones and Hirt (2004) surveyed 538 students, 3 full-time faculty and 14 part-time faculty to compare the teaching effectiveness of part-time and full-time clinical nursing faculty. The study by Allison-Jones and Hirt (2004) gathered data from three separate constituencies, but a future qualitative study does not need to be limited to students and faculty, as administrators could also be included.

In conclusion, adjuncts have become a mainstay at American colleges and universities. The increasing reliance on adjuncts for instructional needs has been building for decades, and this trend will likely continue into the future. The question of whether adjuncts have a negative impact on student learning and outcomes will persist, both as anecdote and academic inquiry. This study will likely be followed by other studies that will seek to better understand how adjuncts impact students' experiences. As explained in Chapter I, subpar student outcomes result in a direct financial and economic impairment to students and their families, and to the local, state, and federal governments that make contributions to students, institutions and the higher education system. If administrators and policymakers use results from academic studies such as this dissertation to make data-driven policy decisions, perhaps the tide can be reversed and

national retention and graduation rates will improve. Such an improvement in student outcomes serves to benefit all constituents in our society.

REFERENCES

Allison-Jones, L. L., & Hirt, J. B. (2004). Comparing the teaching effectiveness of part-time & full-time clinical nurse faculty. *Nursing Education Perspectives, 25*(5), 238-243.

Baron-Nixon, L. (2007). *Connecting non full-time faculty to institutional mission: A guidebook for college/university administrators and faculty developers*. Sterling, VA: Stylus Publishing.

Bean, J. P. (1983). The application of a model of turnover in work organizations to the student attrition process. *Review of Higher Education, 6*(2), 129-148.

Bean, J. P. (1990). Why students leave: Insights from research. In D. Hossler, & J. P. Bean (Eds.), *The strategic management of college enrollments (pp. 147-169)*. San Francisco, CA: Jossey-Bass.

Benjamin, E. (2002). How over-reliance on contingent appointments diminishes faculty involvement in student learning. *Peer Review, 5*(1), 4-10.

Berger, J. B., & Milem, J. F. (2000). Organizational behavior in higher education and student outcomes. In J. C. Smart (Ed.), *Higher education: Handbook of theory and research* (Volume XV, pp. 268-338). New York: Springer.

Bettinger, E. P., & Long, B. T. (2010). Does cheaper mean better? The impact of using adjunct instructors on student outcomes. *Review of Economics and Statistics, 92*(3), 598-613.

Bureau of Labor Statistics (2014). CPI inflation calculator. Retrieved from http://www.bls.gov/data/inflation_calculator.htm

Calcagno, J. C., Bailey, T., Jenkins, D., Kienzl, G., & Leinbach, T. (2008). Community college student success: What institutional characteristics make a difference? *Economics of Education Review, 27*(6), 632-645. doi:10.1016/j.econedurev.2007.07.003

Carnegie Foundation for the Advancement of Teaching (2001). *The carnegie classification of institutions of higher education,* 2000 edition. Menlo Park, CA: Author.

Cataldi, E. F., Bradburn, E. M., & Fahimi, M. (2005). *2004 National study of postsecondary faculty (NSOPF:04): Background characteristics, work activities, and compensation of instructional faculty and staff: Fall 2003.* (No. NCES 2006-176). Washington, DC: U.S. Department of Education.

Chen, R. (2012). Institutional characteristics and college student dropout risks: A multilevel event history analysis. *Research in Higher Education, 53*(5), 487-505. doi:10.1007/s11162-011-9241-4

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. doi:10.1007/s11162-007-9060-9

Christensen, C. (2008). The employment of part-time faculty at community colleges. *New Directions for Higher Education, 143,* 29-36.

Cohen, A. M., & Brawer, F. B. (2003). *The American community college* (4th ed.). San Francisco, CA: Jossey-Bass.

Cotten, S., & Wilson, B. (2006). Student–faculty interactions: Dynamics and determinants. *Higher Education, 51*(4), 487-519. doi:10.1007/s10734-004-1705-4

Dolan, V. (2011). The isolation of online adjunct faculty and its impact on their performance. *International Review of Research in Open and Distance Learning, 12*(2), 62-77.

Dougherty, C. (2007). *Introduction to econometrics* (3rd ed.). Oxford, United Kingdom: Oxford University Press.

Eagan, M. K., & Jaeger, A. J. (2008). Closing the gate: Part-time faculty instruction in gatekeeper courses and first-year persistence. *New Directions for Teaching and Learning, 2008*(115), 39-53. doi:10.1002/tl.324

Ehrenberg, R. G., & Zhang, L. (2005). Do tenured and tenure-track faculty matter? *Journal of Human Resources, 40*(3), 647-659. doi:10.3368/jhr.XL.3.647

Figlio, D. N., Schapiro, M. O., & Soter, K. B. (2013). *Are tenure track professors better teachers?* (National Bureau of Economic Research Working Paper No. 19406). doi:10.3386/w19406

Finkin, M. W. (2000). The campaign against tenure. *Academe, 86*(3), 20-21.

Gappa, J., & Leslie, D. (1993). *The invisible faculty: Improving the status of part-timers in higher education*. San Francisco, CA: Jossey-Bass.

Gujarati, D. N. (2003). *Basic econometrics* (4th ed.). New York: McGraw Hill.

Hoachlander, G., Sikora, A. C., & Horn, L. (2003). *Goals, academic preparation, and outcomes* (No. NCES 2003–164). Washington, DC: U.S. Government Printing Office.

Jacoby, D. (2006). Effects of part-time faculty employment on community college graduation rates. *The Journal of Higher Education, 77*(6), 1081-1103.

Jaeger, A. J., & Eagan, M. K. (2009). Unintended consequences: Examining the effect of part-time faculty members on associate's degree completion. *Community College Review, 36*(3), 167-194. doi:10.1177/0091552108327070

Jaeger, A. J., & Eagan, M. K. (2011). Examining retention and contingent faculty use in a state system of public higher education. *Educational Policy, 25*(3), 507-537. doi:10.1177/0895904810361723

Jaeger, A. J., & Hinz, D. (2009). The effects of part-time faculty on first semester freshmen retention: A predictive model using logistic regression. *Journal of College Student Retention: Research, Theory and Practice, 10*(3), 265-286.

Johnson, I. Y. (2011). Contingent instructors and student outcomes: An artifact or a fact? *Research in Higher Education, 52*(8), 761-785. doi:10.1007/s11162-011-9219-2

Johnson, N. (2012). *The institutional costs of student attrition*. Washington, DC: American Institutes for Research.

Kennedy, P. (1998). *A guide to econometrics* (4th ed.). Cambridge, MA: The MIT Press.

Lyons, R. E. (Ed.). (2007). *Best practices for supporting adjunct faculty* (1st ed.). San Francisco, CA: Jossey-Bass.

Monks, J. (2009). Who are the part-time faculty? *Academe, 95*(4), 33.

National Center for Education Statistics (2012). IPEDS glossary. Retrieved from http://nces.ed.gov/ipeds/glossary/

National Center for Education Statistics (2013a). About IPEDS. Retrieved from http://nces.ed.gov/ipeds/about/

National Center for Education Statistics (2013b). Advance release of selected 2012 digest tables. Retrieved from http://nces.ed.gov/programs/digest/d12/tables_3.asp

Park, H. M. (2009). *Linear regression models for panel data using SAS, stata, LIMDEP, and SPSS.* Bloomington, IN: The University Information Technology Services (UITS) Center for Statistical and Mathematical Computing, Indiana University.

Ronco, S., & Cahill, J. (2006). Does it matter who's in the classroom? Effect of instructor type on student retention, achievement and satisfaction. *AIR Professional File, 100,* 1-12.

Ryan, J. F. (2004). The relationship between institutional expenditures and degree attainment at baccalaureate colleges. *Research in Higher Education, 45*(2), 97-114.

Schibik, T., & Harrington, C. (2004). Caveat emptor: Is there a relationship between part-time faculty utilization and student learning outcomes and retention? *AIR Professional File, 91,* 1-6.

Schneider, M. (2010). *Finishing the first lap: The cost of first-year student attrition in America's four-year colleges and universities.* Washington, DC: American Institutes for Research.

Schneider, M., & Yin, L. (2011). *The high cost of low graduation rates: How much does dropping out of college really cost?* Washington, DC: American Institutes for Research.

Schuster, J. H., & Finkelstein, M. J. (2006). *The American faculty: The restructuring of academic work and careers.* Baltimore, MD: Johns Hopkins University Press.

Scott, M., Bailey, T., & Kienzl, G. (2006). Relative success? Determinants of college graduation rates in public and private colleges in the U.S. *Research in Higher Education, 47*(3), 249-279. doi:10.1007/s11162-005-9388-y

Snyder, T. D., & Dillow, S. A. (2012). *Digest of education statistics 2011.* (No. NCES 2012-001). Washington, DC: U.S. Government Printing Office.

Thedwall, K. (2008). Nontenure-track faculty: Rising numbers, lost opportunities. *New Directions for Higher Education, 143,* 11-19.

Thompson, K. (2003). Contingent faculty and student learning: Welcome to the strativersity. *New Directions for Higher Education, 2003*(123), 41-47. doi:10.1002/he.119

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45*(1), 89-125. doi:10.3102/00346543045001089

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition.* Chicago, IL: University of Chicago Press.

Titus, M. A. (2004). An examination of the influence of institutional context on student persistence at 4-year colleges and universities: A multilevel approach. *Research in Higher Education, 45*(7), 673-699.

Titus, M. A. (2006). 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. doi:10.1007/s11162-005-9000-5

Umbach, P. D. (2007). How effective are they? Exploring the impact of contingent faculty on undergraduate education. *The Review of Higher Education, 30*(2), 91-123.

Yaffee, R. (2003). A primer for panel data analysis. Retrieved from http://www.nyu.edu/its/pubs/connect/fall03/yaffee_primer.html

Zhang, L. (2010). The use of panel data models in higher education policy studies. In J. C. Smart (Ed.), *Higher education: Handbook of theory and research* (pp. 307-349). Netherlands: Springer. doi:10.1007/978-90-481-8598-6_8

Zhang, L., & Ness, E. C. (2010). Does state merit-based aid stem brain drain? *Educational Evaluation and Policy Analysis, 32*(2), 143-165. doi:10.3102/0162373709359683