Analysis of the Effects of Faculty Composition on Graduation and Retention Rates

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ABSTRACT

Institutions of higher education continuously look for factors that could impact a student's chance of graduating. Among many possible variables, research suggests that student engagement has a positive effect on student success (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Tinto 1993, Tinto 2012). One of those important factors is the interaction that occurs between faculty and students inside and outside of the classroom (Kuh et al., 2008; Mayhew, Pascarella, & Terenzini, 2016; Pascarella & Terenzini, 1979; Tinto, 2012). This study explores the possibility that full-time faculty are better suited to strengthen those relationships than instructors that are hired on a part-time basis.

Using data collected by the Department of Education through the Integrated Postsecondary Education Data System (IPEDS), this study evaluated data from 1,005 degree-granting institutions from 2006 to 2012 to determine if there was a relationship between the ratio of part-time to full-time faculty and retention and graduation rates. The methods used in this study include a preliminary review that provided relevant information about the variables used. Additionally, correlation analysis and a review of the time series plots was conducted. Finally, two regression analysis models were developed using retention and graduation rates as dependent variables, the ratio of part-time to full-time faculty per 100 Full-Time-Equivalent (FTE) and the number of full-time faculty per 100 FTE as independent variables, plus a series of control variables.

The results of the study revealed a positive relationship between the number of full-time faculty per 100 FTE and both retention and graduation rates, and a negative relationship between the ratio of part-time to full-time faculty per 100 FTE and retention and graduation rates.

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Chapter 1

INTRODUCTION

In the past, higher education institutions were satisfied with opening their doors to large numbers of students, while recognizing that some of them would not make it to graduation. Lack of academic preparedness for unanticipated levels of rigor have been widely used as the explanation for students who started college but were unable to finish. With greater accountability in higher education during this era of data-driven financing, institutions have begun to assess and improve areas that significantly affect a students' probability to graduate. Although students should take ownership of their academic progress, institutions are recognizing their role in providing an environment conducive to student success. This realization has put into question many of the processes and procedures that have permeated higher education for years, calling for an evaluation of whether a better approach could have a significant impact on student outcomes.

Recently, many initiatives have emerged to address these pressing issues. For instance, a general concern with the effectiveness of remedial education has resulted in the development of new approaches to increase its success. Programs that accelerate the completion of gateway courses in both mathematics and English have been implemented in many institutions and adopted statewide in some cases (Belfield, Jenkins, & Lahr, 2016; Jaggars, Hodara, Cho, & Xu, 2015; Jones, 2015; Tinto 2012; Venezia & Hughes, 2013). Efforts to promote on-time graduation have also emerged strongly. The pace at which students earn credits, particularly during their first year is highly related to

graduation rates (Attewell, Heil, & Reisel, 2012; Attewell & Monaghan, 2016; Crosta 2014). To ensure timely progression, programs such as University of Hawaii's 15-to-finish, and other similar campaigns have been established to encourage students to enroll in 15 credit hours per term in order to graduate on time (Emrey-Arras, 2014; Jones, 2015; Klempin, 2014; Scott-Clayton, 2011). Additionally, institutions have also explored improvements in advisement. Among those, several universities have implemented the use of degree pathways, which provide a specific sequence of courses that students should follow to facilitate their progress towards graduation (Bailey, Jaggars, & Jenkins, 2015a; Bailey, Jaggars, & Jenkins, 2015b; Jenkins & Cho, 2013).

The majority of the initiatives that seem to be positively impacting retention and graduation rates can generally be traced back to improvements in student engagement. Basically, in one way or another, these approaches require advisors, faculty members, and even administrators to spend more time with students inside and outside of the classroom. Even though institutions have not found a single issue that accounts for low retention or low graduation rates, research shows that engaging students generally results in better assimilation to the institution. As Tinto (1975) noted in his model of retention, "other things being equal, the higher the degree of integration of the individual into the college systems, the greater will be his commitment to the specific institution and to the goal of college completion" (p. 96).

Therefore, it is important to look at faculty members as a crucial factor in the integration process. Although faculty members are in the best position to interact with students to improve their engagement and assimilation to the institution, not enough attention seems to be given to the role that part-time faculty play on the students'

experience. According to Pascarella (1980), based on his analysis of the literature, the amount of contact outside of the classroom positively affects satisfaction with the institution, one-year retention rates, and other relevant outcomes. These engagements may be particularly important during the first year when students are still transitioning to a college environment. At 4-year institutions, only about 80% of the first-time, full-time students who started in fall of 2012 returned for their second year, while 61% did so at 2-year colleges (Kena, Hussar, McFarland, de Brey, Musu-Gillette & Wang, 2016). Those retention figures indicate that it is critical to determine whether institutions are engaging the right types of faculty to educate students during the crucial first semesters of their college careers.

In recent years, higher education in the United States has seen a dramatic rise in the use of part-time faculty. In 1993, part-time faculty accounted for 40% of the total faculty, increasing to 49% by 2013 (Kena et al., 2016). A statement from the American Association of University Professors (2003) offered an explanation for the nature of this transition. They argued that decreases in budgets during the 80s and 90s, coupled with increased enrollments resulted in institutions investing more in infrastructure and technology at the expense of faculty development and hiring. Institutions were forced to balance such expenditures by hiring part-time faculty.

These dramatic changes in the composition of the faculty may have had adverse consequences for student outcomes. Unfortunately, due to such facts as skillset and availability, it is more likely that part-time faculty are tasked with teaching first- and second-year courses. Although colleges and universities may see such allocations as a cost-saving solution for the institution, it is still unclear whether this approach is hurting

the students' chance of success. Regrettably, part-time faculty often lack the same resources offered to full-time faculty. For instance, Meixner, Kruck, and Madden (2010) found that some part-time faculty did not attend a regular orientation. They may not have a private office (American Association of University Professors, 2003; Christensen, 2008; Eagan, Jaeger, & Grantham, 2015). They may not feel respected by their colleagues (Eagan et al., 2015; Meixner et al., 2010). Furthermore, their lack of involvement in general institutional matters may significantly affect the efficacy of their instruction. As Elman (2003) noted, the fact that part-time faculty lack participation in departmental and curricular decisions influences their effectiveness first by affecting their satisfaction, but also by preventing the discussion that such participation could generate. Additionally, even part-time faculty who are committed to the institution often spend less time on campus when compared to their full-time counterparts simply due to their condition of part-time employment.

It is important then to determine if an institutional decision to use part-time faculty could have a negative relationship with retention and graduation rates. If this is the case, it may be in the institution's best interest to develop policies that ensure greater participation of part-time faculty in academic matters or, if possible, the replacement of part-time faculty with more full-time faculty lines in the long run.

This analysis used national data collected by the Department of Education. The Higher Education Act of 1965, as amended, requires institutions of higher education receiving federal financial aid to report institutional data to the U.S. Department of Education through the submission of the Integrated Postsecondary Education Data system (IPEDS) surveys. The Delta Cost Project Database was created to assist researchers in the

analysis of the large amounts of data collected through the IPEDS surveys. This database contains items from the IPEDS surveys on finance, enrollment, human resources, completion, and financial aid (American Institute for Research [AIR], 2016). The purpose of this study was to analyze data collected through IPEDS and available in the Delta Cost Project Database to determine if a relationship exists between the ratio of part-time to full-time faculty and retention and graduation rates. Such analysis could help institutions make wiser faculty hiring allocations.

The results from this study have the potential to provide information to aid institutions in reaching a full-time/part-time faculty ratio that is appropriate to affect retention and graduation rates positively. A review of the literature indicates that most studies of this kind are institutional in nature; therefore, their findings may be unique to the characteristics of the individual institution. In contrast, this study looks to determine if those relationships exist at the macrolevel by including all institutions that reported the variables in question through the IPEDS surveys. It is clear that there is no silver bullet for the retention and graduation rates conundrum; however, recommendations derived from this analysis, as well as future research, may yield possible solutions that could move the needle in the right direction.

The next chapter provides a look at the literature on the subject, including literature on the benefits of a college degree, research on low retention and graduation rates and a detailed look at previous research on part-time faculty. Additionally, Chapter 2 provides a theoretical framework for this analysis. Chapter 3 discusses the methodology used in this study, followed by the results included in Chapter 4. Finally, Chapter 5 provides recommendations and next steps.

Chapter 2

LITERATURE REVIEW

Benefits of a College Degree

For many individuals, postsecondary education is simply the next phase in a series of educational achievements. For others, it represents the only avenue to move up the socioeconomic ladder. Either way, obtaining a postsecondary degree has several benefits not only for students but also for their families and ultimately for society. First, although estimates vary, there is a consensus about the effects of holding a college degree versus a high school diploma. Abel and Deitz (2014) for instance, found that "over the past four decades, those with a bachelor's degree have tended to earn 56 percent more than high school graduates while those with an associate's degree have tended to earn 21 percent more than high school graduates" (p. 3). Although the percentage varies, Carnevale, Rose, and Cheah (2011) also found a difference between earnings based on academic achievement. Their estimates indicate that individuals with a baccalaureate degree earn on average 31% more than associate's degree holders, with the percentage increasing to 74% when compared to high school graduates.

Aside from the financial gains at the individual level, obtaining a postsecondary degree has a positive effect in several areas that could be used as a proxy for quality of life. According to a report by the College Board, college graduates are more likely to have health insurance and receive benefits, are less likely to be obese, are more likely to move up socioeconomically, and are more likely to be employed (Baum, Ma, & Payea,

2013). Lower crime rates seem to be related to higher educational attainment as well. Lochner and Moretti (2004) used U.S. census data to analyze the effects of education on incarceration rates. They found that "an additional year of schooling reduces the probability of incarceration by about 0.1 percentage points for whites and 0.4 percentage points for blacks" (p. 171). But higher educational attainment also has significant health benefits. Trostel (2015) found several studies that indicated that college graduates tend to be happier, whereas Hummer and Hernandez (2013) found that college graduates enjoy better life expectancy.

Therefore, it appears that fostering environments where obtaining a college education is a feasible undertaking is in the country's best interest. This is the case not only for the well-being of its individual citizens but also to cultivate economic development from a macroeconomic perspective. Research suggests that ensuring that more individuals obtain a postsecondary degree is simply imperative to maintaining a leading role as a nation from a global perspective. According to the National Center for Education Statistics, "In 2015, some 36 percent of 25- to 29-year-olds had attained a bachelor's or higher degree" (Kena et al., 2016, p. 36). In contrast, a 2010 report by the Georgetown University Center on Education and the Workforce forecasted that by 2018 about 63% of the estimated 46.8 million job openings would require some type of college credential (Carnevale, Smith, & Strohl, 2010). This alarming figure has been a staple of the college completion agenda heavily supported by the Obama Administration, which established a goal of reaching the highest proportion of college graduates in the world by 2020 (Schneider & Yin, 2011). Estimates indicated that achieving such completion rates by the year 2025 could result in an increase in revenue of around $800 billion (Crellin,

Kelly, & Prince 2012). Private organizations such as the Lumina Foundation, the Bill and Melinda Gates Foundation and Complete College America have recognized the importance of the completion agenda, and are heavily invested in promoting college completion.

Low Retention and Graduation Rates

Even though the completion agenda has received lots of attention, graduation rates remain relatively low. At 4-year institutions for first-time, full-time undergraduate students who started college during the fall of 2008, graduation rates were about 60% and around 28% at 2-year institutions for first-time, full-time undergraduate students who started college during the fall of 2011 (Kena et al., 2016). Although many colleges and universities across the country have developed initiatives that positively impact both retention and graduation rates, many individuals who start college do not graduate on time, and many others leave their institutions without earning a credential. A recent report from the National Student Clearinghouse Research Center found that 33% of students who started college as first-time freshmen during fall 2009 had not graduated and were no longer enrolled in any institution 6 years later (Shapiro, Dunda, Huie, Wakhungu, Yuan, & Nathan, 2015).

Just as graduating from college has benefits, failing to graduate has significant negative consequences. First, attending college has a substantial price tag. Students often rely heavily on student loans, and unfortunately many of them are unable to repay them. According to the U.S. Department of Education (2016a), the "FY 2013 national cohort default rate is 11.3 percent." The problem exacerbates as students extend their enrollment. According to a report from Complete College America (2014), an extra year

of college costs about $3,000 at 2-year institutions, and about $9,000 at 4-year institutions.

In addition to direct expenditures in tuition and fees, an extra year of college equates to lost wages, which in 2013 were estimated at $35,000 for associate degree holders and $45,000 for 4-year degree holders (Complete College America, 2014). Even worse, many students who decide to drop out do so after incurring substantial debt without receiving the financial benefits of attaining a degree. According to a report from the Education Policy Center at AIR, "from 2001 to 2009, the percentage of students who borrowed to finance college increased from 47 percent to 53 percent" (Nguyen, 2012, p. 1). The same report indicated that in 2001 of those who borrowed, 23% had dropped out, while the percentage increased to 29% in 2009.

For those students who start but do not get to the finish line, the financial losses are greater. Not only do they give up regular earnings while attending college, but many of them do so while relying on student loans that must be repaid once the student stops attending college. In a 2011 report by AIR, Schneider and Yin (2011) calculated the financial losses of students who started college but did not graduate for the 2002–2003 cohort of students. First, they estimated the losses on the first-year to be about $566 million in federal tax, and $164 million in state income tax. As they noted, although the figure is grim, it only reveals a small part of the problem. The earnings differential between students who graduate and those that do not persists longer than one year. To provide a better estimate, they conducted a present value analysis of the losses and estimated it at "$158 billion in lost income; $32 billion in lost federal income tax

payments; and $7 billion in lost state income tax payments" (Schneider & Yin, 2011, p. 5).

Predictors of College Retention and Graduation Rates: Theoretical Linkages

Pressures from the public focus on the completion agenda and the issues previously discussed regarding student loans and the debt crisis have forced higher education institutions to place greater emphasis on retention and graduation initiatives. The challenge is major considering that the goal is to maintain academic rigor while developing an environment that fosters engagement with students to ensure their retention in the institution.

The theoretical framework for this analysis is based on Tinto's theory of dropout, which has its roots in Van Gennep's rites of passage as well as Durkheim's theory of suicide. First, Tinto (1993) looked at Van Gennep's anthropological study "The Rites of Passage," which discussed the different stages that an individual experiences when moving from various stages of life, particularly from adolescence into adulthood (Tinto 1993). "In that movement, the individual or group leaves an old territory or community (separation), in some fashion crosses a border, whether it be physical or ceremonial, to a new setting (transition), and takes up residence in the new location or community (incorporation)" (Tinto 1993, p. 93). Such movement can be accompanied by feelings of inadequacy, when an individual has left their belief system but has not fully adopted the new guiding principles of the new community, which in some cases leads to departure before the incorporation phase (Tinto 1993). Tinto argued that college attendance can be seen through the same lens, as it reflects a movement to a new community that requires a separation from the previous one, a transition period, as well as opportunities for

incorporation. When incorporation does not happen, "many will eventually leave the institution because they have been unable to establish satisfying intellectual and social membership" (Tinto 1993, p. 99).

Although Van Gennep's theory could be used to understand part of the departure behavior of students, it is not sufficient to explain the process of incorporation. Tinto (1975) used Durkheim's theory of suicide to try to account for this part of the process. According to Durkheim, "The likelihood of suicide in society increases when two types of integration are lacking–namely, insufficient moral (value) integration and insufficient collective affiliation" (Tinto 1975, p. 91). Tinto (1993) argued that using this analogy does not equate departure from higher education to any form of suicide. Instead, he posited that the comparison relies on the fact that in both situations individuals decide to leave their groups, an indication of the mismatch between the values of the person and those of the group.

Colleges, Tinto (1993) argued, can be seen as communities comprising both academic and social systems. Given those unique sets of systems, integration or lack thereof may occur in each or both systems. Individuals may be highly integrated academically, but depart due to issues specifically related to their social systems. On the other hand, many students seem to fit well socially, but succumb to the highly rigorous academic requirements of the institution (Tinto 1993).

Tinto (1993) argued that in the development of these both systems, interaction between faculty, staff, and students plays a crucial role. First, it is through such relationships that students develop socially and academically. Secondly, the interactions with faculty inside and outside of the classroom help students determine whether there is

compatibility between their values and those of the institution. And thirdly, the level, frequency, and quality of such interactions particularly with faculty and staff also signal the degree of dedication the organization presents towards the student. As Tinto noted, such contacts may have an effect on how the student perceives the institution regarding its focus on student success. He explained that the lack of interaction may result in less commitment from the individual to the school, but it may also allow the development of values and behaviors that grow apart from those of the institution, thus separating the student further from the academic systems. The recognition that integration and engagement are crucial to improving student outcomes has led many institutions to develop initiatives that focus on increasing one-on-one contact with students.

Empirical Studies

Several studies have demonstrated that social and academic interactions with faculty are linked to greater retention rates (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Pascarella & Terenzini, 1979; Tinto, 2012). Pascarella and Terenzini (1979) analyzed the behavior and characteristics of 528 first-year students enrolled at Syracuse University based on their answers to surveys conducted before their arrival to campus and during their first term. They found that interaction with faculty outside of the classroom had a significant positive relationship with persistence after the first year, even after controlling for other variables such as race, SAT scores, and other characteristics collected before their enrollment (Pascarella & Terenzini, 1979).

Komarraju, Musulkin, and Bhattacharya (2010) surveyed 242 first-year students at one university to determine which aspects of their interaction and engagement with faculty had an impact on specific academic factors such as self-concept, motivation, and

general academic performance. They determined that "students who perceive their faculty members as being approachable, respectful, and available for frequent interactions outside the classroom are more likely to report being confident of their academic skills and being motivated, both intrinsically and extrinsically" (p. 339). Although this particular study did not link faculty engagement with retention and graduation rates directly, it corroborates the importance of those relationships for characteristics that do affect retention and graduation such as motivation and self-confidence.

Cox (2011) argued that social interactions outside of the classroom in less formal atmospheres help students to see faculty as less intimidating. He noted that "seeing a professor in these alternate settings helps to narrow the gap often implicit in the hierarchy associated with students learning from a professor in the classroom" (p. 62). Micari and Pazos (2012) found a positive relationship between a student's final grade and the student's perception of a positive relationship with the faculty member. They defined positive relationships as "looking up to the professor, feeling comfortable approaching the professor, and feeling that the professor respects the students" (p. 45). Similarly, Woodside, Wong, and Wiest (1999) found a relationship between a faculty member's verbal and nonverbal behavior such as smiling or using humor and students' self-reported academic achievement.

Lundberg (2014) found similar results through a different method. She used results from the Community College Student Experiences Questionnaire for 239 students to determine if student interaction with faculty among other variables had any impact on the students' self-reported level of learning in five categories: general education, intellectual skills, science and technology, personal development, and career preparation.

Her results indicated that student interaction with faculty was the strongest variable for each category.

Kim, Chang, and Park (2009) analyzed the effect of faculty interaction specifically for Asian American students. Using a national sample of 21,559 students who participated in a series of surveys administered between 1994 and 1998 by Cooperative Institutional Research Program, they found that Asian American students interact less frequent with faculty compared to other races. Although the level and frequency of those interactions was lower than that other races, they found that such interactions positively affected students' learning outcomes such as GPA and academic satisfaction among others.

Similarly, Lundberg and Schreiner (2004) analyzed the responses of 4,501 students who took the College Student Experiences Questionnaire from 1998 to 2001. Their goal was to determine if there were differences in the interactions of faculty and students from different racial backgrounds, as well as whether those interactions could predict the difference in learning by ethnic group. In line with other researchers, they found that "satisfying relationships with faculty members and frequent interactions with faculty members, especially those that encourage students to work harder, were strong predictors of learning for every racial group" (p. 559).

Beattie and Thiele (2016) conducted interesting research looking to answer two questions: first, whether large class sizes resulted in fewer interactions with both faculty and classmates; and second, whether those effects were different for first-generation students and minorities. Using the Social Interactions and Academic Opportunities survey, the researchers found that larger class sizes result in fewer interactions with

faculty and classmates. Additionally, they found that this difference was even greater for minority students, specifically in the areas of discussion about ideas and career plans. Once again, although Beattie and Thiele did not analyze a direct relationship between faculty engagement and retention and graduation rates, it did look at specific characteristics that may affect faculty interaction, assuming that such interaction is beneficial for student learning.

Part-Time Faculty

Before expanding on the review of part-time faculty, some definitions need to be clarified. First, in this analysis, the terms *part-time faculty* and *adjunct faculty* are used to refer to faculty members who work for an institution on a part-time basis. For IPEDS purposes, the Department of Education gives institutions a level of autonomy when determining who should be reported as part-time. The definition of part-time for IPEDS purposes is as follows: "As determined by the institution. The type of appointment at the snapshot date determines whether an employee is full-time or part-time. The employee's term of contract is not considered in making the determination of full- or part-time" (U.S. Department of Education, 2016b). Additionally, the literature uses the term *contingent faculty* to refer to part-time and full-time faculty members who are not tenure-track; generally, these are faculty members who have temporary agreements with their institutions regardless of the number of hours they teach on a given term (American Association of University Professors, 2003).

As I discussed earlier, given the importance of faculty–student relationships, it is worth evaluating the faculty who are in the classroom. In general, the use of part-time faculty appears to be an excellent solution for institutions in managing staffing levels.

First, they provide great flexibility in times of financial stress. Secondly, because part-time faculty have greater mobility, they are often used to fill gaps when enrollment is uncertain (Christensen, 2008). Finally, in many occasions, part-time faculty may be desired as they can provide technical competencies arising from their professional experiences in their field (American Association of University Professors, 2003; Cross & Goldenberg, 2003; Murphy Nutting, 2003).

Unfortunately, what seems to be a cost savings solution for institutions at first may also have drawbacks. For instance, Eagan and Jaeger (2009) found a negative relationship between exposure to part-time faculty at community colleges and the likelihood of transferring to a 4-year institution. Ronco and Cahill (2006) examined the performance of freshman and sophomore students as it relates to their exposure to different types of instructors. Although they did not find any differences in student ratings of instruction based on instructor type, Ronco and Cahill (2006) determined that students who had greater exposure to adjuncts and graduate teaching assistants had a lower retention rate than their counterparts who took a larger percentage of their courses from full-time faculty. Similarly, in a different study, Jaeger and Eagan (2011) found a significant negative relationship between exposure to part-time faculty and persistence to the second year among first-year students. Finally, in one of the few studies of its kind, Ehrenberg and Zhang (2005) conducted an analysis of institutional data collected by the College Board from the 1986–1987 academic year to the 2000–2001 academic year to determine the relationship between the percentage of faculty who are part-time, and graduation rates. They found that “other factors held constant, a 10 percentage point increase in the percentage of faculty that is part-time at a public academic institution is

associated with a 2.65 percentage point reduction in the institution's graduation rate" (p. 654).

Kirk and Spector (2009) looked at grades in a Corporate Finance course of 2,597 students from 1992 to 1998 to determine if students who took the course from a part-time faculty member had the same performance level as those whose faculty member was full-time. Their findings indicate that students taught by part-time faculty earned higher grades, which they attributed to grade inflation. Additionally, they found that students who took the first accounting course with an adjunct were not as inclined to pursue accounting as their major (Kirk & Spector, 2009).

The differences between part-time and full-time faculty are significant and may start at the very beginning with the hiring process. If part-time faculty members are hired mainly to fill immediate enrollment needs, it is likely that the recruitment process is not as stringent as that often followed when hiring a full-time faculty member (Benjamin, 2003; Jacobs, 1998). As Jacobs (1998) noted, institutions are less thorough when deciding to hire part-time faculty and often make such decisions based on the availability of the candidate rather than their teaching experience. Typically, full-time positions require national searches evaluated by a search committee involving a teaching presentation. In contrast, Roueche, Roueche, and Milliron (as cited in Benjamin, 2003) conducted a survey of community colleges and found that very few institutions require a teaching presentation for part-time faculty positions. Furthermore, the issue with the selection of part-time faculty extends to their credentials and experience. Benjamin (2003) found that "the proportion of full-time faculty with doctorates is about twice that of part-time faculty" (p. 81). Regarding their experience, Leslie and Gappa (2002) used

survey data from 114 institutions, as well as data from the 1992–1993 National Survey of Postsecondary Faculty. The results indicated that part-time faculty had on average 6 years of experience compared to 11 years for their full-time counterparts.

Cross and Goldenberg (2003) pointed to the fact that hiring part-time and nontenure track faculty to teach lower level courses becomes almost an irreversible decision. Because part-time faculty appointments and nontenure track appointments, in general, are less expensive, institutions may generate savings by choosing to employ more part-time or nontenure faculty. Once the budget has been adjusted, and the savings have been operationalized, it is problematic to reverse the decision by opening new full-time faculty lines (Cross & Goldenberg, 2003).

Benjamin (2002) argued that issues with contingent faculty are not due to their lack of instructional aptitude; instead, he believed they are a matter of engagement. He posited that "the quality cost of contingent faculty derives rather from the relative lack of support, professional development opportunities, evaluation, and above all, involvement in student learning" (pp. 6–7). Researchers seem to agree on this issue. Christensen (2008) argued that institutions often lack commitment towards part-time faculty not only in regard to physical resources such as office space but also concerning the limited training and direction that is given to support them. Murphy Nutting (2003) also noted how on many occasions part-time faculty are unable to obtain funding for professional development and how many scholarship opportunities are only available to faculty members with full-time status. Meixner et al. (2010) surveyed a group of part-time faculty at a midsized undergraduate institution and found that many of them were not properly informed about many of the services available to them, including the availability

of a formal orientation. Similarly, Elman (2003) noted how part-time faculty are often paid based on the hours of actual teaching, excluding any time spent outside of the classroom even if that includes academic activities such as grading.

Without a correct support structure, the lack of appropriate financial compensation and limited professional support, part-time faculty may also have lower levels of employment satisfaction. Eagan et al. (2015) evaluated part-time faculty satisfaction concerning certain institutional characteristics. Their analysis indicates that part-time faculty do experience lower levels of satisfaction. For instance, they found that part-time faculty members who did not have access to office space or a personal computer reported lower levels of satisfaction. Furthermore, part-time faculty expressed less satisfaction derived from issues such as lack of respect for their work and lack of recognition of their contributions to their academic department (Eagan et al., 2015; Meixner et al., 2010). In a survey of online adjunct instructors, Dolan (2011) found similar results indicating that "the overall perception was that an adjunct instructor was a nonentity within the faculty body and was not well known to management" (p. 70).

Additionally, students may not see part-time faculty members as capable as their full-time counterparts. In a study of nursing faculty, Allison-Jones and Hirt (2004) asked students to rate faculty effectiveness. Their findings indicate that nursing students perceived full-time faculty as being more effective than part-time faculty. They argued that this perception may be the result of full-time faculty having more experience than part-time faculty, as well as their greater commitment to the institution and its effectiveness through their involvement with the satisfaction of the accreditation standards.

Umbach (2007) argued that "part-time faculty interact with students less frequently, use active and collaborative techniques less often, spend less time preparing for class, and have lower academic expectations than their tenured and tenure-track peers" (p. 110). Cox, McIntosh, Terenzini, Reason, and Quaye (2010) found similar results, indicating that part-time faculty do in fact interact less often with students, but they were quick to emphasize that this is "precisely because they are *part-time* employees" (p. 785).

Noticeably, a single personal interaction with a faculty member may significantly affect a student's perception of the entire institution and even alter their entire relationship with higher education as a whole. Cox (2011) argued that when interviewing students about their interactions with faculty members, on many occasions a remarkable, positive experience turned into a generalization about the whole faculty. Although Cox's findings are specifically related to positive experiences, it is possible that the same type of generalization could occur if a student had a particularly bad experience.

Although these results seem to indicate that part-time faculty negatively affect students' performance, some researchers have found evidence to the contrary in recent studies. For instance, Rossol-Allison, Alleman Beyers, & Association for Institutional Research (2011) analyzed student learning outcomes at one large institution and found that exposure to full-time faculty does not yield greater graduation or retention rates. In a different study, Landrum (2009) looked at the differences between student's perception of instruction between part-time and full-time faculty during one term as well as grade distribution when comparing both groups. For this analysis, he looked at courses taught during fall 2003 at the College of Social Sciences and Public Affairs at Boise State

University. Although Landrum (2009) found that part-time faculty lacked resources that were often available to full-time faculty, he did not find a significant difference between the students' perceptions based on course evaluations, or between the grade distributions.

Johnson (2006) analyzed the effects of exposure to part-time faculty on students at a midsize university for two semesters. She found that a student's enrollment status can explain the negative relationship between exposure to part-time faculty and retention. Johnson's (2006) findings indicate that part-time students were more likely to take 50% or more courses from part-time faculty, making enrollment status the confounding variable. After controlling for enrollment status and other variables, she did not find a significant difference in retention of students based on their exposure to part-time faculty (Johnson, 2006).

Additionally, Johnson (2011) criticized the methodology used by previous researchers on this topic, arguing that due to the aggregation of the data, the results may not be relevant. Specifically, she claims that "student-level aggregation of faculty characteristics may reflect nothing more than systematic differences between students who take courses from contingent instructors and students who take courses from tenure-track faculty" (p. 763).

Summary

External pressures have forced higher education into evaluating current practices and their effect on retention and graduation rates. Considering the significant effect of increasing the number of college graduates, it is imperative that institutions continue to assess their practices. The literature is clear in advocating for greater faculty–student engagement. Students have presented higher levels of persistence when they feel a strong

connection with the institution. However, recent trends in the faculty composition indicate that colleges and universities continue to increase the number of part-time faculty who teach undergraduate courses. Research suggests that exposure to part-time faculty may have an adverse effect on retention and graduation rates, although some studies have produced contradictory findings.

This research project seeks to provide additional information in this area through the analysis of institutional data. It is the author's hope that this analysis will yield useful information that can provide institutions with valuable insights to make better decisions that could affect the faculty composition. Several hypotheses regarding the effects of faculty composition on retention and graduation rates are tested:

Hypothesis 1: There is a positive relation between the number of full-time faculty per 100 FTE and graduation rates.

Null Hypothesis: There is no relation between the number of full-time faculty per 100 FTE and graduation rates.

Hypothesis 2: There is a negative relation between the ratio of part-time faculty to full-time faculty per 100 FTE and graduation rates.

Null Hypothesis: There is no relation between the ratio of part-time faculty to full-time faculty per 100 FTE and graduation rates.

Hypothesis 3: There is a positive relation between the number of full-time faculty per 100 FTE and first-year retention rates.

Null Hypothesis: There is no relation between the number of full-time faculty per 100 FTE and first-year retention rates.

Hypothesis 4: There is a negative relation between the ratio of part-time faculty to full-time faculty per 100 FTE and retention rates.

Null Hypothesis: There is no relation between the ratio of part-time faculty to full-time faculty per 100 FTE and retention rates.

Chapter 3

METHODOLOGY

The goals of this research study are twofold. First, a descriptive analysis of the data was useful to confirm previous studies regarding recent trends in use of part-time faculty. And, secondly, a regression analysis served to determine if there is a relationship between the variables. For this analysis, the response variables were retention and graduation rates and the explanatory variables were full-time faculty per 100 FTE and the ratio of part-time faculty to full-time faculty per 100 FTE. The analysis also included controls for variables such as Carnegie classification, type of control (public, private not-for-profit, private for profit), expenditures for instruction, percentage of students receiving aid, student enrollment, percentage of minority students, average in-state tuition, whether an institution is a Historical Black College or University (HBCU), whether an institution is a Hispanic Serving Institution (HIS), whether an institution has a hospital, as well as state and year.

Study Data

The data used for this project were collected by the U.S. Department of Education as part of the IPEDS annual surveys. The completion of the IPEDS surveys is a yearly mandate for every institution receiving federal financial aid as required in Title IV of the Higher Education Act of 1965 as amended. IPEDS surveys collect information in nine broad areas including institutional characteristics, institutional prices, admissions, student

enrollment, financial aid, retention, outcomes measure, human resources, finances, and academic libraries.

Failure to submit the requested information may result in fines and loss of financial aid. The information provided by institutions is made public through the College Navigator, a free consumer information tool that makes information about colleges and universities available to prospective and current students and their families. College Navigator also allows the public to perform searches and comparisons among institutions using IPEDS data. The hope is that individuals have the right information to make an informed decision about where to attend college. Because of those two characteristics, institutions often spend a significant amount of time reviewing their submissions for accuracy and consistency. Additionally, the submitted data have also been compiled by the AIR and made available through their Delta Cost Project database, which was designed to ensure that the collected IPEDS data can be used for research purposes from a longitudinal perspective. The publication of the data also incentivizes colleges and universities to ensure the validity of the information they submit, as it would be used not only by prospective students and parents through the College Navigator but also to determine national rankings, as well as for general research purposes such as this study.

Missing Data

According to the documentation provided by the Delta Cost Project, when the data were first evaluated, it was determined that several values were missing for certain institutions and a methodology was designed to address these issues. If a value is missing for a particular year but the institution has provided information for the previous and

following years, the Delta Cost Project performs a regression to estimate the missing value. The regression is performed using the following specification: "The logarithm of each variable for a year is regressed on its value for the previous year and its value for the next year; the regression also includes dummy variables for each year" (AIR, 2011, p. 11).

To account for changes specific to the sector and type of institution, the Delta Cost Project creates 12 regressions based on the Carnegie classification and the sector values for 2- and 4-year private for-profit institutions. This method allows for the adjustment of the values based on the behavior of the particular sector for that variable during those years (AIR, 2011). If data are not available for more than one year, the data are not imputed. After the initial evaluation of the data is conducted, a yearly evaluation is performed on the data for the second-to-last year, which allows for the regressions to be run (AIR, 2011).

Study Sample

The original data set comprises all the institutions that submitted their IPEDS surveys from 2007 to 2012. The total number of records included in the original dataset is 37,800, for a total of 7,238 institutions. However, not all the institutions in the dataset were part of this analysis. The sample was selected based on several characteristics. First, to be included in the sample, the institution must have reported data every year from 2007 to 2012. Only institutions that reported expenditures related to instruction, full-time equivalent enrollment, and completions were included. Finally, given the purposes of the study, only institutions that have retention rates, graduation rates, the total number of full-time faculty, and the total number of part-time faculty were included. Although the

imputation method used by the Delta Cost Project solves many of the issues associated with missing data, some institutions continue to have blank fields. I addressed this issue by selecting only institutions that had complete records for the years of study.

Analysis Technique

First, several data exploration techniques were used to spot anomalies with the data, as well as to help identify important characteristics of the data that may be substantial for the relevance of the model. The descriptive statistics of the variables for the institutions included in this study were analyzed as well. Through this preliminary review, the variables were evaluated in several areas, including their central tendency and their distribution. Additionally, a correlation analysis was conducted. The results of this study helped with the identification of any heteroscedasticity issues (unequal variance of the errors) that needed to be addressed before any regression analysis was performed. Next, multiple time series plots of the dependent and independent variables were conducted. A review of the multiple time series plot was useful to determine if the original explanatory, as well as control variables, were in fact relevant for the model.

The second component of this project involved a regression analysis, which was conducted to examine preliminary indications of statistically significant relationships between the dependent and the explanatory variables. The analysis was conducted through pooled regression analysis to identify statistically significant relationships between the dependent variables (graduation rate and first-year retention rate) and the independent variables. To account for the longitudinal nature of the data, year and state dummy variables were included.

Table 1 displays the variables that were utilized in this study, as well as their descriptions. The descriptions of the variables are obtained directly from the Delta Cost Project (AIR, 2016).

Table 1:

Description of Variables

Dependent Variables	
Full-time Retention Rate	The percentage of the previous year's fall first-time full-time cohort (minus exclusions) that re-enrolled at the institution as either full-time or part-time the following fall as defined by IPEDS.
Graduation Rate	Percentage of full-time, first-time, degree/certificate-seeking undergraduate students graduating within 150% of normal time as defined by IPEDS.
Independent Variables	
Full-time Faculty per 100 FTE	The number of full-time faculty members per 100 FTE students as defined by IPEDS. The full-time equivalent of an institution's part-time enrollment is estimated by multiplying part-time enrollment by factors that vary by control and level of institution and level of student; the estimated full-time equivalent of part-time enrollment is then added to the full-time enrollment of the institution. This formula is used by the U.S. Department of Education to produce the full-time equivalent enrollment data published annually in the Digest of Education Statistics.
Ratio of Part-Time Faculty to Full-Time Faculty per 100 FTE	The calculated field obtained from dividing part-time faculty per 100 FTE over full-time faculty per 100 FTE.
Control Variables	
Expenditures for Instruction per 100 FTE	A functional expense category that includes expenses of the colleges, schools, departments, and other instructional divisions of the institution and expenses for departmental research and public service that are not separately budgeted. Includes

	general academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and regular, special, and extension sessions. Also includes expenses for both credit and noncredit activities. Excludes expenses for academic administration where the primary function is administration (e.g., academic deans). Information technology expenses related to instructional activities are included if the institution separately budgets and expenses information technology resources (otherwise these expenses are included in academic support).
Percentage of Students Receiving Aid	Percentage of full-time, first-time degree seeking students who received federal grants.
Student Enrollment	This includes part-time and full-time students.
Percentage of Minority Students	Percentage of students who have identified with a race other than white.
Average In-State Tuition Rate	The tuition charged by institutions to those full-time undergraduate students who meet the state's or institution's residency requirements.
Control	A classification of whether an institution is operated by publicly elected or appointed officials (public control) or by privately elected or appointed officials and derives its major source of funds from private sources (private control). Two dummy variables are used, with public institution being the reference category.
Is Institution Private Nonprofit	Dummy variable (1=Institution is private nonprofit, 0=All Other)
Is Institution Private For-Profit	Dummy variable (1=Institution is private for-profit, 0=All Other)
Carnegie Group	The Carnegie Classification is used to classify institutions by the degrees the institution offers. The Carnegie Group variable represents a simplified version of the Carnegie classification. Four dummy variables are used, with Bachelor institutions being the reference category.

Research/Doctoral Institution	Dummy variable (1=Institution is considered a Research/Doctoral Institution 0=Institution is not considered a Research/Doctoral Institution)
Master Institution	Dummy variable (1=Institution is considered a Master Institution 0=Institution is not considered a Master Institution)
Associate Institution	Dummy variable (1=Institution is considered a Master Institution 0=Institution is not considered a Master Institution)
Other	Dummy variable (1=Institution is considered Specialized, Tribal, or unknown 0=Institution is not considered Specialized, Tribal)
Institution is a Historically Black College or University (HBCU)	Dummy variable (1=Institution is an HBCU 0=Institution is not an HBCU)
Institution is a Hispanic Serving Institution	Dummy variable (1=Institution is an HSI 0=Institution is not an HSI)
Institution has a Hospital	Dummy variable (1=Institution has a hospital 0=Institution does not have a hospital)

A revision of the data indicated that the expenditures for instruction variable presented a considerable variation between institutions. This is due to the inclusion of large institutions with a much larger amount than the average. As such, a logarithmic transformation of this variable was used. Such transformation improved the normality of the variable which in turn aided in its use for this model. The same type of transformation was used on the student enrollment variable.

The two preliminary models that were used are as follows:

Graduation Rate = $b_0 + b_1 FTper100FTE + b_2 PTFTRatio + b_3 Expendper100FTE + b_4 PercFed + b_5 LogEnroll + b_6 PercMin + b_7 AveTuition + b_8 PrivateNP + b_9 PrivateFP + b_{10} Master + b_{11} Bachelor + b_{12} Associate + b_{13} Other + b_{14} HBCU + b_{15} HSI +$

$b_{16}Hospital + b_{17}AY2008 + b_{18}AY2009 + b_{19}AY2010 + b_{20}AY2011 + b_{21}AY2012 + \sum_{i=1}^{49} b_{i+21}State_i + E$

FTRetentionRate = $b_0 + b_1FTper100FTE + b_2PTFTRatio + b_3Expendper100FTE + b_4PercFed + b_5LogEnroll + b_6PercMin + b_7AveTuition + b_8PrivateNP + b_9PrivateFP + b_{10}Master + b_{11}Bachelor + b_{12}Associate + b_{13}Other + b_{14}HBCU + b_{15}HSI + b_{16}Hospital + b_{17}AY2008 + b_{18}AY2009 + b_{19}AY2010 + b_{20}AY2011 + b_{21}AY2012 + \sum_{i=1}^{49} b_{i+21}State_i + E$

Where:

*FTper*100*FTE* is full-time faculty per 100 FTE.

PTFTRatio is the ratio of part-time faculty to full-time faculty per 100 FTE.

Expendper100FTE is the expenditures for instruction per 100 FTE.

PercFed is the Percentage of Federal Grant Recipients.

LogEnroll is the logarithm of the total student enrollment.

PercMin is the percentage of minority students.

AvgTuition is the average in-state tuition rate.

PrivateNP is a dummy variable to indicate that the institution is private nonprofit.

PrivateFP is a dummy variable to indicate that the institution is private for-profit.

Bachelor is a dummy variable to indicate that the institution is in the Bachelor Carnegie group.

Master is a dummy variable to indicate that the institution is in the Master Carnegie group.

Associate is a dummy variable to indicate that the institution is in the Associate Carnegie group.

Other is dummy variable to indicate that the institution does not belong to any of the previous Carnegie groups, including the reference category, which is Public.

HBCU is a dummy variable to indicate that the institution is not classified as a Historically Black College or University.

HSI is a dummy variable to indicate that the institution is classified as a Hispanic Serving Institution.

Hospital is a dummy variable to indicate that the institution does not have a hospital.

*AY*2008 is a dummy variable to indicate 2008 as the year.

*AY*2009 is a dummy variable to indicate 2009 as the year.

*AY*2010 is a dummy variable to indicate 2010 as the year.

*AY*2011 is a dummy variable to indicate 2011 as the year.

*AY*2012 is a dummy variable to indicate 2012 as the year.

E is the error.

Data Limitations

Although institutions have a great deal of respect towards the U.S. Department of Education and the data requested through the IPEDS submissions, there is recognition among members of the higher education community concerning the issues with the quality of the data reported through IPEDS. In the past, it has been reported that institutions have provided inaccurate information in areas such as entrance scores to external constituencies such as U.S. News & World Report (Ma, Kulich, & Hu, 2015, p. 41). In addition to knowingly providing wrong information, the collection and calculation of the data requested through the IPEDS surveys has a certain level of complexity which

may result in the submission of incorrect data. Therefore, it is possible that some of the data obtained through the IPEDS survey may have integrity issues or is not comparable if the institutions used different definitions than those provided by the Department of Education.

In addition to issues with data quality, the current analysis looks at aggregate data using several control variables. However, certain characteristics not collected through IPEDS may have an even greater effect institutionally than those collected and analyzed through this study. Moreover, individual features of the students receiving the instruction may have significant effects on the variables being examined. Although such features can be included in some of the control variables, other relevant factors may be ignored by looking at the data in the aggregate.

Chapter IV

DATA ANALYSIS AND FINDINGS

This project sought to determine if differences in the composition of faculty, specifically between the number of part-time and full-time faculty have effects on retention and graduation rates by analyzing IPEDS data. Tinto's (1975) theory of drop-out posits that individuals depart college in part because they are unable to fit in the new community, which may occur due to their lack of connection with the academic or social systems that develop around the college or university community. Among the various individuals who interact with students in the collegiate setting, faculty members are perhaps in the best position to provide an environment that fosters students' success. Through their interactions in and out of the classroom, students grow socially and academically, while at the same time developing a sense of belonging to the institution. It is therefore important to determine if students' success is being impacted by the type of faculty that the institution hires; specifically, if having a high percentage of part-time faculty has any effects on retention and graduation rates at both private and public institutions.

The response variables for this analysis were retention and graduation rates and the explanatory variables were full-time faculty per 100 FTE and the ratio of part-time faculty to full-time faculty per 100 FTE. Additionally, several control variables were used in the regression models to account for confounding factors that could also affect retention and graduation rates. To account for the longitudinal nature of the data, the

study additionally controlled for the academic year. Finally, dummy variables were used to account for any significant differences due to region. This chapter presents the results of a descriptive statistical analysis and a pooled ordinary least square regression analysis of the IPEDS institutional data for the period between 2007 and 2012. The following hypotheses are tested through various models.

Hypothesis 1: When comparing postsecondary institutions, there is a positive relationship between the number of full-time faculty per 100 FTE and graduation rates.

Null Hypothesis 1: When comparing postsecondary institutions, there is no relationship between the number of full-time faculty per 100 FTE and graduation rates.

Hypothesis 2: When comparing postsecondary institutions, there is a negative relationship between the ratio of part-time faculty to full-time faculty per 100 FTE and graduation rates.

Null Hypothesis 2: When comparing postsecondary institutions, there is no relationship between the ratio of part-time faculty to full-time faculty per 100 FTE and graduation rates.

Hypothesis 3: When comparing postsecondary institutions, there is a positive relationship between the number of full-time faculty per 100 FTE and first-year retention rates.

Null Hypothesis 3: When comparing postsecondary institutions, there is no relationship between the number of full-time faculty per 100 FTE and first-year retention rates.

Hypothesis 4: When comparing postsecondary institutions, there is a negative relationship between the ratio of part-time faculty to full-time faculty per 100 FTE and retention rates.

Null Hypothesis 4: When comparing postsecondary institutions, there is no relationship between the ratio of part-time faculty to full-time faculty per 100 FTE and retention rates.

Descriptive Statistics

The descriptive statistics for all the variables (Table 2) provide basic information about the dataset. Additionally, they point to possible relationships between the variables included in the analysis.

The first dependent variable, graduation rates, reflects the percentage of students that start as first-time freshmen at an institution who are able to complete their degrees within 150% of the time needed for regular completion of the program of study. The mean value of 0.4092232 indicates that about 41% of the students who start as first-time freshmen complete their degrees within 150% of the time required. The minimum value in the dataset is 0.016 or 1.6%, while the highest value is 1 or 100%. The variable presents a relatively high standard deviation of 0.2273856, which is a measure of spread or how much the data set is spread out from its mean. This spread is in part due to the inclusion of institutions with very different characteristics, as well as the inclusion of data from all the years in the study.

The second dependent variable is the full-time retention rate. This is a measure that represents the percentage of students who started as first-time, full-time freshmen during a fall term and returned for the next term as part- or full-time students. The mean

value of 0.6739749 indicates that about 67% of the students in the first-time, full-time cohort returned for the next fall. The minimum value is 0 or 0%, while the maximum is 1 or 100%. The standard deviation for this variable is 0.1479939.

The first independent variable in this analysis is the number of full-time faculty per 100 full-time equivalent (FTE) students. The FTE is an estimate used to convert part-time students into full-time through an equivalence for consistency purposes. Once part-time students are calculated as a FTE students, this number is added to the number of full-time students to produce the full-time equivalent of an institution or FTE. The variable represents the number of full-time faculty members that an institution employs per every 100 FTE. Calculating the value in terms of 100 FTE removes the effects of the size of the institutions, which vary widely. The mean full-time faculty per 100 FTE is 4.618377, which indicates that institutions have on average about five full-time faculty members per every 100 FTE. The minimum value for this variable is 0.1415428 corresponding to the University of Phoenix-Dallas Campus for the 2012 academic year, while the highest value of 50.52 corresponds to Massachusetts Institute of Technology for the 2007 academic year. The variable has a standard deviation of 2.975868.

The second independent variable is the ratio of part-time faculty to full-time faculty per 100 FTE. This is a calculated value generated by dividing the number of part-time faculty per 100 FTE, over the number of full-time faculty per 100 FTE. The mean value of 2.179523 indicates that on average, there are about two part-time faculty members per 100 FTE for every full-time faculty member per 100 FTE. The standard deviation for this variable is significantly high at 3.822138, with a minimum of 0.0071 and a maximum of 99. The high values in both the full-time faculty per 100 FTE, as well

as the ratio of part-time faculty per 100 FTE over full-time faculty per 100 FTE are important cues to the presence of outliers. This topic is revisited later.

Next, five control variables were included in the analysis. The first one is expenditures in instruction per 100 FTE. This variable represents the amount of money institutions spend on activities related to instruction. A complete definition from IPEDS is included in Table 1. The value was then calculated to indicate the amount of money institutions spend in instruction for every 100 FTE. Given that this analysis includes data from 2007 to 2012, a consumer price index (CPI) provided by the Delta Cost Project has been used to transform any monetary variable into 2012 dollars. The mean for this variable is $745,416.90, the minimum is $24,230.48, and the maximum is $9,772,438.00. Given the wide range of values, the variable has a large standard deviation of $631,210.50.

The second control variable is the percentage of students receiving federal aid. This variable represents the percentage of first-time, full-time degree-seeking students who received federal grant aid. Since federal aid is awarded on the basis of income almost exclusively to low income students based on federal guidelines, this variable can be used as a proxy for the percentage of students who are low-income. The mean value is 0.4078059, which indicates that on average about 41% of the full-time, first-time degree students receive federal aid. The minimum value is 0 or 0%, while the maximum is 1 or 100%. The standard deviation for this variable is 0.192607 or approximately 19%.

The third control variable included in the analysis represents the total enrollment reported by an institution. The mean for this variable is 9762.879 with a minimum of 76 students, a maximum of 272,128 students, and a standard deviation of 15,779.98. From

these statistics, it is apparent that the variable as reported is highly skewed due to institutions with very large enrollments. To address this problem, the variable was transformed using the natural logarithm. In addition to solving the skewness issue, this transformation was beneficial for analysis as the coefficient resulting from a regression can be interpreted as the change in the dependent variable when the total enrollment increases by 1%. The transformed variable has a mean of 8.518254, a minimum of 4.330733, a maximum of 12.51403 and a standard deviation of 1.175249.

The fourth control variable included in the analysis is the percentage of minority students. This represents the number of students who self-identified with a race other than White. The mean value for this variable is 0.3557703 or about 36%, with a minimum of 0 or 0%, and a maximum of 1 or 100%. The standard deviation for this variable is 0.2224128 or 22%.

Finally, the fifth control variable is in-state tuition, and represents the average tuition charged to full-time undergraduate students who meet the state requirements to be considered in-state. As with expenditures in instruction, a CPI index was used to convert the values from multiple years into 2012 dollars. The mean value for this variable is $11,586.97 with a minimum of $508.86, a maximum of $45,290, and a standard deviation of $10,732.76.

Table 2:

Descriptive Statistics

Variables	N	Mean	Std. Dev.	Min	Max
Graduation Rate	6,030	0.409223	0.227386	0.016194	1
Full-time Retention Rate	6,030	0.673975	0.147994	0	1
Full-time Faculty per 100 Full-time Equivalent (FTE)	6,030	4.618377	2.975868	0.141543	50.5234
Ratio of Part-time Faculty to Full-time Faculty per 100 Full-time Equivalent (FTE)	6,030	2.179523	3.822138	0.007194	99
Expenditures in Instruction per 100 Full-time Equivalent (FTE) (2012 dollars)	6,030	745416.9	631210.5	24230.48	9772438
Percentage of students receiving Federal Aid	6,030	0.407806	0.192607	0	1
Total Enrollment	6,030	9762.879	15779.98	76	272128
Logarithm Natural (LN) of Total Enrollment	6,030	8.518254	1.175249	4.330733	12.51403
Percentage of Minority Students	6,030	0.35577	0.222413	0	1
In-state Tuition (2012 dollars)	6,030	11586.97	10732.76	508.86	45290

Although the descriptive statistics for the complete dataset provide an important general overview, it is possible to see differences in the data when comparing the data by year. To look at any trends or significant changes during the period of analysis, the descriptive statistics were also generated by year and are displayed on Appendix A.

Even though initiatives in student success have been implemented throughout the country, and several institutions have been able to report significant gains in their graduation rates, the average graduation rate increased only about 1% from 40% in 2007

to 41% in 2012. Similarly, retention rates have increased about 1% from approximately 67% in 2007 to close to 68% in 2012.

The number of full-time faculty members per 100 FTE has decreased steadily from 4.71 in 2007 to 4.48 in 2011, with an increase to 4.56 in 2012. At the same time, the ratio of part-time faculty to full-time faculty per 100 FTE has decreased from 2.38 to 2.10.

The percentage of first-time, full-time degree-seeking students receiving federal aid increased significantly from approximately 33% in 2007 to 49% in 2012. According to the College Board about 9.4 million students received Pell Grants in the 2011–2012 aid year, compared to 5.5 million students during the 2007–2008 year (Baum & Payea, 2012). Although a greater number of students are receiving federal aid, in-state tuition has increased significantly from an average of $10,806.91 in 2007 to an average of $12,353.93 in 2012. During the same time, the average enrollment increased significantly from 9,111 to 10,249.

Finally, the average percentage of minority students in the dataset increased from 33.2% in 2007 to 37.9% in 2012. This change in demographics is not surprising. According to Snyder and Dillow (2013),

> From 1976 to 2011, the percentage of Hispanic students rose from 4 percent to 14 percent, the percentage of Asian/Pacific Islander students rose from 2 percent to 6 percent, the percentage of Black students rose from 10 percent to 15 percent, and the percentage of American Indian/Alaska Native students rose from 0.7 percent to 0.9 percent. During the same period, the percentage of White students fell from 84 percent to 61 percent (308).

The Great Recession had dramatic effects in the higher education arena that impacted enrollment, with more individuals looking to attend college given the difficulty in finding suitable employment. As Barr and Turner (2013) noted, "Unlike many goods, the demand for higher education typically increases during economic downturns. In periods of high unemployment or recession, the opportunity cost of time is lower" (p. 170). Additionally, such increases in enrollment tend to come from students outside of the traditional age who were not originally considering school, with many students looking for short-term programs. As such, increases in enrollment during a recession tend to be greater for community colleges. Barr and Turner (2013) also noted an important feature of the Great Recession, which was an increase in enrollment in the for-profit sector. Barr and Turner offered several reasons for this phenomenon including flexibility of the institutions and programs, focus on career and technical training, and a decrease in funding for public institutions (pp. 175–176). However, as they noted, even though enrollment increased in the last decade, state appropriations decreased "from $75.3 billion in 2007 to $73.8 billion in 2010" (p. 169). For my dataset, average in-state tuition increased from $10,807 in 2007 to $12,354 using 2012 dollars. According to Barr and Turner, "tuition increases at public universities were marked during the period of the Great Recession and such increases shift the cost of higher education from the states (in the form of across-the-board subsidies) to students" (p. 169).

Next, the scatterplots of the means for the dependent variables from 2007 to 2012 (Figure 1 and Figure 2) remain relatively steady for both variables during that period. However, there is a clear difference when looking at the variables by every Carnegie group, particularly between Associate granting institutions and the rest.

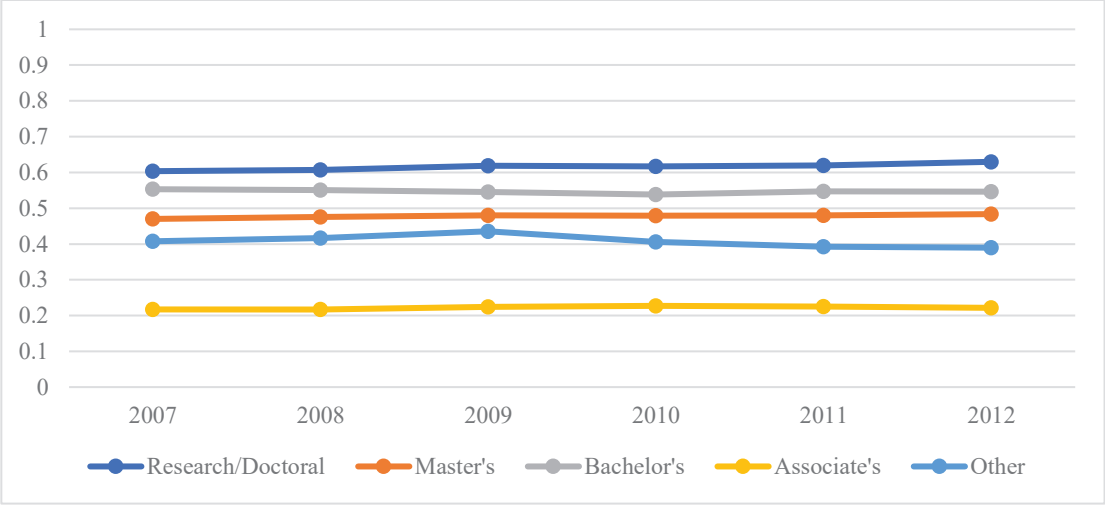

Figure 1. Mean graduation rate by Carnegie Group 2007–2012

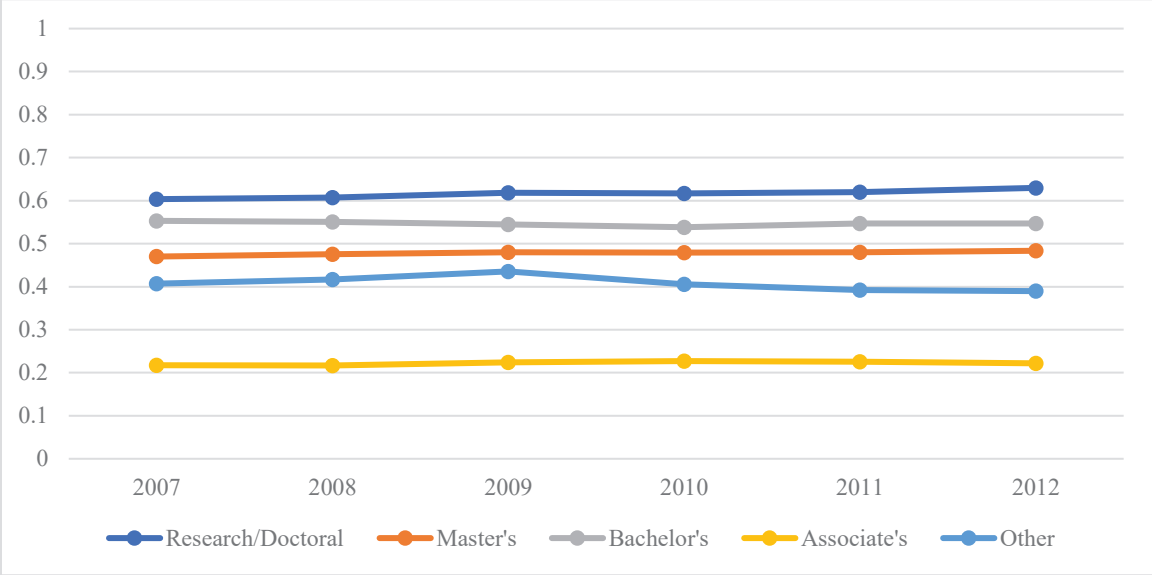

Figure 2. Mean retention rate by Carnegie Group 2007–2012

Additionally, scatterplots of the independent and dependent variables provide a preliminary look into the relationships between the variables. In regard to the first hypothesis, presented in Figure 3, for every year of data, there is a positive relationship between the graduation rate and the full-time faculty per 100 FTE. The slope of the graph did not change significantly for any of the years in the analysis. For the second hypothesis, there is a negative relation between the graduation rate and the ratio of part-

time faculty to full-time faculty per 100 FTE for every year of analysis as depicted in Figure 4. The slope of the relationship changed from 2007 to 2008, in part due to the presence of far outliers as it is seen in the graph. Based on this analysis, we can say that in general, the higher the number of full-time faculty per 100 FTE, the higher the graduation rate, while the larger the ratio between part-time faculty and full-time faculty per 100 FTE, the lower the graduation rate. Both relationships align with the literature, and support the first two hypotheses.

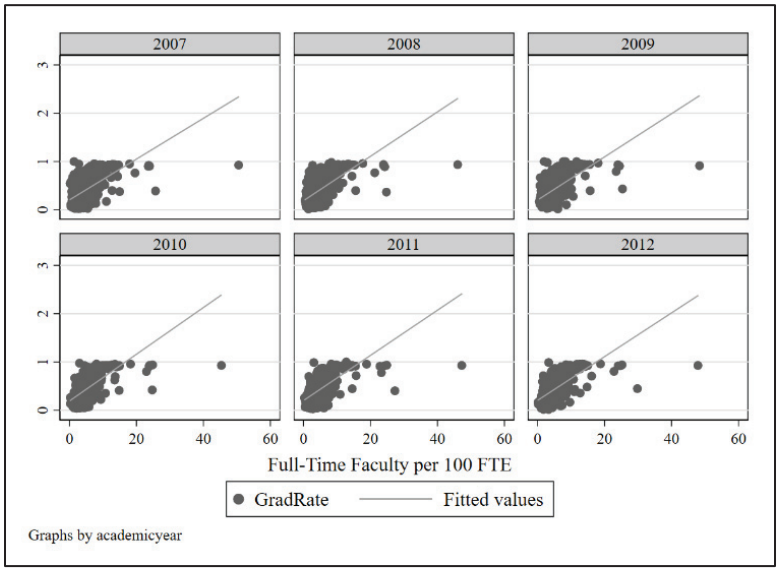

Figure 3. Bivariate relationship between graduation rates and full-time faculty per 100 FTE

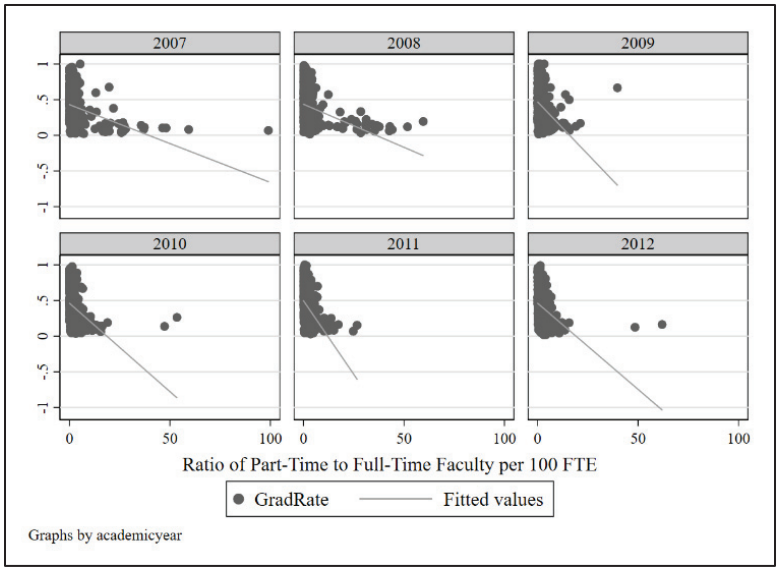

*Figure 4. Bivar*iate relationship between graduation rates and the ratio of part-time faculty to full-time faculty per 100 FTE

The same behavior is evident for the retention rate in relation with both independent variables as it is displayed in Figures 5 and 6. Equally, the preliminary results from the scatterplots align with the third hypothesis indicating that the larger the number of full-time faculty per 100 FTE, the higher the retention rate. Inversely, the higher the ratio between part-time faculty and full-time faculty per 100 FTE, the lower the retention rate, which is consistent with the forth hypothesis. Once again, the slope of the relationship changed from 2007 to 2008, in part due to the presence of far extreme outliers as noted in the graph.

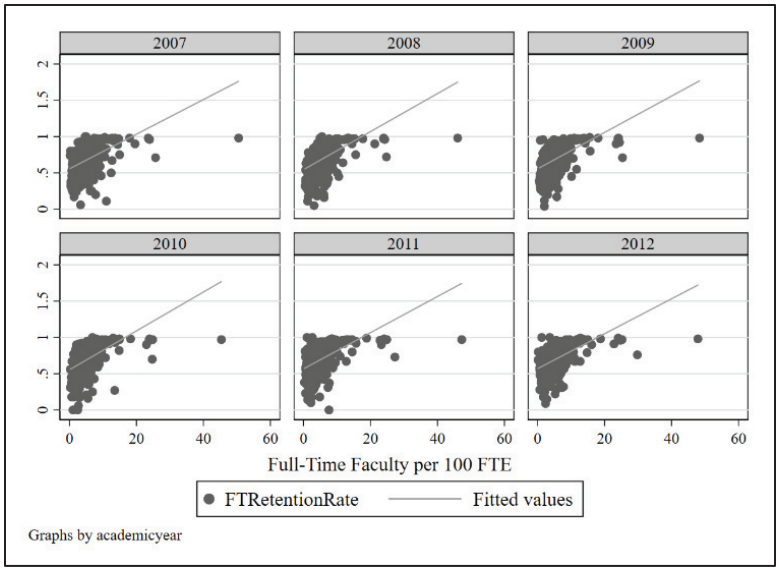

Figure 5. Bivariate relationship between the retention rates and full-time faculty per 100 FTE

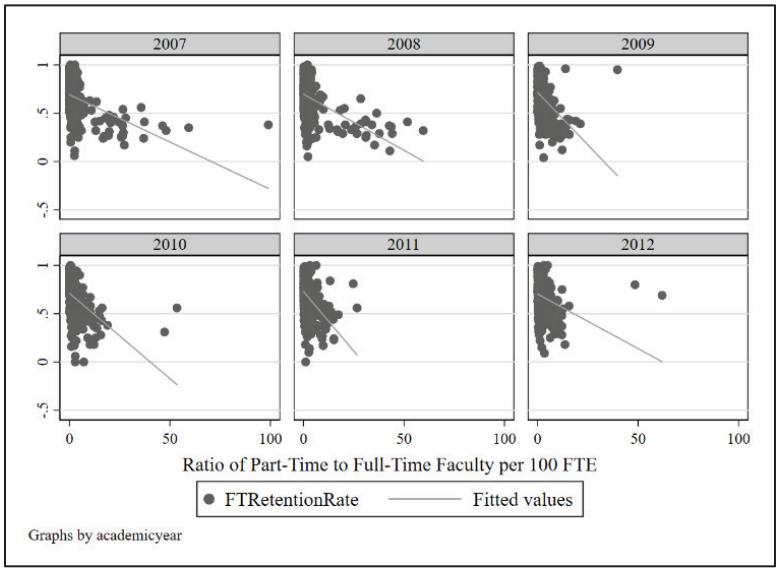

Figure 6. Bivariate relationship between the Retention Rates and the Ratio of Part-Time Faculty to Full-Time Faculty per 100 FTE

Correlation Analysis

After simple exploratory techniques were used to identify the expected relationships between the dependent and independent variables, the relationships were evaluated closely through the use of a correlation table displayed in Table 3.

Table 3:

Dependent and Independent Variables: Correlation

Variables	1	2	3	4
1. Graduation rate	1			
2. Full-time retention rate	.78***	1		
3. Full-time faculty per 100 FTE	.60***	.50***	1	
4. Ratio of part-time to full-time faculty per 100 FTE	-.29***	-.34***	-.30***	1

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

The results revealed a high positive correlation between graduation rates and the number of full-time faculty per 100 FTE (0.60). Additionally, a negative correlation between the graduation rate and the ratio of part-time to full-time faculty was found, although at a much lower value (-0.29). Similar results were obtained for the retention rate with a high positive correlation with the number of full-time faculty per 100 FTE (0.51), and a negative but low correlation with the ratio of part-time to full-time faculty (-0.34).

A complete list of correlations displayed in Appendix B shows a high correlation between expenditures in instruction per 100 FTE and full-time faculty per 100 FTE (0.78) was found. This is not a surprise given that faculty salaries constitute a significant portion of institutional expenditures.

Ordinary Least Square Regression Analysis

The next step in the analysis is the examination of the data through linear regression analysis, using ordinary least squares, a method to estimate the best fitted line for the set of data by minimizing the sum of the squares of the residuals.

The first model which aims to answer Hypotheses 1 and 2 used the graduation rate as dependent variable, and the full-time faculty per 100 FTE, and ratio of part-time to full-time faculty per 100 FTE as independent variables. The results of the first regression performed (Appendix C) show that collectively, the complete model accounts for 76% of the variation in the graduation rate ($F(69, 5960) = 280.58$, $p < .00001$, $R^2 = .7646$) as indicated by the R^2. Additionally, a significant and positive relation was found between the full-time faculty per 100 FTE and the graduation rate (t=8.24 p=.000) while controlling for several factors including expenditures in instruction per 100 FTE, percentage of students that receive federal aid, total enrollment, percentage of minority students, in-state tuition, Carnegie classification, type of control, academic year, state, whether the institution was designated as an HSI, whether the institution was designated as HBCU, and whether the institution had a hospital. The results indicate that for every additional full-time faculty per 100 FTE, graduation rates increase 0.77%. On the other hand, a negative relation was found between the ratio of part-time to full-time faculty per 100 FTE and the graduation rate (t=-12.17, p=.000) using the same control variables. The results indicate that an increase of 1 unit in the ratio of part-time to full-time faculty per 100 FTE is associated with a decrease of 0.58% in the graduation rates.

All the control variables are statistically significant, with the exception of the logarithm of the total enrollment. As expected, expenditures in instruction per 100 FTE

and in-state tuition are positively related to graduation rates. This is similar to the results found by Gansemer-Topf and Schuh (2004), who indicated that "private institutions allocated more money per headcount student than their public counterparts on instruction and academic support and had higher graduation rates. By institutional type, the more resources allocated to instruction and academic support, the higher the graduation rates" (p. 139). On the other hand, the percentage of students receiving federal aid and the percentage of minority students are negatively related to graduation rates. These findings are in line with those reported by the National Student Clearinghouse Research Center, which found a substantial difference in graduation rates by race for the cohort of 2010. Specifically, a significant gap between the completion of Asian and White students when compared to Hispanic and Black students (Shapiro, Dunda, Huie, Wakhungu, Yuan, & Nathan, 2017).

Dummy variables were used to account for differences in the type of control (public, private not-for-profit, or private for-profit), Carnegie classification, whether the institution is an HBCU, whether the institution is a HSI, or whether the institution has a hospital. According to this regression, graduation rates are lower for private institutions both not-for-profit and for profit, when comparing them with the reference category, which was public institutions. Graduation rates were lower for all other Carnegie classifications when compared with research and doctoral institutions, which was the reference category. Having a hospital, being a HSI or being an HBCU did not appear to be statistically significant.

Dummy variables were used to account for the different years included in the analysis. Additionally, regional differences were managed by the inclusion of dummy

variables for every state. Using 2007 as the base year, all the coefficients for the rest of the academic years were positive, but only years 2010, 2011, and 2012 were statistically significant with *p* values of 0.014, 0.0154, and 0.0154 respectively. This statistical difference may be a sign of the increased efforts by institutions to increase graduation rates in recent years.

The second model used the full-time retention rate as the dependent variable, and the full-time faculty per 100 FTE, and ratio of part-time to full-time faculty per 100 FTE as independent variables. The results of the second regression (Appendix C) indicate that collectively this second model accounts for about 64% of the variation in the retention rate ($F(69, 5960) = 193.24$ $p < .0001$, $R^2 = .6463$). Additionally, a significant and positive relation was found between the full-time faculty per 100 FTE and the retention rate ($t = 3.69$, $p = .000$) while controlling for several factors including expenditures in instruction per 100 FTE, percentage of students that receive federal aid, total enrollment, percentage of minority students, in-state tuition, Carnegie classification, type of control, academic year, state, whether the institution was designated as HSI, whether the institution was designated as HBCU, and whether the institution had a hospital. The results indicate that for every additional full-time faculty per 100 FTE, retention rates increase 0.36%. On the other hand, a negative relation was found between the ratio of part-time to full-time faculty per 100 FTE and the retention rate ($t = -4.29$, $p = .000$). The results indicate that an increase of 1 unit in the ratio of part-time to full-time faculty per 100 FTE is associated with a decrease of 0.42% in the retention rates.

Similar to the first model, expenditures in instruction per 100 FTE and in-state tuition are positively related to retention rates, although in this case, expenditures per

instruction per 100 FTE was only significant at the 0.05 level. The logarithm of total enrollment was also positively related to retention rates, but this time the relationship was statistically significant. This difference could be due to economies of scale for student support services, which may be achieved as enrollment grows, but additional research would be needed to confirm this hypothesis. On the other hand, the percentage of students receiving federal aid and the percentage of minority students display a negative relation with retention rates.

Once again, academic year and state were used as control variables. Similar to the first model, all the years present a positive coefficient in relation to 2007, but only 2010, 2011 and 2012 are statistically significant. This again could be the result of increased efforts driven by the college completion agenda.

Collinearity

In order to ensure that the regressions conducted are appropriate for this analysis, several post-estimation techniques were used. First, the collinearity of the variables was evaluated. That is, if the predictors are collinear, the estimators could be problematic. To evaluate the collinearity of the variables, the variance inflation factor (VIF) was calculated (Appendix D). A value of 1 in the VIF would be obtained if there was no collinearity between the variables. Generally, values greater than 10 are considered to be a sign of collinearity. The results indicate that the two independent variables of study present a relatively low VIF at 3.83 for the full-time faculty per 100 FTE, and 1.68 for the ratio of part-time to full-time faculty per 100 FTE. Even though the VIF for in-state tuition is high at 9.59, this does not present an issue given that in-state tuition is used as a control variable and it is not collinear with the two variables of interest.

Evaluation of Unusual Data

As was mentioned previously, the analysis conducted using the descriptive statistics and the graphical representations of the bivariate relationships alerted us to the presence of unusual data. It is important to determine to what extent their presence in the analysis has significantly affected the results found, and whether their inclusion has changed the sign and strength of the relationships that were found. STATA provides several postestimation techniques that can be used to identify unusual data points. One of the methods to identify unusual data is to calculate the Cook's distance, which estimates the effects that eliminating an observation could have on the resulting coefficients (StataCorp, 2017). Figures 7 and 8 display Cook's distance for the first and second models respectively, against the unit ID with each marker labeled with the unit id of the record. As noted in both figures, Record 440420, which corresponds to the University of Phoenix-Boston Campus, presents an extremely high value for both models.

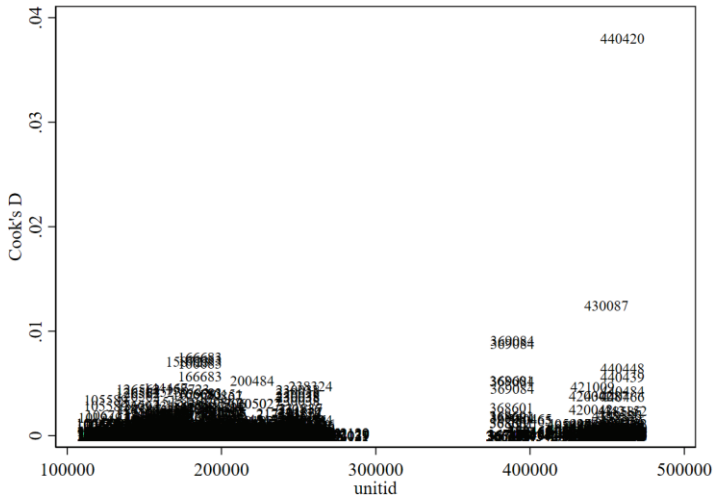

Figure 7. Cook's distance by Unit ID Model 1

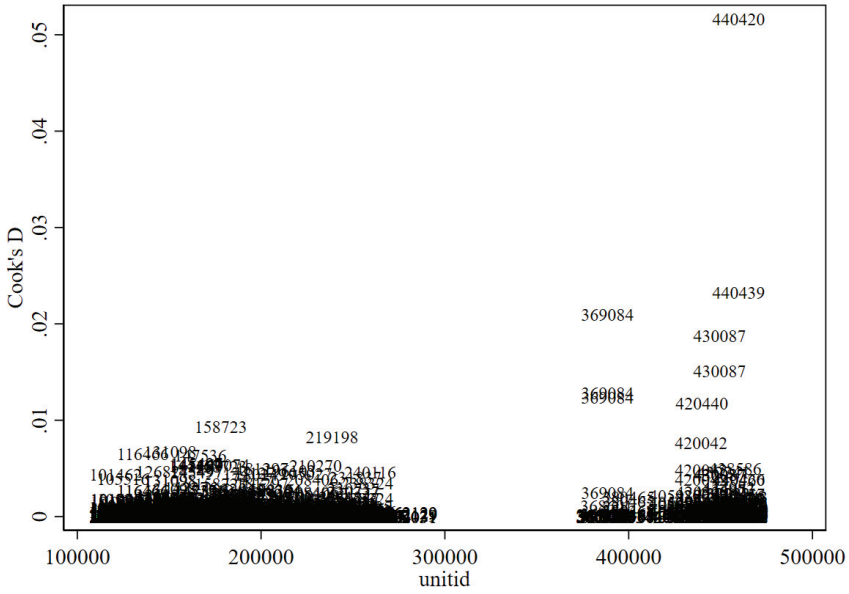

Figure 8. Cook's distance by Unit ID Model 2

Another method to identify unusual data points is to calculate the leverage. This method identifies institutions that display extreme values on the predictor variables. Since both models use the same independent variables, the leverage will be the same for both models. Figure 9 displays the leverage versus the unit id which shows several records that stand out. The institutions that have extreme values in this measure are the University of Phoenix-Hawaii Campus, the University of Alaska Fairbanks, and once again, the University of Phoenix-Boston Campus.

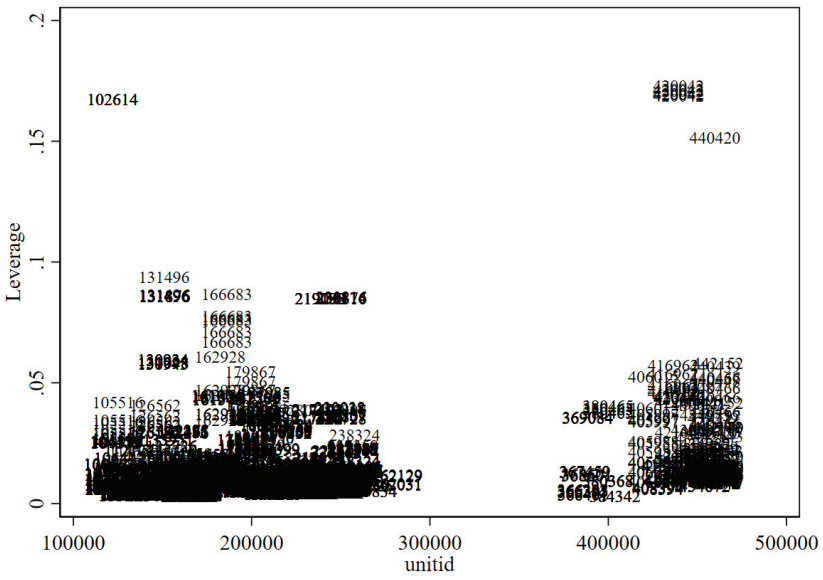

Figure 9. Leverage by Unit ID

Another useful postestimation technique used to identify unusual observations is to generate the DFITS estimate, which according to STATA "attempts to summarize the information in the leverage versus residual-squared plot into one statistic" (Stata 2017, 2264). Using this method, the DFITS statistic were generated for both regressions. As shown in figures 10 and 11, for both models the University of Phoenix-Boston appears to be significantly outside of the main group.

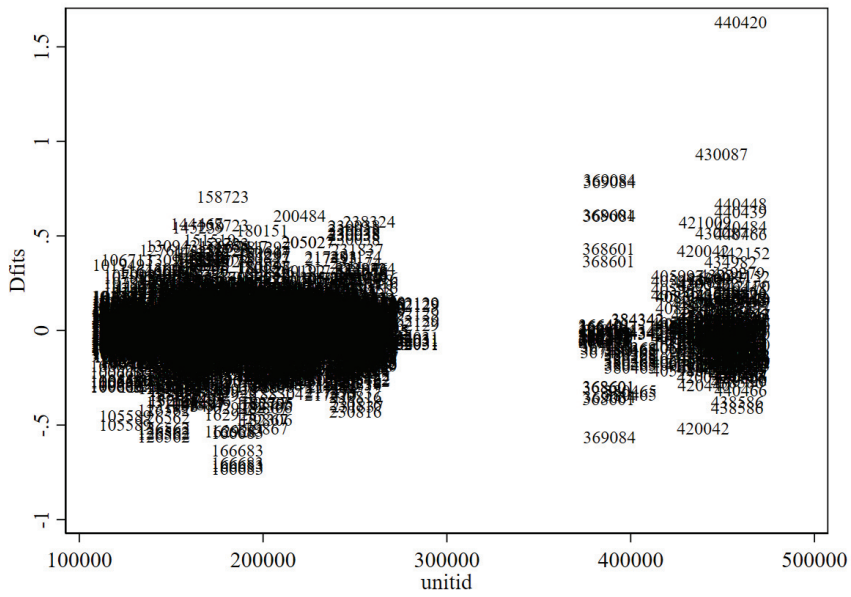

Figure 10. DFITS by Unit ID for Model 1

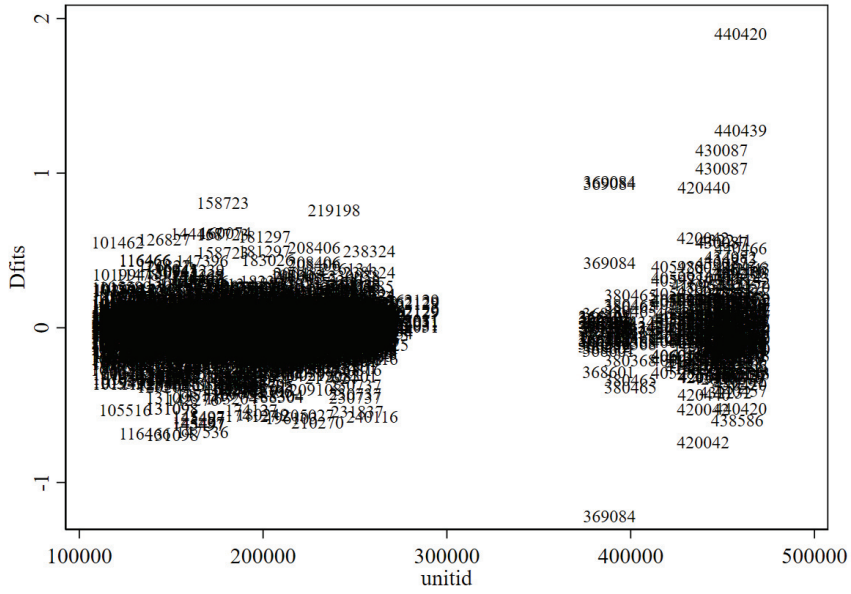

Figure 11. DFITS by Unit ID for Model 2

After using the main techniques to identify unusual data, three institutions were found to present extreme data points, namely the University of Phoenix-Boston Campus, the University of Phoenix-Hawaii Campus, and the University of Alaska Fairbanks. Both

models were then generated excluding the three institutions to determine whether their inclusion in the main analysis significantly affected the results.

Table 4 shows a comparison between the results for model 1 with the complete set of institutions and model 1 excluding the three institutions mentioned above. A complete table listing the results for all the control variables is included in Appendix E.

Table 4:

Model 1 Regression Results: Complete Dataset and Dataset Without Outliers

Variables	Model 1 Complete Dataset	Model 1 Removing Outliers
Full-time Faculty per 100 Full-time Equivalent (FTE)	0.00774*** (-0.000939)	0.00756*** (-0.00094)
Ratio of Part-time Faculty to Full-time Faculty per 100 Full-time Equivalent (FTE)	-0.00590*** (-0.000485)	-0.00670*** (-0.00053)
Expenditures in Instruction per 100 Full-time Equivalent (FTE)	2.54e-08*** (-4.31E-09)	2.58e-08*** (-4.30E-09)
Percentage of students receiving Federal Aid	-0.00103*** (-0.0000767)	-0.00106*** (-0.0000773)
Logarithm Natural (LN) of Total Enrollment	-0.00263 (-0.00212	-0.00263 (-0.00212)
Percentage of Minority Students	-0.198*** (-0.0102)	-0.196*** (-0.0102)
In-state Tuition (2012 dollars)	0.00000971*** (-0.000000412)	0.00000960*** (-0.000000413)
N	6030	6012
R^2	0.765	0.765
adj. R^2	0.762	0.762

p values in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

As the results show, even though the three institutions presented such extreme values, their exclusion from the first model did not change the results in any significant way. Although the coefficients changed slightly, the differences are very small, and the direction and significance of the variables remained the same. Additionally, the R^2, which represent the goodness of fit of the model, remains the same after the exclusion of the three institutions.

The second model was also run excluding the same institutions and the results displayed in Table 5 are very similar to those found with the first model. Once again, the exclusion of the institutions with extreme values did not significantly change the results of the regressions. A complete table including all the control variables is available in the Appendix E.

Table 5:

Model 2 Regression Results: Complete Dataset and Dataset Without Outliers

Variables	Model 2 Complete Dataset	Model 2 Removing Outliers
Full-time Faculty per 100 Full-time Equivalent (FTE)	0.00360***	0.00349***
	(-0.000749)	(-0.000749)
Ratio of Part-time Faculty to Full-time Faculty per 100 Full-time Equivalent (FTE)	-0.00422***	-0.00465***
	(-0.000387)	(-0.000422)
Expenditures in Instruction per 100 Full-time Equivalent (FTE)	9.16e-09**	9.31e-09**
	(-3.44E-09)	(-3.43E-09)
Percentage of students receiving Federal Aid	-0.00107***	-0.00108***
	(-0.0000612)	(-0.0000616)
Logarithm Natural (LN) of Total Enrollment	0.0192***	0.0193***
	(-0.00169)	(-0.00169)
Percentage of Minority Students	-0.0821***	-0.0811***
	(-0.00813)	(-0.00812)

Variables	Model 2 Complete Dataset	Model 2 Removing Outliers
In-state Tuition (2012 dollars)	0.00000585***	0.00000582***
	(-0.000000329)	(-0.000000329)
N	6030	6012
R^2	0.646	0.646
adj. R^2	0.642	0.642

p values in parentheses
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

The next chapter contains a detail examination of the findings, as well as important limitations of this study and future possibilities for research.

Chapter V

DISCUSSION AND CONCLUSIONS

This chapter contains a discussion of the findings, conclusions and considerations for future research that are the subject of this dissertation. The increasing levels of accountability associated with higher education, and the financial pressures due to lower levels of funding have pushed institutions to focus on measures and means of increasing student success, specifically by improving retention and graduation rates. Student success is affected by myriad of factors including academic ability, academic support, engagement, and institutional fit among others. This study proposes that one of those factors is the composition of the faculty. The integral role of faculty in the development of academic and social structures necessary to cultivate students' sense of belonging is sometimes overlooked in the student success discussion. Given that a significant portion of the time students spend on campus is time spent in the classroom, faculty are in a great position to have a significant impact on students' engagement, and therefore their success. This study posits that there are significant differences between part-time and full-time faculty members, which are in turn related to differences in retention and graduations rates.

The exploratory analysis along with the OLS regression analysis showed a positive relationship between the number of full-time faculty per 100 FTE and retention and graduation rates, and a negative relationship between the ratio of part-time to full-time faculty per 100 FTE and retention and graduation rates. Both relationships held even

when controlling for expenditures in instruction per 100 FTE, the percentage of students receiving aid, the logarithm of total enrollment, the percentage of minority students, in-state tuition, type of control, Carnegie classification, HBCU status, HSI status, and whether the institution has a hospital. The results of this study indicate that institutions that maintain a higher percentage of full-time faculty tend to present better retention and graduation rates; findings that are consistent with the original hypotheses.

Although previous research in this area has been conducted using different methodologies and with various levels of scope, the findings of this study align well with the results obtained in other studies. In a study similar to this one, Ehrenberg and Zhang (2005) also found a negative relation between the percentage of part-time faculty and graduation rates. Using data from the College Board from the academic years of 1986–1987 through 2000–2001, coupled with information provided through IPEDS, they found a 2.65% decrease in graduation rates when the number of part-time faculty increased by 10%.

Jaeger and Eagan (2011) used data from a sample of six institutions from the same state using data provided directly by each institution. They calculated the percentage of exposure of full-time students to contingent faculty, and used other variables to account for the propensity of a student to enroll in such courses. Using that information, they conducted probit regressions by institutional type to find the likelihood of a student being retained. Similar to this study, their findings indicate that exposure to contingent faculty was related to a decrease in the student's chance of being retained.

The results obtained Ronco and Cahill (2006) in their analysis of freshman students at one university also compare to the results obtained in this study; however,

they found that the difference in retention was only significant for students that took about 75% or more of their courses with adjuncts and graduate teaching assistants. For the rest of the students, the relationship between exposure to adjuncts and graduate teaching assistants was not significant after controlling for other academic factors.

Both Jaeger and Eagan (2011) and Ronco and Cahill (2006) conducted their studies using records at the student level. This allowed them to explore the characteristics of the students at a deeper level, although the analysis was limited to students in six institutions in the case of Jaeger and Eagan (2011) and only one institution for Ronco and Cahill (2006). In contrast, this study uses data at the institutional level for a large number of institutions, but like Ehrenberg and Zhang's (2005) study it lacks detailed information at the student level which could uncover institutional and student characteristic at play.

As discussed in the introductory remarks, the results from this study provide additional supporting evidence that greater exposure to part-time faculty is negatively related to graduation and retention rates even when analyzing the data from a macrolevel, although institutional results may vary due to specific characteristics of the institution as well as of the students.

Unfortunately, the conditions that result in higher percentages of part-time faculty are often difficult to overcome. As discussed in the literature review, hiring full-time faculty tends to be more expensive, which makes it extremely difficult to make any significant shifts towards a better faculty composition. Given the financial constraints, in the short term institutions should explore options to use their full-time faculty more strategically. As previously discussed, a more significant portion of student departures occurs during the first years when students are taking core courses. Institutions could

consider focusing their faculty assignments on allocating more full-time faculty to lower level courses in order to increase students' chances of developing stronger relationships that can support student success during those crucial years.

Furthermore, it is possible that some negative impact of the effectiveness of part-time faculty could be mitigated to some extent. First, it is important that institutions assess their onboarding and continual support of part-time faculty to ensure that the resources available to them are comparable to those given to full-time faculty. As mentioned in the literature review, part-time faculty report a general lack of support, not only in terms of physical resources but also regarding training and funding for personal development (Eagan et al., 2015; Meixner et al., 2010; Murphy Nutting, 2003). Developing programs that signal greater commitment from the institution towards the faculty member could result in greater faculty satisfaction, as well as stronger buy-in of the vision and mission of the institution. These changes could be in the form of physical resources such as better offices but also more in the form of structural improvements to their support program. As Jacobs (1998) put it, "Although offices, telephones, and perks can make the part-time faculty member's experience more enjoyable, the benefits of inclusion in the culture can make it more satisfying and rewarding, both for the part-time faculty and to those they teach." Additionally, an attempt to standardize the faculty experience for both full- and part-time faculty could result in a more homogenous experience for students. Second, institutions could explore creative ways in which part-time faculty can engage with students outside of the classroom. Although implementing any initiative that increases the number of hours of paid work would be extremely

expensive, it is worth exploring any solutions that could improve the student experience when being taught by a part-time faculty.

Despite the fact that the literature review and the data analysis point to a clear negative relationship between the ratio of part-time to full-time faculty per 100 FTE and retention and graduation rates, it is unclear whether institutions have the capacity to react to significant changes in enrollment without relying heavily on part-time faculty. As an example, consider the average growth in enrollment throughout the analyzed period: year after year the average enrollment grew from 9,110 in 2007 to 10280 in 2011, to conclude only with a small decline to 10,249 in 2012. Limitations in the process of budgetary planning often leave institutions unable to quickly react to enrollment growth. Hiring full-time faculty is a lengthy process that often includes an extensive search process. When institutions experience significant increases in enrollment that are not planned, they may need to rely on part-time faculty to satisfy the instructional needs. It is therefore realistic to expect that institutions will need to maintain a certain percentage of part-time faculty to operate. Enhancements to the support system for part-time faculty could significantly improve their satisfaction as well as the students' outcomes.

In addition to the main hypotheses, this study sheds light into other important findings related to the retention and graduation conundrum that are worthy of mention. First, despite all the efforts, retention and graduation rates did not increase significantly during the period of analysis. Although individually, some institutions have been able to report important increases in their rates, this progress was not the norm. Two possible perspectives from this finding have to do with economic conditions and slow adoption of initiatives that work.

It is clear that many factors affect student behaviors and decisions to remain in college. Even though some of those factors can be affected by the institutions, external forces such as economic conditions have a significant effect in higher education enrollment. As previously discussed, individuals generally tend to enroll in higher education when the economy is not performing well and tend to go back to the labor market during strong economic times. Although this is a known behavior, it is difficult for institutions to entice students to remain enrolled once their economic conditions improve to the point that the opportunity cost of staying in college is too heavy. It is essential then to continue developing flexible programs that allow students to move in an out of the labor market without having to put their education plans on hold. Additionally, higher education must continue to advocate for the long-term impact of a degree versus the short-term investment of time, cost of attendance, and lost wages. If changes in enrollment driven by the economy were not temporary and institutions were able to able to retain those students at a higher rate, this would in turn facilitate the creation of full-time faculty lines potentially affecting retention and graduation.

Second, initiatives that have worked for a college or university may not be scalable to other institutions right away. It is possible that part of the slow pace of progress is merely a matter of time. For early adopters, there is a significant investment in compiling, analyzing, and presenting data before any results can be shared with other colleges and universities. Then, if any other institution wishes to implement the solution presented, they too must spend additional time studying and executing which is dependent on the conditions and resources at their disposal.

Another important finding is that institutions that reported higher expenditures in instruction per 100 FTE, presented higher graduation and retention rates. This relationship does not come as a surprise as it is expected that expenditures in instruction are positively related to increases in academic support and therefore better graduation and retention rates. Although the methods used in this study are not sufficient to determine causality, it is possible that increasing expenditures per instruction results in better graduation and retention rates. The question then could be shifted to determine if institutions are allocating their funds in the right areas, and whether institutions could operate in a more efficient manner by shifting funds from other areas into expenditures used specifically in instruction.

In-state tuition was also positively related to retention and graduation rates. This relationship could be analyzed from two perspectives. First, institutions use tuition revenue for expenditures in instruction, but also in other important areas such as student affairs. Higher tuition rates could result in better retention rates simply due to the availability of more resources. Institutions that have access to greater resources may be able to hire more faculty to reduce the faculty-to-student ratio, provide better student support services, and implement technological improvements that could help student success. Second, the relationship could be simply a result of socioeconomic differences. In other words, students whose families can afford higher tuitions may have attended better high schools, and received better preparation prior to attending college. Increasing tuition is certainly not a tool that should be used to increase retention and graduation rates, as it would likely have a negative impact on access to higher education; however, additional research on this area would be required for a more in-depth analysis.

The size of the institution was also found to be positively related with retention and graduation rates. This relationship could be in part due to the economies of scale that are generated by the high volume of students. Large institutions are more likely to have additional support services and perhaps offer a more robust student experience, which could result in greater engagement outside of the classroom. On the other hand, this higher enrollment could result in larger class sizes and less personalized attention in the classroom. Further research in this area could provide additional information to determine the size of those two opposite effects.

This analysis also shows a difference in graduation and retention rates by Carnegie classification. As evidenced in the exploratory analysis, as well as in the regression analysis, an institution's graduation and retention rates are strongly related with its Carnegie classification. Generally, institutions in different Carnegie classifications exhibit different student body composition, degree offerings, faculty credentials, and other variables not included in this model. As such, there may be other confounding variables that are strong drivers to changes in the variables of interest.

Additionally, institutions experiencing changes in their Carnegie classification sometimes engage in such a dramatic change as part of large mission and vision transformations. Such movements are generally accompanied by new programs and initiatives that, although not required, are certainly expected to match the prospects of what a college in a higher Carnegie classification should look like. Additional research focusing specifically on institutions moving from one Carnegie classification to the next could provide further information into the processes and initiatives that institutions

implement to achieve the new classification, and whether such changes are accompanied by retention and graduation increases.

Upon examination of the dataset, the presence of outliers for the two independent variables was clear. Even though such extreme values generally affect the performance of the regressions, simply removing the institutions from the analysis could result in bias. To avoid this issue, the analysis was performed on the complete dataset as well as a reduced dataset excluding the unusual data points. The regression without the outliers produced slightly larger coefficients for the independent variables across all four models, but the direction and the significance of the independent variables remained the same.

Study Limitations

Because of the nature of this analysis, the relationships found between the variables cannot be construed as causal. In other words, given than this analysis is not an experiment, there is not enough information to determine whether improving the proportion of full-time faculty will result in improvements in graduation and retention rates. Even though the analysis supports the hypotheses, without a true experiment, we cannot rule out the existence of confounding variables that could be the true drivers of the variation on the dependent variables. Although the results of this study indicate that for every additional full-time faculty per 100 FTE, institutions exhibit graduation and retention rates that are respectively 0.77% and 0.36% higher, it cannot be inferred that increasing an institution's full-time faculty per 100 FTE will result in such improvements.

An important factor missing from this analysis is the selectivity of the institution. Unfortunately, the sample of institutions used in this analysis did not provide complete

data on this variable, impeding its inclusion in the model without the elimination of large groups of institutions. Nevertheless, it is likely that selectivity is an important factor in student success as it serves as a proxy for the academic preparedness of the student body of an institution. It is worth mentioning that some institutions have recently decided to stop requiring the submissions of test scores as entrance requirements which would make it even harder to include a selectivity variable in the future.

Finally, this study was conducted by analyzing traits across a variety of institutions in the United States as a whole. It is possible that local institutional factors have a greater impact on an institution's retention and graduation rates.

Future Research

New legislation under the Affordable Care Act (ACA) came in effect in 2014. Among its many provisions, it "requires employers with more than fifty full-time employees to provide health benefits to employees who work thirty hours a week or more" (American Association of University Professors, 2013). Because part-time faculty are generally paid based on the credit hours of the courses they teach, the new ruling presented new challenges for higher education. According to Wilhelm, the American Council on Education proposed two ways for institutions to address the new ruling. The first proposal is to categorize part-time faculty as full-time employees, if their faculty load is equivalent to three quarters of a full-time faculty load. The second proposed solution is to add one hour of preparation to each hour of classroom teaching when calculating the 30 hours threshold (Wilhelm, 2013). It may be too early to determine the possible implications that the ACA may have on the faculty composition of universities across the nation, but it is possible that the impact could be seen in two directions. First, it

could result in a reduction of part-time faculty, which could be compensated with a larger number of full-time faculty lines. On the other hand, this could be addressed by increasing the number of part-time faculty who are employed while reducing the number of courses that they teach. Additional research on this area could focus not only on the percentage of faculty who are hired as part-time employees, but also on the average credit hours taught by a single part-time faculty member. It is possible that instructors who teach only one course are in general less engaged and involved with the campus community, than an instructor teaching two or three courses every term, which could in turn affect retention and graduation rates.

Conclusion

Prediction of retention and graduation rates is a very complicated endeavor. The act of returning to school year after year with the goal of eventually obtaining a college degree is a complex decision for students. Aside from the fact that they must adapt to a new environment full of academic and social challenges, students must also accept the high opportunity cost that attending college represents when comparing it with the wages they give up.

From the theoretical perspective, the literature indicates that a sense of belonging and the ability to engage with the campus community are two factors that significantly affect whether a student decides to return to school. The infrastructure needed to develop a welcoming environment is made up of both social and academic activities that slowly integrate a student into the rest of the campus community. One of the most important interactions is that which occurs with faculty in an out of the classroom.

This research posits that institutions with higher percentages of full-time faculty in their ranks tend to have better retention and graduation rates. Given their availability outside of the classroom, their commitment to the institution as full-time employee, and a more robust support system offered by the institution, full-time faculty are in a better position to engage with students. The results of this study confirm the original hypotheses that there is a negative relation between the ratio of part-time faculty to full-time faculty per 100 FTE and retention and graduation rates, and a positive relation between the number of full-time faculty per 100 FTE and retention and graduation rates. Although the findings of this study support the hypotheses initially established, a significant increase in the number of full-time faculty employed by any given institution is an expensive measure. It is unclear whether administrative leaders are aware of the drawbacks of heavy dependence on part-time faculty and are unable to react due to fiscal restraints and institutional history, or if there is lack of awareness and institutional data to support this claim as it pertains to their institutions. In either case, a study such as this one may act as a catalyst for research in this area. Once institutions analyze their own data using the theoretical tenants discussed here, they will be able to determine if investing in high numbers of full-time faculty is financially feasible considering the potential returns through better retention and graduation rates.

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APPENDIX A:

Descriptive Statistics by Year

Descriptive Statistics for Year 2007

Variables	*N*	Mean	Std. Dev.	Min	Max
Graduation Rate	1,005	0.404562	0.225667	0.023256	1
Full-time Retention Rate	1,005	0.668736	0.148551	0.06	1
Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	4.721126	2.961065	0.180904	50.5234
Ratio of Part-time Faculty to Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	2.383154	5.510029	0.007194	99
Expenditures in Instruction per 100 Full-time Equivalent (FTE)	1,005	742523.6	623458.3	72936.56	9772438
Percentage of students receiving Federal Aid	1,005	0.327085	0.169479	0	0.93
Total Enrollment	1,005	9110.557	14457.96	81	225962
Logarithm Natural (LN) of Total Enrollment	1,005	8.45904	1.165971	4.394449	12.32812
Percentage of Minority Students	1,005	0.33193	0.220072	0	1
In-state Tuition (2012 dollars)	1,005	10806.91	9946.638	566.2984	40164.82

Descriptive Statistics for Year 2008

Variables	N	Mean	Std. Dev.	Min	Max
Graduation Rate	1,005	0.406243	0.228047	0.016194	0.980568
Full-time Retention Rate	1,005	0.668623	0.152205	0.05	1
Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	4.735791	2.883476	0.46729	46.03559
Ratio of Part-time Faculty to Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	2.45916	5.263528	0.013158	59.58824
Expenditures in Instruction per 100 Full-time Equivalent (FTE)	1,005	751143.6	623837.1	77630.21	8355147
Percentage of students receiving Federal Aid	1,005	0.35195	0.172326	0	1
Total Enrollment	1,005	9286.491	14889.45	76	232960
Logarithm Natural (LN) of Total Enrollment	1,005	8.471036	1.171358	4.330733	12.35862
Percentage of Minority Students	1,005	0.341035	0.221559	0	1
In-state Tuition (2012 dollars)	1,005	11011.27	10194.67	515.9668	40970.99

Descriptive Statistics for Year 2009

Variables	N	Mean	Std. Dev.	Min	Max
Graduation Rate	1,005	0.411941	0.228872	0.017857	1
Full-time Retention Rate	1,005	0.673731	0.14572	0.04	0.99
Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	4.7044	2.963934	0.508647	48.36
Ratio of Part-time Faculty to Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	1.958253	2.409018	0.013699	39.75
Expenditures in Instruction per 100 Full-time Equivalent (FTE)	1,005	751252.5	643566	24230.48	9005971
Percentage of students receiving Federal Aid	1,005	0.36598	0.173908	0	1
Total Enrollment	1,005	9587.921	15528.59	95	244273
Logarithm Natural (LN) of Total Enrollment	1,005	8.495978	1.179895	4.553877	12.40604
Percentage of Minority Students	1,005	0.348773	0.22018	0.001835	0.998621
In-state Tuition (2012 dollars)	1,005	11442.96	10665.15	508.8615	42627.76

Descriptive Statistics for Year 2010

Variables	*N*	Mean	Std. Dev.	Min	Max
Graduation Rate	1,005	0.410117	0.22681	0.037957	0.976
Full-time Retention Rate	1,005	0.674579	0.148915	0	1
Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	4.508338	2.955881	0.266785	45.37744
Ratio of Part-time Faculty to Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	2.085642	3.024817	0.022222	53.5
Expenditures in Instruction per 100 Full-time Equivalent (FTE)	1,005	739157.9	627961	122247	8957424
Percentage of students receiving Federal Aid	1,005	0.437652	0.19104	0	1
Total Enrollment	1,005	10063.02	16251.29	103	259515
Logarithm Natural (LN) of Total Enrollment	1,005	8.550628	1.175511	4.634729	12.46657
Percentage of Minority Students	1,005	0.361813	0.225067	0	0.99793
In-state Tuition (2012 dollars)	1,005	11786.2	10984.66	572.233	44025.19

Descriptive Statistics for Year 2011

Variables	*N*	Mean	Std. Dev.	Min	Max
Graduation rate	1,005	0.410903	0.227558	0.031519	1
Full-time retention rate	1,005	0.678627	0.147056	0	1
Full-time faculty per 100 full-time equivalent (FTE)	1,005	4.477638	3.021297	0.2792	47.2459
Ratio of part-time faculty to full-time faculty per 100 full-time equivalent (FTE)	1,005	2.08658	2.307084	0.017391	26.66667
Expenditures in instruction per 100 full-time equivalent (FTE)	1,005	741825.7	627310.8	116809.9	9241655
Percentage of students receiving Federal Aid	1,005	0.47804	0.188721	0	0.98
Total enrollment	1,005	10280.28	16610.2	102	262321
Logarithm natural (LN) of total enrollment	1,005	8.572275	1.173694	4.624973	12.47732
Percentage of minority students	1,005	0.372033	0.223275	0	0.998092
In-state tuition (2012 dollars)	1,005	12120.58	11194.73	642.2836	44572.84

Descriptive Statistics for Year 2012

Variables	N	Mean	Std. Dev.	Min	Max
Graduation Rate	1,005	0.411574	0.227809	0.018349	0.989899
Full-time Retention Rate	1,005	0.679552	0.145409	0.09	1
Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	4.562969	3.062571	0.141543	47.87412
Ratio of Part-time Faculty to Full-time Faculty per 100 Full-time Equivalent (FTE)	1,005	2.104351	3.031932	0.0301	62
Expenditures in Instruction per 100 Full-time Equivalent (FTE)	1,005	746598.3	642270.3	131066.1	9561755
Percentage of students receiving Federal Aid	1,005	0.486129	0.196539	0	1
Total Enrollment	1,005	10249.01	16797.02	90	272128
Logarithm Natural (LN) of Total Enrollment	1,005	8.560565	1.182807	4.49981	12.51403
Percentage of Minority Students	1,005	0.379039	0.221058	0	0.996936
In-state Tuition (2012 dollars)	1,005	12353.93	11280.69	658	45290

APPENDIX B:

Correlations

Dependent, Independent and Control Variables: Correlations

Variables	Graduation Rate	Full-time Retention Rate	Full-Time Faculty per 100 FTE	Ratio of Part-Time to Full-Time Faculty per 100 FTE	Expenditures In Instruction per 100 FTE
Graduation Rate	1				
Full-time Retention Rate	0.782***	1			
Full-Time Faculty per 100 FTE	0.595***	0.504***	1		
Ratio of Part-Time to Full-Time Faculty per 100 FTE	-0.289***	-0.337***	-0.300***	1	
Expenditures In Instruction per 100 FTE	0.554***	0.501***	0.786***	-0.200***	1
Percentage of Students Receiving Federal Aid	-0.461***	-0.542***	-0.310***	0.337***	-0.320***
Logarithm of Total Enrollment	-0.0126	0.233***	-0.0447***	-0.0553***	0.115***
Percentage of Minority Students	-0.248***	-0.185***	-0.0791***	0.229***	0.0011
In-State Tuition	0.691***	0.502***	0.501***	-0.0743***	0.503***
Control	0.326***	0.0759***	0.155***	0.307***	0.133***
Carnegie Classification	-0.557***	-0.545***	-0.392***	0.149***	-0.360***
Institution is HBCU	0.108***	0.0838***	-0.0294*	0.0701***	0.0188
Institution is HIS	-0.00298	0.00803	-0.0136	-0.018	-0.0053
Institution has a Hospital	-0.149***	-0.166***	-0.252***	0.0357**	-0.183***
Academic Year	0.0101	0.0280*	-0.0289*	-0.0304*	-0.00152
State	0.0450***	0.0346**	0.0251	-0.0173	0.0256*

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Dependent, Independent and Control Variables: Correlations

Variables	Graduation Rate	Full-time Retention Rate	Full-Time Faculty per 100 FTE	Ratio of Part-Time to Full-Time Faculty per 100 FTE	Expenditures In Instruction per 100 FTE
Graduation Rate	1				
Full-time Retention Rate	0.782***	1			
Full-Time Faculty per 100 FTE	0.595***	0.504***	1		
Ratio of Part-Time to Full-Time Faculty per 100 FTE	-0.289***	-0.337***	-0.300***	1	
Expenditures In Instruction per 100 FTE	0.554***	0.501***	0.786***	-0.200***	1
Percentage of Students Receiving Federal Aid	-0.461***	-0.542***	-0.310***	0.337***	-0.320***
Logarithm of Total Enrollment	-0.0126	0.233***	-0.0447***	-0.0553***	0.115***
Percentage of Minority Students	-0.248***	-0.185***	-0.0791***	0.229***	0.0011
In-State Tuition	0.691***	0.502***	0.501***	-0.0743***	0.503***
Control	0.326***	0.0759***	0.155***	0.307***	0.133***
Carnegie Classification	-0.557***	-0.545***	-0.392***	0.149***	-0.360***
Institution is HBCU	0.108***	0.0838***	-0.0294*	0.0701***	0.0188
Institution is HIS	-0.00298	0.00803	-0.0136	-0.018	-0.0053
Institution has a Hospital	-0.149***	-0.166***	-0.252***	0.0357**	-0.183***
Academic Year	0.0101	0.0280*	-0.0289*	-0.0304*	-0.00152
State	0.0450***	0.0346**	0.0251	-0.0173	0.0256*

*$p < 0.05$, **$p < 0.01$, **$p < 0.001$

Dependent, Independent and Control Variables: Correlations

Variables	Percentage of Students Receiving Federal Aid	Logarithm of Total Enrollment	Percentage of Minority Students	In-State Tuition	Control
Percentage of Students Receiving Aid	1				
Logarithm of Total Enrollment	-0.250***	1			
Percentage of Minority Students	0.358***	0.121***	1		
In-State Tuition	-0.249***	-0.300***	-0.0707***	1	
Control	0.180***	-0.501***	0.133***	0.721***	1
Carnegie Classification	0.278***	-0.382***	0.0342**	-0.297***	-0.0625***
Institution is HBCU	-0.197***	0.0478***	-0.426***	0.105***	0.0914***
Institution is HIS	0.0137	0.0339**	0.118***	-0.00956	-0.0164
Institution has a Hospital	0.0927***	-0.211***	-0.00308	-0.0204	0.0553***
Academic Year	0.189***	0.0360**	0.0749***	0.0519***	0
State	-0.0153	-0.0672***	-0.129***	0.0813***	0.0478***

*$p < 0.05$, **$p < 0.01$, **$p < 0.001$

Dependent, Independent and Control Variables: Correlations

Variables	Carnegie Classification	Institution is HBCU	Institution is HIS	Institution has a Hospital	Academic Year	State
Carnegie Classification	1					
Institution is HBCU	0.0743***	1				
Institution is HIS	-0.0776***	0.019	1			
Institution has a Hospital	0.218***	-0.0261*	-0.0481***	1		
Academic Year	0	0	0	-0.00503	1	
State	-0.0242	0.0532***	0.0218	0.0181	0	1

*$p < 0.05$, **$p < 0.01$, **$p < 0.001$

APPENDIX C:

Results of Regression Analysis

Model 1: Graduate Rates versus Full-Time Faculty per 100 FTE and Ratio of Part-Time to Full-Time Faculty per 100 FTE plus Control Variables

Variables	b	t	p
Full-Time Faculty per 100 FTE	.00774***	8.24	2.02E-16
Ratio of Part-Time to Full-Time Faculty per 100 FTE	-.0059***	-12.2	1.13E-33
Expenditures In Instruction per 100 FTE	2.54e-08***	5.91	3.71E-09
Percentage of Students Receiving Federal Aid	-.00103***	-13.4	1.77E-40
Logarithm of Total Enrollment	-0.00263	-1.24	0.214
Percentage of Minority Students	-.198***	-19.4	1.29E-81
In-State Tuition	9.71e-06***	23.6	2.20E-117
Public (Control=1)	0	.	.
Private nonprofit (Control=2)	-.0621***	-6.97	3.48E-12
Private for profit (Control=3)	-0.00597	-0.505	0.614
Research/Doctoral Institution (Carnegie Classification=1)	0	.	.
Master Institution (Carnegie Classification=2)	-.0706***	-12.3	3.95E-34
Bachelor's Institution (Carnegie Classification=3)	-.0998***	-14.4	3.86E-46
Associate's Institution (Carnegie Classification=4)	-.242***	-37.5	6.10E-276
Other (Carnegie Classification = 5)	-.109***	-11.2	6.01E-29
Institution is Historically Black College or University (1)	0	.	.
Institution is not Historically Black College or University (2)	-0.00876	-0.862	0.389
Institution is not Hispanic Serving (0)	0	.	.
Institution is Hispanic Serving (1)	-0.0095	-0.617	0.537
Institution has a hospital (1)	0	.	.
Institution does not have a hospital (2)	-0.0136	-1.15	0.25
Academic Year 2007	0	.	.
Academic Year 2008	0.00482	0.972	0.331
Academic Year 2009	0.0087	1.74	0.0813
Academic Year 2010	.014**	2.75	0.0059
Academic Year 2011	.0154**	3.01	0.00266
Academic Year 2012	.0154**	2.99	0.00282
Reference State IL		.	.
State AK	-.257***	-5.61	2.15E-08
State AL	-0.00905	-0.948	0.343
State AR	-0.0116	-0.867	0.386
State AZ	-.0347*	-1.92	0.0545
State CA	.0856***	10.4	5.48E-25
State CO	-.0482**	-3.56	0.000373

Variables	b	t	p
State DC	0.0274	0.838	0.402
State DE	0.0106	0.393	0.694
State FL	.0321*	2.98	0.00293
State GA	.0461**	4.28	0.0000192
State HI	-0.0263	-0.568	0.57
State IA	0.021	1.63	0.103
State ID	-.129***	-6.59	4.85E-11
State IN	-.0605***	-6.07	1.39E-09
State KS	0.000801	0.0622	0.95
State KY	-.0649***	-4.96	7.21E-07
State LA	-0.0138	-1.09	0.278
State MA	-0.006	-0.613	0.54
State MD	-.0371**	-3.73	0.000196
State ME	-0.00268	-0.115	0.908
State MI	-.0322***	-3.38	0.000739
State MN	0.00834	0.952	0.341
State MO	-.0403***	-3.87	0.00011
State MS	0.0198	1.16	0.244
State MT	0.0000274	0.00168	0.999
State NC	-0.0026	-0.283	0.777
State ND	0.0264	1.36	0.174
State NE	.0771***	3.63	0.000281
State NH	-0.00813	-0.387	0.699
State NJ	0.0182	1.84	0.0664
State NM	0.0183	0.905	0.365
State NV	-.114***	-4.87	1.12E-06
State NY	.0456***	5.89	4.06E-09
State OH	-.0362***	-3.88	0.000105
State OK	-.0569***	-4.02	0.0000578
State OR	-.0762***	-6.21	5.72E-10
State PA	0.012	1.54	0.124
State RI	0.0445	2.12	0.0341
State SC	0.0107	0.828	0.408
State SD	-.0378*	-1.16	0.246
State TN	-.0749***	-6.94	4.24E-12
State TX	-.0321***	-3.81	0.00014
State UT	-0.00722	-0.338	0.735
State VA	0.0012	0.134	0.893
State VT	-.0881**	-2.69	0.00718
State WA	0.0084	0.722	0.47
State WI	0.0128	0.972	0.331
State WV	-.0723***	-4.22	0.0000251
Constant	.558***	20.3	1.26E-88

Variables	b	t	p
Observation	6030		
R^2	0.765		
p value	0.000***		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Model 2: Full-Time Retention Rates versus Full-Time Faculty per 100 FTE and Ratio of Part-Time to Full-Time Faculty per 100 FTE plus Control Variables

Variables	b	t	p
Full-Time Faculty per 100 FTE	.0036***	3.69	0.000228
Ratio of Part-Time to Full-Time Faculty per 100 FTE	-.00422***	-4.29	0.0000181
Expenditures In Instruction per 100 FTE	9.16e-09*	2.25	0.0247
Percentage of Students Receiving Federal Aid	-.00107***	-11.2	6.01E-29
Logarithm of Total Enrollment	.0192***	9.17	6.55E-20
Percentage of Minority Students	-.0821***	-7.89	3.68E-15
In-State Tuition	5.85e-06***	15.5	6.85E-53
Public (Control=1)	0	.	.
Private nonprofit (Control=2)	-.0528***	-6.39	1.78E-10
Private for profit (Control=3)	-.0656***	-4.33	0.0000153
Research/Doctoral Institution (Carnegie Classification=1)	0	.	.
Master Institution (Carnegie Classification=2)	-.0375***	-8.37	7.16E-17
Bachelor's Institution (Carnegie Classification=3)	-.0434***	-7.33	2.59E-13
Associate's Institution (Carnegie Classification=4)	-.12***	-22.4	1.60E-106
Other (Carnegie Classification = 5)	-.073***	-6.12	9.96E-10
Institution is Historically Black College or University	0	.	.
Institution is not Historically Black College or University	-0.00926	-1.02	0.309
Institution is not Hispanic Serving	0	.	.
Institution is Hispanic Serving	-0.0114	-0.881	0.378
Institution has a hospital	0	.	.
Institution does not have a hospital	-0.0129	-1.54	0.123
Academic Year 2007	0	.	.
Academic Year 2008	0.00268	0.675	0.499
Academic Year 2009	0.00704	1.81	0.0708
Academic Year 2010	.0125**	2.97	0.00301
Academic Year 2011	.0168***	4.04	0.0000541
Academic Year 2012	.0178***	4.23	0.0000233
Reference State IL			
State AK	-0.0215	-0.588	0.556
State AL	0.0112	1.47	0.143
State AR	-0.00504	-0.474	0.636
State AZ	-0.0221	-1.53	0.125
State CA	.0759***	11.5	2.14E-30
State CO	0.0154	1.43	0.154

Variables	b	t	p
State DC	0.0271	1.04	0.3
State DE	-0.0313	-1.46	0.145
State FL	.0426***	4.96	7.28E-07
State GA	.0476***	5.53	3.42E-08
State HI	0.0616	1.67	0.0956
State IA	0.0103	1	0.317
State ID	-.057***	-3.66	0.000253
State IN	-.0233**	-2.7	0.00697
State KS	-0.00991	-1.28	0.202
State KY	-.0255**	-2.93	0.00338
State LA	0.021	1.67	0.095
State MA	.0233**	3.15	0.00162
State MD	.0193*	2.34	0.0191
State ME	0.0315	1.51	0.132
State MI	.0212**	2.87	0.00415
State MN	-0.00879	-1.16	0.244
State MO	-0.0151	-1.61	0.107
State MS	.0618***	6.41	1.55E-10
State MT	-.037**	-2.74	0.0062
State NC	.0401***	4.72	2.40E-06
State ND	.0338*	2.19	0.0289
State NE	.0667***	4.2	0.0000273
State NH	0.0088	0.558	0.577
State NJ	.0555***	8.66	6.13E-18
State NM	0.0204	0.683	0.494
State NV	0.00642	0.405	0.686
State NY	.0518***	7.58	4.08E-14
State OH	-.025**	-3.04	0.00234
State OK	-.0348***	-3.38	0.000721
State OR	-.0286*	-2.2	0.028
State PA	.0295***	4.77	1.92E-06
State RI	.0673***	5.65	1.69E-08
State SC	.0244**	3.04	0.00241
State SD	0.0259	1.09	0.274
State TN	-0.00879	-1.2	0.231
State TX	0.0105	1.45	0.148
State UT	-0.0119	-0.623	0.533
State VA	.0282***	4.1	0.0000411
State VT	-0.0221	-1.81	0.0697
State WA	0.0129	1.65	0.099
State WI	0.0143	1.19	0.236
State WV	-.0189*	-2.01	0.0445
Constant	.583***	22	1.30E-103

Variables	b	t	p
Observation	6030		
R^2	0.646		
p value	0.000***		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

APPENDIX D:

Collinearity

Collinearity

Variable	VIF	1/VIF
Full-Time Faculty per 100 FTE	3.83	0.261315
Ratio of Part-Time to Full-Time Faculty per 100 FTE	1.68	0.5954
Expenditures In Instruction per 100 FTE	3.62	0.276293
Percentage of Students Receiving Federal Aid	2.09	0.479277
Logarithm of Total Enrollment	3.03	0.330478
Percentage of Minority Students	2.52	0.397541
In-State Tuition	9.59	0.104254
Public (Control=1)		
Private nonprofit (Control=2)	8.04	0.124386
Private for profit (Control=3)	3.37	0.297084
Research/Doctoral Institution (Carnegie Classification=1)		
Master Institution (Carnegie Classification=2)	3.08	0.324631
Bachelor's Institution (Carnegie Classification=3)	3.27	0.305891
Associate's Institution (Carnegie Classification=4)	4.82	0.207324
Other (Carnegie Classification = 5)	2.14	0.466859
Institution is not Historically Black College or University	1.7	0.588687
Institution is Hispanic Serving	1.14	0.874609
Institution does not have a hospital	1.25	0.798426
Academic Year 2007		
Academic Year 2008	1.67	0.598335
Academic Year 2009	1.7	0.589901
Academic Year 2010	1.75	0.572304
Academic Year 2011	1.78	0.562148
Academic Year 2012	1.8	0.556434
Reference State IL		
State AK	1.02	0.976966
State AL	1.46	0.684264
State AR	1.2	0.834383
State AZ	1.1	0.909165
State CA	1.93	0.517245
State CO	1.23	0.810566
State DC	1.04	0.958358
State DE	1.05	0.949471
State FL	1.33	0.754432
State GA	1.33	0.752926
State HI	1.05	0.956345
State IA	1.19	0.838064
State ID	1.11	0.902329
State IN	1.36	0.732642
State KS	1.19	0.837191
State KY	1.23	0.81219
State LA	1.24	0.80774
State MA	1.36	0.737049

Variable	VIF	1/VIF
State MD	1.36	0.733047
State ME	1.05	0.952006
State MI	1.37	0.728368
State MN	1.47	0.678743
State MO	1.34	0.748435
State MS	1.12	0.890482
State MT	1.17	0.858103
State NC	1.5	0.666425
State ND	1.1	0.911421
State NE	1.09	0.916581
State NH	1.07	0.933678
State NJ	1.39	0.720774
State NM	1.18	0.846117
State NV	1.07	0.935777
State NY	1.72	0.581087
State OH	1.39	0.718067
State OK	1.16	0.865294
State OR	1.23	0.814258
State PA	1.66	0.603056
State RI	1.07	0.935101
State SC	1.21	0.827343
State SD	1.03	0.967142
State TN	1.28	0.783963
State TX	1.65	0.60741
State UT	1.1	0.905873
State VA	1.43	0.701456
State VT	1.04	0.958611
State WA	1.23	0.81432
State WI	1.18	0.850212
State WV	1.14	0.879988
Mean VIF	1.8	

APPENDIX E:

Results of Regression Analysis Excluding Outliers

Model 1: Graduate Rates Versus Full-Time Faculty per 100 FTE and Ratio of Part-Time to Full-Time Faculty per 100 FTE plus Control Variables Excluding Outliers

Variables	b	t	p
Full-Time Faculty per 100 FTE	.00756***	8.05	1.03E-15
Ratio of Part-Time to Full-Time Faculty per 100 FTE	-.0067***	-12.7	2.90E-36
Expenditures In Instruction per 100 FTE	2.58e-08***	6	2.09E-09
Percentage of Students Receiving Aid	-.00106***	-13.6	8.85E-42
Logarithm of Total Enrollment	-0.00263	-1.24	0.214
Percentage of Minority Students	-.196***	-19.2	1.02E-79
In-State Tuition	9.60e-06***	23.3	1.10E-114
Public (Control=1)	0	.	.
Private nonprofit (Control=2)	-.0601***	-6.75	1.62E-11
Private for profit (Control=3)	0.00345	0.288	0.773
Research/Doctoral Institution (Carnegie Classification=1)	0	.	.
Master Institution (Carnegie Classification=2)	-.0705***	-12.2	4.48E-34
Bachelor's Institution (Carnegie Classification=3)	-.0999***	-14.4	2.72E-46
Associate's Institution (Carnegie Classification=4)	-.242***	-37.4	3.00E-275
Other (Carnegie Classification = 5)	-.108***	-11.1	2.53E-28
Institution is Historically Black College or University	0	.	.
Institution is not Historically Black College or University	-0.00755	-0.744	0.457
Institution is not Hispanic Serving	0	.	.
Institution is Hispanic Serving	-0.00993	-0.645	0.519
Institution has a hospital	0	.	.
Institution does not have a hospital	-0.014	-1.18	0.237
Academic Year 2007	0	.	.
Academic Year 2008	0.00525	1.06	0.29
Academic Year 2009	0.00895	1.79	0.0731
Academic Year 2010	.0146**	2.87	0.00409
Academic Year 2011	.0161**	3.15	0.00165
Academic Year 2012	.0161**	3.14	0.00172
Reference State IL			
State AL	-0.00888	-0.93	0.352
State AR	-0.0116	-0.873	0.382
State AZ	-0.034	-1.89	0.0592
State CA	.0848***	10.3	1.45E-24
State CO	-.0465***	-3.44	0.000595
State DC	0.0278	0.849	0.396

Variables	b	t	p
State DE	0.0103	0.384	0.701
State FL	.0318**	2.95	0.0032
State GA	.0457***	4.24	2.28E-05
State IA	0.0212	1.65	0.0993
State ID	-.128***	-6.55	6.28E-11
State IN	-.0602***	-6.04	1.61E-09
State KS	0.000997	0.0775	0.938
State KY	-.0648***	-4.96	7.16E-07
State LA	-0.0143	-1.13	0.259
State MA	-0.004	-0.405	0.686
State MD	-.0365***	-3.66	0.000254
State ME	-0.00143	-0.0614	0.951
State MI	-.0314***	-3.3	0.000976
State MN	0.00803	0.917	0.359
State MO	-.0397***	-3.82	0.000137
State MS	0.0194	1.14	0.255
State MT	-0.0006	-0.0366	0.971
State NC	-0.00257	-0.28	0.779
State ND	0.0258	1.33	0.183
State NE	.0765***	3.61	0.000311
State NH	-0.00751	-0.358	0.72
State NJ	0.0184	1.86	0.0633
State NM	0.0169	0.84	0.401
State NV	-.114***	-4.85	1.25E-06
State NY	.0452***	5.85	5.03E-09
State OH	-.0353***	-3.79	0.000151
State OK	-.0568***	-4.02	5.95E-05
State OR	-.0753***	-6.13	9.21E-10
State PA	0.012	1.54	0.125
State RI	.0442*	2.1	0.0354
State SC	0.0104	0.805	0.421
State SD	-0.0378	-1.16	0.246
State TN	-.075***	-6.95	3.95E-12
State TX	-.0323***	-3.83	0.00013
State UT	-0.00792	-0.371	0.71
State VA	0.00165	0.185	0.853
State VT	-.0866**	-2.65	0.00811
State WA	0.0084	0.723	0.47
State WI	0.0131	0.993	0.321
State WV	-.0721***	-4.21	2.57E-05
Constant	.559***	20.3	5.59E-89
Observation	6012		
R^2	0.765		

Variables	b	t	p
p value	0.000***		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Model 2: Full-Time Retention Rates versus Full-Time Faculty per 100 FTE and Ratio of Part-Time to Full-Time Faculty per 100 FTE plus Control Variables Excluding Outliers

Variables	b	t	p
Full-Time Faculty per 100 FTE	.00349***	4.66	3.24E-06
Ratio of Part-Time to Full-Time Faculty per 100 FTE	-.00465***	-11	5.72E-28
Expenditures In Instruction per 100 FTE	9.31e-09**	2.71	0.00666
Percentage of Students Receiving Federal Aid	-.00108***	-17.5	1.10E-66
Logarithm of Total Enrollment	.0193***	11.4	5.29E-30
Percentage of Minority Students	-.0811***	-9.99	2.68E-23
In-State Tuition	5.82e-06***	17.7	1.98E-68
Public (Control=1)	0	.	.
Private nonprofit (Control=2)	-.0521***	-7.34	2.43E-13
Private for profit (Control=3)	-.0612***	-6.41	1.53E-10
Research/Doctoral Institution (Carnegie Classification=1)	0	.	.
Master Institution (Carnegie Classification=2)	-.0373***	-8.14	4.86E-16
Bachelor's Institution (Carnegie Classification=3)	-.0434***	-7.85	4.81E-15
Associate's Institution (Carnegie Classification=4)	-.12***	-23.4	1.90E-115
Other (Carnegie Classification = 5)	-.0723***	-9.35	1.21E-20
Institution is Historically Black College or University	0	.	.
Institution is not Historically Black College or University	-0.00875	-1.08	0.28
Institution is not Hispanic Serving	0	.	.
Institution is Hispanic Serving	-0.0116	-0.948	0.343
Institution has a hospital	0	.	.
Institution does not have a hospital	-0.0131	-1.39	0.164
Academic Year 2007	0	.	.
Academic Year 2008	0.00337	0.854	0.393
Academic Year 2009	0.00738	1.86	0.0635
Academic Year 2010	.0128**	3.16	0.00157
Academic Year 2011	.017***	4.16	3.22E-05
Academic Year 2012	.0179***	4.37	1.25E-05
Reference State IL			
State AL	0.0113	1.49	0.136
State AR	-0.00498	-0.469	0.639
State AZ	-0.0216	-1.5	0.133
State CA	.0756***	11.5	2.98E-30

Variables	b	t	p
State CO	0.0165	1.53	0.126
State DC	0.0272	1.04	0.297
State DE	-0.0313	-1.46	0.143
State FL	.0426***	4.97	6.90E-07
State GA	.0475***	5.53	3.35E-08
State IA	0.0104	1.02	0.309
State ID	-.0565***	-3.63	0.000281
State IN	-.0231**	-2.92	0.00355
State KS	-0.00969	-0.946	0.344
State KY	-.0254*	-2.44	0.0146
State LA	.0209*	2.07	0.0388
State MA	.0238**	3.02	0.00255
State MD	.0197*	2.49	0.0129
State ME	0.0322	1.74	0.0824
State MI	.0216**	2.85	0.0044
State MN	-0.00894	-1.28	0.2
State MO	-0.0146	-1.77	0.077
State MS	.0617***	4.55	5.56E-06
State MT	-.037**	-2.84	0.0045
State NC	.0402***	5.51	3.82E-08
State ND	.0337*	2.18	0.0293
State NE	.0666***	3.94	0.0000813
State NH	0.009	0.538	0.59
State NJ	.0556***	7.06	1.84E-12
State NM	0.02	1.25	0.213
State NV	0.00696	0.373	0.709
State NY	.0517***	8.4	5.68E-17
State OH	-.0246***	-3.31	0.000941
State OK	-.0346**	-3.07	0.00215
State OR	-.0279**	-2.86	0.00429
State PA	.0295***	4.73	2.29E-06
State RI	.0671***	4.01	0.0000607
State SC	.0244*	2.36	0.0181
State SD	0.0261	1	0.315
State TN	-0.00877	-1.02	0.307
State TX	0.0106	1.58	0.115
State UT	-0.0121	-0.713	0.476
State VA	.0284***	3.99	0.0000659
State VT	-0.0215	-0.824	0.41
State WA	0.013	1.41	0.159
State WI	0.0146	1.38	0.167
State WV	-0.0187	-1.37	0.17
Constant	.583***	26.6	7.90E-148

Variables	b	t	p
Observation	6012		
R^2	0.646		
p value	0.000***		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$