J. COLLEGE STUDENT RETENTION, Vol. 10(3) 265-286, 2008-2009

THE EFFECTS OF PART-TIME FACULTY ON FIRST SEMESTER FRESHMEN RETENTION: A PREDICTIVE MODEL USING LOGISTIC REGRESSION

AUDREY J. JAEGER, PH.D.
North Carolina State University, Raleigh

DERIK HINZ, M.S.

ABSTRACT

Part-time faculty clearly serve a valuable purpose in higher education; however, their increased use raises concerns for administrators, faculty, and policy makers. Part-time faculty members spend a greater proportion of their overall time teaching, but the initial evidence suggests that these instructors are less available to students and are less engaged with the campus environment. Recent research attempts to connect part-time faculty utilization to student outcomes. This study explored the effects of exposure to part-time faculty instruction on student retention. Typical first-year students entering the study institution between 1999 and 2003 received over one-quarter of their total first-year instruction from part-time faculty. Furthermore, results show that as exposure to part-time faculty instruction increases, the odds of being retained decrease. Because the use of part-time faculty varies based on institutional type, additional research should focus on diverse institutional settings.

INTRODUCTION

Part-time faculty are an integral asset to higher education institutions (Gappa & Leslie, 1993), yet they are often portrayed as less qualified and less committed than their full-time counterparts. Recent research attempts to connect part-time

doi: 10.2190/CS.10.3.b
http://baywood.com

faculty utilization to student outcomes, in particular retention (Harrington & Schibik, 2004). Despite the lack of knowledge on the effects of part-time faculty on student outcome—part-time faculty members continue to teach large numbers of first-year students—little is known about their affect on student performance and retention. Focusing on decisions of first-year students is critical given that the typical 4-year college or university loses 26% of its students between the first and second years, and approximately 60% of the students who drop out of any given cohort of entering students do so in the first year (Terenzini & Reason, 2005). The first year of college is foundational for securing a return-on-investment for students, parents, the institution, the state, and society.

A considerable body of research addresses student retention. These studies portray student retention as a complex issue that involves the interaction of different variables including gender, race, ethnicity, and age as well as complex psychological variables such as intention and commitment (Braxton, Hirschy, & McClendon, 2004; Pascarella & Terenzini. 2005; Seidman, 2005; Tinto, 1993). One potential factor affecting freshman retention that has received little attention is the employment status of faculty. Researchers (Pascarella & Terenzini, 2005; Tinto, 1993) assert that the formal and informal academic and social experiences of students affect retention. However, the literature does not address the relationship between student retention and the use of part-time faculty.

REVIEW OF RESEARCH AND THEORETICAL PERSPECTIVES

Part-Time Faculty

According to the National Center for Education Statistics (NCES), during the fall of 2003, approximately 1.2 million faculty were employed in institutions of higher education, with 43.7% of those being employed part time (Cataldi, Fahimi, & Bradburn, 2005). Advocates for reducing the number of part-time faculty note that the increasing use of part-time faculty threatens shared governance, academic freedom, and the quality of students' education (Buck, 2061: Thompson, 2003). Even though advocates value the contributions of part-time faculty and note that these individuals lack support, job-security, and often the academic freedom that tenure affords, the student experience is often negatively linked to part-time faculty. Thompson noted, "We [the higher education community] need a more secure and rewarded faculty who are held accountable for their teaching quality and who can also hold our institutions accountable in supporting the learning process" (p. 46). Part-time faculty members spend a greater proportion of their overall time teaching, but the initial evidence suggests that these appointees are less accessible to students, bring less scholarly authority to their jobs, and are less integrated into the campus culture (Schuster, 2003). Schuster and Finkelstein (2006a) noted that part-time faculty teach more undergraduates, have fewer

publications, have fewer funded research projects, have fewer contact hours with students (30%-40% less), and have mostly master's degrees. Although the differences between part-time and full-time faculty are distinctive, no clear conclusion can be drawn as to the effect of part-time faculty on student outcomes in higher education. Therefore, this quantitative research will explore the impact of part-time faculty instruction on first- to second-year student retention.

Defining Part-Time Faculty

It is not an easy task to define part-time faculty status. Because of this high level of variability in defining part-time status, making analytical comparisons between part-time faculty from one institution to another is difficult (Leslie, 1978). Gappa (1984) defined a part-time faculty member as "anyone who (1) teaches less than the average full-time teaching load, or (2) has less than a full-time faculty assignment and range of duties, or (3) may have a temporary full-time assignment" (p. 5). This definition, however, excludes graduate assistants who are teaching part-time while pursuing a degree. All persons included in Gappa's definition of part-time faculty are "non-tenured and nonpermanent and have little or no job security unless specific mention is made of tenure status (p. 5). In addition, part-time faculty within institutions are not a monolithic group Scholars (Levin, 2006; Levin, Kater, & Wagoner, 2006; Wagoner, Metcalfe, & Olaore, 2005) discuss the distinctiveness of faculty within institutions, particularly faculty at community colleges. In addition, Conley, Leslie, and Zimbler (2002) concluded that part-time faculty are not the same. Uniquenesses based on gender, academic discipline, perceived level of support, other employment, and work motivations make part-time faculty a distinctive group to study. Furthermore, as the overall population of faculty changes in relation to demographics, relationship to the institution, and task employment, so does the population of part-time faculty (Schuster & Finkelstein, 2006b).

Growth of Part-Time Faculty

In fall 1987, 26.3% of faculty at 4-year institutions were part-time (Kirshstein, Matheson, & Jing, 1997). In 1992, that percentage grew to 32.9%. In fall 2003, 66.7% of all faculty in the public community college system were employed part-time compared to 33.9% within public 4-year institutions (Cataldi, Fahimi, Bradburn, & Zimbler, 2005). Conley, Leslie, and Zimbler (2002) noted that the increase in the number and percentage of part-time faculty over the last 20 years is undeniable, and the increase has been tracked over time by *The Digest of Education Statistics.* The increasing use of part-time faculty has been attributed to increased financial stress on institutions (Leslie, 1998; Leslie & Gappa, 2002). The use of part-time faculty as an instructional tool is not a new concept. Blackburn (1978) wrote,

> While records do not permit a definitive determination of the development and use of part-time faculty, we do know the phenomenon extends back to the first colleges and universities. Indeed, the first college staffs in the United States, as elsewhere, were composed of individuals whose principal occupation was other than academic. Most were ministers serving part time in the classroom and destined to leave for a full-time career in the parish in a few years. It was not until well into the nineteenth century, with the possibility that one could make such a life an actual career, that laypersons entered the work of college teaching (p. 100).

A look at the history of higher education finds that as employment opportunities within higher education became more common and lucrative, the population of part-time faculty grew. With the passage of the Servicemen's Readjustment Act of 1944, commonly known as the GI Bill. enrollment within U.S. higher institutions experienced an unprecedented increase in student enrollments (Lucas, 1994). The rapid increase in post-war enrollment at U.S. institutions placed 2-year or community colleges in an unfavorable position of competing with 4-year colleges and universities for qualified, full-time faculty thus leading to an increased demand for part-time instructors (Blackburn, 1978; Gappa, 1984).

The use of part-time faculty in community colleges has continued to grow, and as of 2003, 60% of the total part-time faculty in public higher education was employed in the community college (Cataldi et al., 2005). The use of part-time faculty, however, turned out to be an incredible advantage. As Gappa (1984) stated, "Part-timers provided the great flexibility needed to offer the large assortment of vocational and technical programs available at low cost—with or without academic credit, day or night on or off campus" (p. 3). The community college system was not the only type of institution to benefit from the use of part-time faculty. Four-year colleges and universities also capitalized on the availability of part-time faculty and rapidly instituted new programs or updated existing ones at a very low cost. In support of this philosophy. Gappa (1984) stated, "Administrators could provide competent instruction by part-timers at between 50 and 80 percent of the direct cost of comparable instruction by full-time faculty" (p. 4). While there are many reasons for the rapid expansion of part-time faculty in higher education post-World War II, Leslie (1998) suggests that the two biggest underlying causes have been the rapid expansion of the community college system and the increased financial constraints coupled with increased competition among colleges and universities.

Part-Time Faculty Dilemma

Although the increased use of part-time faculty within higher education makes sense from an administrative point of view, their use does not come without criticism. Haeger (1998) wrote, "The most important academic concern is the perception that part-time faculty threaten the quality of academic programs in

terms of course content, advising, faculty-student interaction, and collegiality within academic departments" (p. 85). Yet some criticisms of part-time faculty are not based in empirical research. Research comparing the effectiveness of part-time and full-time faculty is rarely cited by critics (Gappa, 1984, p. 8). In addition, the two primary areas of concern regarding part-time faculty, working conditions (exploitation of part-time faculty) and the lack of integration into the institutional culture, have not been fully explored (Wagoner et al., 2005).

In addition to the perceived difference in quality of instruction, opponents of the use of part-time faculty argue that the level of student service provided by part-time faculty also lags behind that of full-time faculty. In a case study conducted by Gappa and Leslie (1993), a community college vice president stated:

> Part-time faculty don't have the institution's mission in focus. They do not know as much about the "open-door" student body as the full-time faculty know. They probably aren't as ready to diagnose problems and give individual help. Part-time faculty don't know where to send students who need help, where to get assistance themselves, or other avenues to help, and so on . . . (p. 101).

Although this quote represents a critical view-point of part-time faculty, most criticisms from faculty governing bodies and faculty advocates challenge the lack of support (e.g., office space, computer access, staff support) and job security for part-time faculty. Little evidence exists addressing the differences in student outcomes as a result of exposure to part-time faculty.

Retention

There is no lack of research relating to student persistence and retention. Tinto's (1993) model of student integration, Astin's (1975) model of student involvement and Bean's (1983) model of student attrition are three of the main conceptual frameworks in this area. Many other scholars have contributed to understanding why students do not persist and institutions fail to retain them. Berger and Lyon (2005) defined persistence as the desire and action of a student to stay within the system of higher education from beginning year through degree completion; whereas, retention refers to the ability of an institution to retain a student from admission to the university through graduation.

Tinto's (1975, 1993) concepts of academic and social integration help inform this research. Tinto's theory suggested that rewarding encounters with the formal and informal academic and social systems of the institution lead to greater student integration in these systems and thus to persistence (Pascarella & Terenzini, 2005). Tinto's (1993) concept of academic integration is not without criticism. Braxton, Hirschy, and McClendon (2004) found only modest empirical support for the influence of academic integration on subsequent institutional commitment and on student departure. Reliable knowledge that supports this idea of academic integration fails to emerge in Braxton and Hirschy's (2005) work, particularly at

residential colleges and universities. Recent research by Lohfink and Paulsen (2005) added another dimension to this critique. These researchers found that academic integration was not related to persistence for continuing-generation students although it did have a positive effect for first-generation students.

Mechanisms of social integration include student-faculty interactions as well as the learning environment in the classroom. Working from Tinto's (1975, 1993) student interactionalist theory of student departure, research by Pascarella and Terenzini (1997, 2005) asserted that student-faculty interactions play a crucial role in the connection between student and institution. Student-faculty interaction is a significant factor in predicting college persistence (Gaff & Gaff, 1981). The engagement of the student in classroom discussions and collaborative learning experiences are part of a larger experience—the students' adjustment to college and their decision to remain enrolled in the institution (Nora, Barlow, & Crisp, 2005). The type of interaction that students report as being most important is contact with faculty outside of the classroom (Stodt, 1987). Endo and Harpel (1982) found that informal contact in which faculty members develop friendly relationships with students and exhibit a personal concern with their affective and cognitive growth, significantly influences students' personal and social outcomes in addition to their intellectual gains, which in turn affects persistence. Pascarella and Terenzini (2005) noted that the research before and after 1990 supports the generally positive effects of non-classroom student-faculty interactions on educational attainment.

Other models help contribute to better understanding the role of faculty interaction in persistence. Bean (1980, 1983, 1990) included student contact with faculty as one of his behavioral measures in his model of student persistence. Bean's research shows that student interaction with faculty plays an important role in the persistence process. Berger and Milem's (1999) research helps inform this study as well. Their work contributes to understanding the relationship between involvement behaviors and integration perceptions by testing the direct and indirect effects of these constructs on student persistence. They noted that involvement with faculty has a positive effect on persistence.

This study draws from the frameworks posited by Bean (1990) and Tinto (1993). Both frameworks emphasize the importance of students establishing meaningful connections to the academic and social spheres of the institution. To the extent that increased opportunities to engage with faculty inside and outside the classroom facilitate academic ties between students and their institutions, the availability of faculty has significant implications for student retention. Bean (1990) paralleled students' decision to leave an institution with turnover in organizations, as students dissatisfied with their educational experiences decide to seek alternative opportunities at other institutions or outside higher education. Limited interactions with professors, such as would be expected with part-time faculty, may lead to discontent and a level of dissatisfaction or disconnection on the part of the student.

As students seek to develop meaningful relationships with faculty members, connections to their peers remain just as important to their level of satisfaction with college (Bean, 1990). On-campus living increases students' likelihood of creating ties with their peers and leads to greater levels of satisfaction with their college experience (Astin, 1993). By increasing levels of students' satisfaction with the social aspects of college, on-campus living has significant implications for student retention.

The Impact of Part-Time Faculty Instruction on Student

Although some research explores the role of faculty instruction on student persistence (Braxton, Bray, & Berger, 2000), this specific research did not focus on the role of part-time versus full-time faculty. Given the substantial differences between part-time and full-time faculty, it is important to understand how these differences affect student outcomes. For example, students' perceptions of faculty members' availability and concern for them has positive and significant effects on persistence (Halpin, 1990; Mallette & Cabrera, 1991; Pascarella, 1980). Given the reported importance of student-faculty interaction on retention, should educators and policy makers question the increased use of part-time faculty? Is there a retention-related cost to part-time faculty utilization? Haeger (1998) noted that part-time faculty often do not have offices, hold limited or no meeting hours, have limited or no phone and computer access, and are not compensated for advising students.

Hagedorn and her colleagues (Hagedorn, Perrakis, & Maxwell, 2002) concluded from a 3-year study that community colleges wanting to encourage student success should not rely heavily on part-time faculty who hold sparse office hours and appear inaccessible. Thus, part-time faculty may not be as engaged with students outside of the classroom, leading students to conclude their lack of interest. "When students feel faculty members do not care about the student's development, their bonds to the institution weaken" (Bean, 2005, p. 225).

"Several studies suggest that students' perceptions of faculty members' availability and interest in them may be enough to promote persistence" (Pascarella & Terenzini, 2005, p. 417). Does the reduced availability of part-time faculty have a negative impact on student satisfaction leading to lower first-year retention rates? The literature provided little help in answering this question. A study by Harrington and Schibik (2004) attempted to produce some quantitative data in response to the apparent void in the literature regarding exposure to part-time faculty instruction and retention. Harrington and Schibik examined 7,174 entering first-year students at a midsized comprehensive midwestern university. The research found a significant negative correlation between the percentages of courses taught by part-time faculty to retention rates in the second semester. Yet, the Harrington and Schibik study focused on a relatively short retention

span and tended to cluster students of lower academic ability with higher percent exposure to part-time faculty instruction. Harrington and Schibik's results could be due to the way the authors grouped their data rather than an outcome relating to part-time faculty. The use of part-time faculty differs depending on institutional type, thus additional research is necessary.

Beyond Harrington and Schibik (2004), a small number of additional single-site studies investigated the effects of instructor status on student retention. Kehrberg and Turpin's (2002) study of a regional comprehensive institution concluded that exposure to part-time faculty does not impact the academic performance or retention rates of first time freshmen. This study calculated percent exposure to faculty types based on number of courses, not on the number of credit hours, which leaves room for interpretation. Furthermore, Kehrberg and Turpin did not offer any type of predictive model. Ronco and Cahill's (2006) recent study of a public research-intensive institution showed that retention is primarily predicted by background and educational experience variables, yet the authors did see a higher level of attrition among the group of students with the lowest percent exposures to full-time faculty in the first year. Ronco and Cahill's work is the most comprehensive to date, but still offered a single institution perspective and groups data similar to Harrington and Schibik (2004).

There is little doubt that the combination of increased enrollment and decreased educational funding contributes to the rapid increase in the use of part-time faculty. Part-time faculty serve a valuable purpose in higher education; however, their increased use raises concerns for administrators and policy makers. The lack of any clear data regarding the effects of part-time faculty on student outcomes across institutions illustrates the need for additional research.

METHOD

A review of current literature reveals little in regard to the effect of exposure to part-time faculty instruction on freshman retention. What little information is available suggests that as exposure to part-time faculty instruction increases, student retention rates decrease. This study will strive to quantify this effect by using logistic regression to construct a predictive model for retention based upon part-time faculty exposure and several other first-year student attributes that have been identified by the study institution as important to retention (Caison, 2001).

Research Question

This quantitative research strives to answer the following research question: What is the impact of part-time faculty instruction on first- to second-year student retention? Logistic regression is used to predict the dichotomous dependent variable (retained).

Population and Sample

The study institution is a large research-extensive institution located in the southeast that enrolls an average freshman class of approximately 3,800 and had an average first- to second-year retention rate of 71.6% for the years 1999-2003. For this study, the entire first-semester freshman cohorts from the study institution for fall 1999, 2000, 2001, 2002, and 2003 were analyzed. The combined cohorts 1999-2003 yielded 18,620 unique first-semester student records. From this data, 41 records were removed from the dataset. These 41 records had no matching enrollment data, most likely explained as the student withdrawing from the university during the first few days of the school year prior to the university census date. The resulting dataset had a total of 18,579 unique students.

In an effort to make the sample more generalizable to the traditional, first-year population, several subpopulations of students were removed from the analysis population of 18,579. A total of 1,427 part-time students (those taking less than 12 hours in either fall or spring semesters), 703 student athletes, 513 academic scholarship recipients, 382 University Transition Program participants (students who are academically eligible for admission to the study institution but not into their first or second choices of colleges and who demonstrate academic or transitional needs), and 155 international students were deleted from the analysis population. The final analysis contained 15,399 students. Because both athletes. particularly at a large athletic-revenue generating institution, and scholarship-supported students have a monetary stake in persisting in college, they cannot easily be generalized as a "typical" student. In general, international students bring dramatically different educational experiences and cultural expectations into college and thus were excluded from analysis as well; previous research suggests a similar strategy (Tinto, 1993). Furthermore, a majority of the international students at the study institution were receiving scholarship aid. Finally, the University Transition Program students receive extensive support services such as intensive academic advising not available to other undergraduate students, making their inclusion in the analysis inappropriate. Because the sample in this study was large, the removal of these unique populations did not jeopardize the study. In fact, the removal of these unique students increased the generalizability of the sample to other more traditional student populations.

Data regarding faculty status received special consideration. The assignment of faculty into full-time, part-time, or graduate student status was done using an exclusion process. First, a list of instructors was derived from an courses taken by new freshmen during their first year of enrollment. Graduate teaching assistants were then removed from the list of instructors. Next, tenured and tenure-track instructors or those nontenure-track instructors teaching one full-time equivalent were assigned full-time faculty status. The remaining instructors were assigned part-time faculty status.

Data Collection

Anonymous student record data for the 1999-2003 undergraduate cohorts as well as course enrollments and faculty teaching schedules were provided by the University's planning and analysis department. Student demographic data (SAT scores, gender, high school rank, and high school GPA) were merged with first-year (fall and spring semesters) course data (course, credit hours, instructor) and instructor data (position) using SAS software. The independent variables were chosen based on previous institutional research that supported each of these factors as relevant to student persistence at the study institution (Caison, 2001). Although the literature has shown that some academic and social integration factors (e.g., place of residence) are positive predictors of retention, this study chose only those variables that were most significant to the study institution based on multiple previous research projects (Jaeger, 2005). The resulting dataset contained non-normalized (multiple records per key) student data containing one record per student per course for the first academic year (fall and spring semesters). Each course record identified the rank/position of the instructor as either full-time faculty, part-time faculty, or graduate student. (See Figure 1.)

Data Analysis

In this study, the research question will be answered using logistic regression with the SAS system. Logistic regression is the statistical analysis of choice because of its predictive ability on a dichotomous dependent variable (retained). The dataset was first normalized (one key record per student) to produce cumulative totals of the number of first-year credit hours taught by each of the three instructor types: full-time faculty; part-time faculty; or graduate student. Each of these cumulative totals was then divided by the total number of hours that students took during their first year to calculate a percentage (0-100%) exposure to each type of instructor. Descriptive statistics for the study variables as well as a logistic regression model (retained = 1) were calculated using SAS software. Multicollinearity was tested for using the REG procedure of SAS software with the TOL (tolerance) and VIF (variance inflation) options (Allison, 1999).

The final analysis dataset had a total of 15,399 unique student records and 11 variables: retained; ethnicity; gender; high school GPA; high school percentile rank; SAT verbal score; SAT math score; total SAT score; percent exposure to graduate student instruction; percent exposure to part-time faculty instruction; and percent exposure to full-time faculty instruction. Each unique record contained a percentage (0-100%) for the type of instruction (graduate student, part-time, or full-time) that students received during their first year of study. Because the logit procedure in SAS is unable to model parameters with missing values, 905 observations were excluded from the logistic model by SAS resulting in an actual dataset of 14,494. In order to minimize the number of records omitted from the logistic analysis, high school rank was removed as a model parameter due to the

Variable	Model Role	Description
Retained	Dependent	Binary value, the student persisted (1) into their second year or s/he did not persist (2).
High school GPA	Independent	Ratio scale value ranging 0-5.
Gender	Independent	Nominal value, male (1) or female (2).
Total first-year credit hours attempted	Independent	Ratio value 12-40. The total number of hours attempted by a student in his or her first year.
Percent exposure to graduate instruction	Independent	Ratio value ranging 0-100%. The total number of hours taught by a graduate student during the first year divided by the total number of hours attempted during the first year.
Percent exposure to part-time faculty instruction	Independent	Ratio value ranging 0-100%. The total number of hours taught by a part-time faculty member during the first year divided by the total number of hours attempted during the first year.
Percent exposure to full-time faculty instruction	Independent	Ratio value ranging 0-100%. The total number of hours taught by a full-time faculty member during the first year divided by the total number of hours attempted during the first year.
SAT verbal score	Independent	Ratio value 0-800. The student's score on the verbal portion of the Standardized Aptitude Test (SAT).
SAT math score	Independent	Ratio value 0-800. The student's score on the math portion of the Standardized Aptitude Test (SAT).
Total SAT score	Independent	Ratio value 0-1600. The student's combined score on the verbal and math portions of the Standardized Aptitude Test (SAT).

Figure 1. Variables

high amount of missing data, which would have accounted for approximately 1,600 additional observations being removed.

FINDINGS

The dataset was first analyzed with descriptive statistics. Table 1 lists the standard descriptive statistics for each of the interval variables initially considered as being significant parameters in the logistic model. Descriptive statistics were also calculated for two categorical parameters: gender and ethnicity. The study included 42.69% (n = 6,574) females and 57.31% (n = 8,825) males. The study included 14,113 White students, 1,495 African-American students, 762 Asian students, 324 Hispanic students, 132 Native-American students (note: some students identified with more than one ethnicity).

With the exception of high school rank, which had an unacceptable percentage (9.44%) of missing data, the 11 independent variables were regressed on first- to second-year retention (retained = 1) using logistic regression with a backward elimination method. Backwards elimination reduced the number of variables in the model from 11 to 6. The resulting model (see Table 2), containing high school GPA, total first-year credit hours attempted, SAT verbal score, SAT math score, gender, and percentage of exposure to part-time instruction, was found to be significant ($\chi^2 = 65.7384$, $df = 6$, $p < .0001$). Four of the six model variables (high school GPA, total first year credit hours attempted, gender, and percentage of exposure to part-time instruction) were found to be significant predictors of first-to second-year retention (see Table 2).

Table 1. Descriptive Statistics of Analysis Variables

Parameter	*N*	Minimum	Maximum	Mean	Standard Deviation
High school GPA	15,370	2.6	5.25	3.995	0.387
SAT verbal score	14,494	330	800	579	71
SAT math score	14,494	380	800	612	75
Total SAT score	14,494	830	1600	1191	127
Total first-year credit hours attempted	15,399	12	40	31	2.282
Percent exposure to grad. student instruction	15,399	0	57.143	13.502	10.615
Percent exposure to part-time faculty instruction	15,399	0	100	24.593	16.650
Percent exposure to full-time faculty instruction	15,399	0	100	61.905	17.172

Table 2. Maximum Likelihood Estimates

Parameter	Parameter estimate (β)	Standard error	*p*-Value	Odds ratio	Tolerance	Variance inflation
Intercept	–0.511	0.593				
High school GPA	0.366	0.103	0.0004	1.443	0.799	1.252
Total first year credit hours attempted	0.085	0.016	< 0.0001	1.088	0.945	1.058
Gender (1 = male)	0.141	0.039	0.0003	1.328	0.879	1.138
Percent exposure to part-time faculty instruction	–0.004	0.002	0.049	0.996	0.983	1.018
SAT math score	–0.0002	0.0006	0.725	1.000	0.628	1.593
SAT verbal score	–0.0008	0.0006	0.156	0.999	0.759	1.318

Note: *p*-values in bold are significant at the 0.05 α-level.
Model Likelihood Ratio $\chi^2 = 65.7384$, $df = 6$, $p < 0.0001$
Hosmer-Lemeshow Goodness-of-Fit Test $\chi^2 = 7.0642$, $df = 8$, $p = 0.5297$

The overall goodness-of-fit for the logistic model was assessed using the Hosmer and Lemeshow (HL) test (Hosmer & Lemeshow, 2000). The HL test has become a popular method for assessing goodness-of-fit for logistic models due to limited other credible techniques (Allison, 1999). The HL test has an approximate chi-square distribution under the null hypothesis, which indicated the fitted model is correct. The HL test for the logistic model had a *p*-value of .5297, which supports accepting the null hypothesis that this model is a good fit for the data. An alternative method for assessing a model's overall value is to measure its predictive value via the use of the generalized R^2 statistic. The generalized R^2 statistic is similar to the R^2 statistic used in assessing linear regression models; however, the generalized R^2 statistic tests the null hypothesis that all model coefficients are 0. Although the generalized R^2 statistic may be similar to the linear R^2 statistic, it cannot be interpreted as a proportion of variance "explained" by the independent variables (Allison, 1999, p. 57). The generalized R^2 statistic for the logistic model was .0045. R^2 values below .70 in linear regression are typically considered unacceptable; however, Hosmer and Lemeshow (2000) stated,

> R^2 values (generalized) are low when compared to R^2 values typically encountered with good linear regression models. Unfortunately low R^2 values in logistic regression are the norm and this presents a problem when reporting their values to an audience accustomed to seeing linear regression values (p. 167).

Because there is no widely accepted cutoff value for generalized R^2 values and the statistical inability to explain variance between dependent and independent variables within a model, generalized R^2 values are usually not an accepted method for assessing a model's predictive value.

The parameter estimates (β) generated from the logistic procedure are difficult to interpret, and typically only their sign (+ or –) is of value. Instead of using the β coefficient to describe the impact of a parameter upon the modeled outcome, the odds ratio is generally used instead (Allison, 1999). The use of the odds ratio in conjunction with the sign of the β coefficient is interpreted as for every one unit increase in the independent variable X there is a Y increase/decrease in the dependent variable. For example, using the reported β coefficients and odds-ratios reported in Table 2, a one-unit increase in GPA results in a 1.4 times higher odds of being retained into the second year.

As is the case with ordinary linear regression, multicollinearity is a concern in logistic regression because its presence may obscure the individual effects of the independent variables. Multicollinearity exists when there is a strong linear dependency between the independent variables. Following Allison's (1999) methodology for diagnosing multicollinearity, tolerance and variance inflation statistics were calculated for the independent variables. Low tolerance values suggest high multicollinearity with values greater than 0.40 considered acceptable. In the absence of multicollinearity, the variance inflation factor should be

less than 4.0. Following these guidelines, results indicate an absence of multicollinearity among the variables in this step of the analysis (see Table 2).

Unlike previous research (Harrington & Schibik, 2004), this research did not find SAT math scores to be statistically significant (odds-ratio = 1.000, $p = 0.725$) in predicting retention based upon exposure to part-time faculty instruction. The results of the logistic regression show that of the six parameters modeled, high school GPA, total first-year hours attempted, gender, and the percent instruction received from part-time faculty significantly contributed to predicting student retention into the second year. Of the four significant model parameters, only high school GPA (odds ratio = 1.443, $p < .001$), and gender (odds ratio = 1.328, $p < .001$) had a substantial positive impact on the odds of being retained into the second year of college.

IMPLICATIONS AND CONCLUSION

The use of logistic regression for predicting a dichotomous categorical outcome from a collection of independent variables has become an accepted practice in the social sciences. This research used logistic regression to explore the effect of several demographic variables in combination with exposure to part-time faculty instruction on student retention. As the use of part-time faculty continues to grow within institutions of higher education, quantitative research of this nature becomes an important tool for administrators making educational policy decisions.

The results of the logistic regression (see Table 2) show that of the six parameters modeled (gender, high school GPA, total hours attempted, percent exposure to part-time faculty instruction, SAT verbal score, and SAT math score), only high school GPA (odds ratio = 1.443, $p < .001$) and gender (odds ratio male vs. female = 1.328, $p < .001$) substantially positively impact the outcome of a student being retained into the second year. These findings contradict, in part, those of Harrington and Schibik (2004) who found SAT math score, total hours attempted, gender, and a high level (50% or more) of exposure to part-time faculty instruction all to be significant parameters for predicting retention. According to the Harrington and Schibik study, students who had 75% or more of their course work taught by part-time faculty had a 1.47 times higher odds of not being retained. They also found male students had a 1.33 times higher odds of not being retained. In contrast this research found that males were 33% more likely to be retained than females. Harrington and Schibik found the SAT math score a significant predictor of retention, but the parameter had almost no impact upon the retention outcome. This research, however, found that neither SAT verbal score (odds ratio = 0.999, $p = .156$) or SAT math score (odds ratio = 1.000, $p = .725$) had a significant predictive role in first- to second-year retention. This research supports Harrington and Schibik's conclusion regarding the hours attempted by students in their first term. This study showed the total hours attempted by a student during the first year had a significant (odds ratio = 1.088, $p < .001$) predictive

ability on the retention outcome; the odds of retention increased 1.088 times for each one-hour increase in the total number of hours attempted during the first year (see Table 2). This result may suggest that students who attempt more hours may have a greater self-efficacy and are already more likely to persist.

In order to interpret the odds ratio of exposure to part-time faculty instruction, which has a negative regression coefficient, the inverse odds ratio suggested by DesJardins (2001) is utilized. "There is a simple transformation necessary to put the odds-ratios for negatively-related coefficients on the same metric as the odds-ratios produced when estimated coefficients are positive" (p. 4). The following formula = 1/(.996) was applied, where .996 is the odds-ratio corresponding to the "Percent Exposure to Part-Time Faculty Instruction," the negatively-related variable of interest. The results of the equation produce an inverse odds-ratio of 1.004. In this instance, the reference group for the inverse coefficients becomes students "not retained." Thus, with every one unit increase in percent exposure to part-time faculty instruction, students have a 1.004 times higher odds of not being retained. This result shows that the number of hours taken by a first-year student from a part-time faculty member is a factor in student retention. Each one unit increase leads to a decreased odd of being retained.

An examination of the quartile demographics (see Table 3) from the Harrington and Schibik study clearly shows that poorly performing students are clustered with the highest exposure to part-time faculty instruction. This fact makes it questionable as to whether or not the outcome of not being retained in the Harrington and Schibik study is a result of a high level of exposure to part-time faculty instruction or perhaps this finding is a residual methodological effect.

Table 3. Results of Harrington and Schibik (2004) Quartile Demographics for the Fall 2000 Cohort (n = 1885)

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Gender (0 = female, 1 = male)	0.40	0.37	0.43	0.49
SAT total score	1013	975	920	855
ACT composite	22.4	20.7	18.9	18.4
Fall 2000 hours attempted	13	13	13	11
Fall 2000 hours earned	10	10	8	6
Fall 2000 GPA	2.39	2.46	2.23	1.36

Note: From Harrington and Schibik (2004).

By using this technique, Harrington and Schibik generate clusters within the data because exposure to part-time faculty instruction is collapsed into only four possible categories. The use of a ratio scale for measuring part-time faculty exposure is more appropriate than quartiles because it allows greater quantitative detail than an ordinal scale such as quartiles (Hatcher & Stepanski, 1994). In addition, the Harrington and Schibik study does not clearly define what constitutes part-time faculty status, making it difficult to compare the results of the two studies.

David Leslie (1978) wrote, "As can be readily inferred from the brief descriptions of possible courses of action, there is too much ignorance about both part-time faculty and knowledge production to make confident decisions" (p. 109). More than 25 years later, this statement still holds value. Given that in 2003 approximately 43.7% of all faculty in the United States were classified as part-time (Cataldi et al., 2005), the void in the literature regarding the impact of part-time faculty on student decisions is concerning. The ever-increasing role of part-time faculty in the education and development of students, particularly first-year students, warrants research to explore the possible effects on students. Of particular interest to researchers in higher education is the attrition rate within the first year. Tinto (1993) wrote,

> We begin our study of departure with the first year of college. We do so because the first year proves . . . to be an especially important year in the process of persistence. The character of one's experience in that year does much to shape subsequent persistence. By the same token, the largest proportion of institutional leaving occurs in that year and prior to the beginning of the second year. For this reason alone . . . the first year has become a special object of institutional policy aimed at reducing student attrition (p. 14).

This research found that a typical first-year student entering this large research-extensive institution between 1999 and 2003 received nearly one-third of his or her total first-year instruction from part-time faculty and graduate students. The results of this research suggest that the use of part-time faculty to instruct first-year students has an adverse effect in relation to retention. This research does not, however, address any difference in quality of instruction between part-time and full-time faculty, thus this element in the equation is unexplained. In addition, the large size of the dataset (n = 14,494) gives the logistic analysis enormous statistical power. With this level of statistical power, significant parameters may be detected that have limited practical meaning.

The practical implications of this research are difficult to delineate since colleges and universities may not have the financial resources available to convert part-time faculty lines into tenured or tenured track positions. Thus, it would be important for institutional leaders to consider how part-time faculty are supported and whether additional support would have any impact on student outcomes. Furthermore, additional research should investigate course level data

in connection with part-time faculty and student retention. Perhaps particular courses serve as "gatekeepers" for students and the type of faculty appointment could affect student retention in theses courses. This suggestion supports Seidman's (2005) work, which identified the use of four different perspectives when discussing student retention:

1. retention within the educational system;
2. institutional retention;
3. retention within a major; and
4. course-level retention.

While the present study discusses institutional retention, future studies should explore course-level and major retention.

It would be of scholarly merit for future quantitative studies to explore the quality of instruction provided by part-time faculty as compared to that given by full-time faculty. As the literature in this article illustrates, claims of a difference in instructional quality are quite common; however, little data exists to support such claims. Further research in this area should account for the difference between voluntary student withdrawal and suspension as well as later reenrollments (Berger & Braxton, 1998; Eckland, 1964). Students who were suspended from the study institution, although few, were included with those who chose not to return. In addition, as retention research continues to broaden, a multitude of other dependent variables could be considered as part of the research, including but not limited to financial, institutional, organizational, as well as other individual background characteristics (Berger & Milem, 1999; Braxton, Bray, & Berger, 2000). This research has built on the limited quantitative research available addressing part-time faculty instruction and retention, yet without further research, it is unclear as to what accounted for differences between these studies. Future research should continue to thoroughly explore the relationship between part-time faculty instruction and retention at various institutional types, since the use of part-time faculty is different depending on the type of institution. Vaughan (2000) notes that students in community colleges often have more interaction with faculty than with administrative staff members. These influential relationships with faculty are even more crucial for students in community colleges, because the majority of student interactions with institutional representatives in community colleges are with faculty (Vaughan, 2000). In addition, this factor could also be true of small, liberal arts institutions where faculty have more contact with students than at large, research universities.

Given the inherent instability in long-term institutional planning and the negative public image associated with low retention rates, administrators would be well served in investing resources in evaluating the impact of part-time faculty instruction on college student outcomes. Administrators and educational policy makers need to realize that as the usc of part-time faculty grows, so should our understanding of this resource.

REFERENCES

Allison, P. D. (1999). *Logistic regression using the SAS system: Theory and application.* Cary, NC: SAS Institute.

Astin, A. W. (1975). *Preventing students from dropping out.* San Francisco: Jossey-Bass.

Astin, A. W. (1993). *What matters in college? Four critical years revisited.* San Francisco: Jossey-Bass.

Bean, J. P. (1980). Dropouts and turnover: The synthesis and test of a causal model of student attrition. *Research in Higher Education, 12*(2), 155-187.

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

Bean, J. P. (1990). Understanding why students stay or leave. In D. Hossler, J. P. Bean, & associates (Eds.), *The strategic management of college enrollments.* San Francisco: Jossey-Bass.

Bean, J. P. (2005). Nine themes of college student retention. In A. Seidman (Ed.), *College student retention* (pp. 213-243). Westport, CT: Praeger.

Berger, J. B., & Braxton, J. M. (1998). Revisiting Tinto's interactionalist theory of student departure through theory elaboration: Examining the role of organizational attributes in the persistence process. *Research in Higher Education, 39*(2), 103-120.

Berger, J. B., & Lyon, S. C. (2005). Past to present: A historical look at retention. In A. Seidman (Ed.), *College student retention* (pp. 1-29). Westport, CT: Praeger.

Berger, J. B., & Milem, J. F. (1999). The role of student involvement and perceptions of integration in a causal model of student persistence. *Research in Higher Education, 40*(6), 641-664.

Blackburn, R. T. (1978). Part-time faculty and the production of knowledge. In D. W. Leslie (Ed.), *Employing part-time faculty* (pp. 99-111). San Francisco: Jossey-Bass.

Braxton, J. M., Bray, N. J., & Berger, J. B. (2000). Faculty teaching skills and their influence on the college student departure process. *Journal of College Student Development, 41*(2), 215-227.

Braxton, J. M., & Hirschy, A. S. (2005). Theoretical developments in the study of college student retention. In A. Seidman (Ed.), *College student retention* (pp. 61-87). Westport, CT: Praeger.

Braxton, J. M., Hirschy, A. S., & McClendon, S. A. (2004). *Understanding and reducing college departure.* San Francisco: Jossey-Bass.

Buck, J. (2001). The president's report: Successes, setbacks. and contingent labor. *Academe, 87*(5), 18-26.

Caison, A. (2001). *Retention and student quality.* Unpublished manuscript.

Cataldi, E. F., Fahimi, M., & Bradburn, E. M. (2005). *2004 National Study of Postsecondary Faculty (NSOPF:04) Report on Faculty and Instructional Staff in Fall 2003*(NCES 2005-172). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved July 3, 2006 from http://nces.ed.gov/pubsearch

Cataldi, E. F., Fahimi, M., Bradburn, E. M., & Zimbler, L. (2005). *2004 National Study of Postsecondary Faculty (NSOPF:04) Report on Faculty and Instructional Staff in Fall* (NCES Report No. 2005-172). Washington, DC: U.S. Department of Education, Institute of Educational Sciences.

Conley, V. M., Leslie, D. W., & Zimbler, L. J. (2002). *Part-time instructional faculty and staff: Who they are, what they do, and what they think* (NCES 2002163). U.S. Department of Education. Washington, DC: U.S. National Center for Education Statistics.

DesJardins, S. L. (2001). A comment on interpreting odd-ratios when logistic regression coefficients are negative. *AIR Professional File, No. 81.* Tallahassee, FL: Association of Institutional Research.

Eckland, B. (1964). College dropouts who come back. *Harvard Educational Review, 34,* 402-420.

Endo, J. J., & Harpel, R. (1982). The effect of student-faculty interaction on students' educational outcomes. *Research in Higher Education, 16*(2), 115-138.

Gaff, J. G., & Gaff, S. (1981). Student-faculty relationships. In A. W. Chickering & Associates (Eds.), *The modern American college* (pp. 642-656). San Francisco: Jossey-Bass.

Gappa, J. M. (1984). Part-time faculty: Higher education at a crossroads (ASHE Report No. 3). Washington, DC: Association for the Study of Higher Education.

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

Haeger, J. D. (1998). Part-time faculty, quality programs, and economic realities. In D. W. Leslie (Ed.), *The growing use of part-time faculty: Understanding causes and effects* (pp. 81-88). San Francisco: Jossey-Bass.

Hagedorn, L., Perrakis, A., & Maxwell, W. (2002). *The negative commandments: Ten ways community colleges hinder student success.* (ED 466 262).

Halpin, R. (1990). An application of the Tinto model to the analysis of freshman persistence in a community college. *Community College Review, 17,* 22-32.

Harrington, C., & Schibik, T. (2004). Caveat emptor: Is there a relationship between part-time faculty utilization and student learning outcomes and retention? *AIR Professional File, No. 91.* Tallahassee, FL: Association of Institutional Research.

Hatcher, L., & Stepanski, E. J. (1994). *A step-by-step approach to using the SAS system for univariate and multivariate statistics.* Cary, NC: SAS Institute.

Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression* (2nd ed). New York: John Wiley & Sons.

Jaeger, A. J. (2005, November). *Is freshman retention a consequence of faculty employment status?:* How part-time faculty instruction affects student outcomes. Paper presented at the meeting of the Association for the Study of Higher Education, Philadelphia, PA.

Kehrberg, N., & Turpin, W. K. (2002, March). *Impact of part-time faculty on freshman performance, satisfaction and retention.* Paper presented at the meeting of the North Carolina Association for Institutional Research, Greensboro, NC.

Kirshstein, R. J., Matheson, N., & Jing, Z. (1997). *Instructional faculty and staff in higher education institutions: Fall 1987 and Fall 1992* (NCES 97-470). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Leslie, D. W. (1978). Employing part-time faculty. *New Directions for Institutional Research, No. 18.* San Francisco: Jossey-Bass.

Leslie, D. W. (1998). The growing use of part-time faculty: Understanding causes and effects. *New Directions for Institutional Research, No. 104.* San Francisco: Jossey-Bass.

Leslie, D. W., & Gappa, J. M. (2002). Part-time faculty: Competent and committed. *New Directions for Community Colleges, No. 118.* San Francisco: Jossey-Bass.

Levin, J. S. (2006). Faculty work: Tensions between educational and economic values. *Journal of Higher Education, 77*(1), 62-88.

Levin, J. S., Kater, S. T, & Wagoner, R. L. (2006). *Community college faculty: At work in the new economy.* New York: Palgrave Macmillan.

Lohfink, M. M., & Paulsen, M. B. (2005). Comparing the determinants of persistence for first-generation and continuing generation students. *Journal of College Student Development, 46*(4), 409-428.

Lucas, C. J. (1994). *American higher education: A history.* New York: St. Martin's Griffin.

Mallette, B., & Cabrera, A. (1991). Determinants of withdrawal behavior: An exploratory study. *Research in Higher Education, 32*(2), 179-194.

Nora, A., Barlow, E., & Crisp, G. (2005). Student persistence and degree attainment beyond the first year in college. In A. Seidman (Ed.), *College student retention* (pp. 129-153). Westport, CT: Praeger.

Pascarella, E. T., & Terenzini, P. (1997). Patterns of student-faculty informal interaction beyond the classroom and voluntary freshman attrition. *Journal of Higher Education, 48*(5), 540-552.

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research* (2nd ed.). San Francisco: Jossey-Bass.

Ronco, S., & Cahill, J. (2006). Does it matter who's in the classroom? Effect of instructor type on student retention, achievement and satisfaction. *AIR Professional File, No. 100.* Tallahassee, FL: Association of Institutional Research.

Schuster, J. H. (2003). The faculty makeover: What does it mean for students? *New Directions for Higher Education, No. 123.* San Francisco: Jossey-Bass.

Schuster, J. H., & Finkelstein, M. J. (2006a). *Rethinking faculty work and workplaces: The faculty appointments revolution and its implications.* Paper presented at the meeting of the Association for the Study of Higher Education, Anaheim, CA.

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

Seidman, A. (2005). *College student retention.* Westport CT: Praeger.

Stodt, M. M. (1987). Educational excellence as a prescription for retention. *New Directions for Higher Education, No. 15.* San Francisco: Jossey-Bass.

Terenzini, P. T., & Reason, R. D. (2005, November). *Parsing the first year college: A conceptual framework for studying college impacts.* Paper presented at the meeting of the Association for the Study of Higher Education, Philadelphia, PA.

Thompson, K. (2003). Contingent faculty and student learning: Welcome to the strativersity. *New Directions for Higher Education, No. 123.* San Francisco: Jossey-Bass.

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

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

Vaughan, G. B. (2000). *The community college story* (2nd ed.). Washington, DC: Community College Press.

Wagoner, R. L., Metcalfe, A. S., & Olaore, I. (2005). Fiscal reality and academic quality: Part-time faculty and the challenge to organizational culture at community colleges. *Community College Journal of Research & Practice, 29*(1), 25-44.

Direct reprint requests to:

Audrey J. Jaeger, Ph.D.
Department of Adult and Higher Education
310H Poe Hall, Campus Box 7801
Raleigh, NC 27695-7801
e-mail: audrey_jaeger@ncsu.edu