

**THE RELATIONSHIP BETWEEN STATE APPROPRIATIONS AND STUDENT
RETENTION AT PUBLIC, FOUR-YEAR INSTITUTIONS OF HIGHER
EDUCATION**

by

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STATEMENT BY THE AUTHOR

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SIGNED: _____

DEDICATION

To my wife, Freedom, with love, for joining me in Arizona to allow me to undertake this task, for offering to help and support at every turn, and for always boosting my confidence and lighting my fire to finish. This kind of work simply can't be done alone and without you, it would never have been done. You were my chief cheerleader and, as the end of this work drew near, my chief formatter – a thankless job that you willingly took on after my patience with the detail wore thin. Now I hope we can truly enjoy what has become the fruits of OUR labor. I am forever grateful to you for allowing me the time and space to do this.

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ABSTRACT

The purpose of this quantitative study was to identify and explore the relationship between state appropriations and freshman to sophomore retention at public, four year institutions of higher education. Additional questions concerning the users of retention programming – learning centers, summer bridge programs, and freshman seminars – emerged during the analysis of the initial question.

Data sources included the College Board annual survey of institutions, WebCASPAR, Barron's Profiles of American Colleges, and email surveying of the 271 institutions included in the sample for the years 1991 and 1996. The data was used in a series of multiple regressions and fixed effects regressions. The fixed effects method was viable since the same institutions provided observations for two points in time. The choice of independent variables was informed by retention theory and prior quantitative research into the retention question, as well as by the small body of literature addressing the efficacy of retention interventions. The new independent variable was the state dollars allocated per FTE student at each institution in 1991 and 1996.

The multiple regression analyses confirmed that state dollars have a statistical impact on freshman to sophomore retention. In addition, the analyses suggested that summer bridge programming is the most effective of the three retention interventions considered, despite the small size of these programs relative to learning centers and freshman seminars. However, learning centers were the most numerous of the three programs and freshman seminars were the fastest growing. Descriptive statistics

suggested that institutions using these three programs have higher populations of students of color and also were more selective than those institutions not using the programs.

The fixed effects regressions, however, returned very different results, with freshman seminars showing a strong, negative effect on retention rates and state appropriations no apparent effect. Data limitations may have resulted in these disparate results. Implications of this work include a stronger case for institutions to lobby the states and the suggestion to implement summer bridge programming prior to the other two interventions while additional research should employ a more robust data set and focus on disaggregating state money into its primary beneficiaries.

CHAPTER ONE – INTRODUCTION

Student retention, the ability of an institution of higher education to keep students enrolled and then graduate those students, is a complex process shaped by various forces, factors, and relationships. Many of these forces, factors, and relationships have been studied extensively. Yet our understanding of why some students leave an institution before graduating and others persist remains limited. The search continues for elements of the retention puzzle that institutions can leverage to positively influence student retention.

One interesting element of the puzzle is finances. Public institutions depend upon a combination of revenue sources - tuition, fees, grants, gifts, student aid, and corporate support, to name a few. The competing priorities connected to these varied revenue sources suggests that institutions may be focusing more on some elements of their performance (such as research grants) while neglecting other elements (such as undergraduate education) (Slaughter and Leslie, 1997). Of these revenue streams, state financial support represents one that is clearly on the decline in terms of overall share of the bill for education students. As state revenues declined in the early nineties, did institutions witness a decline in retention and how did institutions go about trying to improve their retention rates?

Currently, there exists no evidence that student retention rates are at all at risk when states contribute less money to the institution. However, a reduction in funding often results in loss of personnel and loss of programs, not to mention an increase in tuition. Decreased funding may also result in larger class sizes and more part time

faculty. All of these outcomes do not predict greater student persistence. In fact, it is not unreasonable to believe that these outcomes, either in concert or individually may retard student's ability or desire to persist. The question of the impact of declining state subsidy on student retention begs analysis given the current financial climate.

Whether or not the loss of state revenue directly impacts retention rates, it does create a campus financial climate rife with challenge, and the possibility of indirect effects on retention through programming. In response to this challenge, public institutions appear to be turning to programs aimed at boosting student retention, either to offset the student losses incurred by declining state revenues, or to appease the state and improve the chances of receiving state support. The state often accuses institutions of failing to serve students. Retention programming allows institutions to put on a good face for the state, regardless of whether or not the programming actually leads to student persistence. In turn, states may regard the student friendly appearance of this programming as reason to support the institutions come budget time. However, the true effectiveness of these programs remains unknown.

What is left is an intertwining of state appropriations, institutional programming, and student retention. Decreasing state dollars may inhibit retention. Institutions are responding to this potential inhibition by increasing programming intended to support retention. These programs, theoretically, improve retention, but extensive evidence is not available. The student-centered nature of these programs may also entice the state to contribute more to the institution. These concerns can be studied and unraveled given the appropriate data and methods.

There is much research on student retention. There is an equally large body of work on state funding. There is limited work on the effectiveness of retention programming or the implementers of this programming. However, there is no work encompassing all three, or appreciating the potential for these elements to drive each other. The significance of these relationships is not small. As states redefine their relationships with colleges and universities by demanding more while providing less (Slaughter and Leslie, 1997), the consequences for this redefinition are not entirely foreseeable or understood. States complain of the inefficiency of schools - they fail to graduate students in numbers deemed acceptable to legislators and the public. However, were the loss of students viewed as an outcome of funding decisions, institutions could approach the funding process with the state with a new assertiveness. Moreover, if effective programming emerged that would help slow or eliminate the loss of students, states would have to take notice and consider supporting such efforts. Legislators otherwise suspicious of higher education, interested only in their own political futures, and perhaps jealous of the stability of tenure (Callan and Finney, 1997) might begin a more serious consideration of funding higher education. Most important, states would have to begin bearing the responsibility of their choices.

The limited resources of the institution also require appropriate choices of investment. Many public, four-year institutions are operating learning centers, summer bridge programs, and freshman seminars. These programs have been on the increase, historically, and may have come about both to stem the tide of student departure and to boost the profile of institutions to the state and general public. However, evidence lacks

if these programs even work, making their continued use more of a risk than is perhaps appropriate. A greater understanding of who offers these programs and the effectiveness of these programs as retention tools will allow institutions seeking to cut programs, or choosing to implement new programs, evidence with which to support their choices.

It is important to note that throughout this work, the words “retention”, “persistence”, and “attrition” will all be used to express the continuation or cessation of enrollment. While each will be used, in part, so that the word “retention” will not appear hundreds of times in this research, I intend on some value judgment in my choice among these words. We cannot discount the implied value these three words hold concerning who is responsible for student success in higher education. Institutions retain students, student choose to persist, and attrition results from either student departure or institutional loss of students. There is implicit responsibility in each of these words and as Bangura notes, the role of language in research is under analyzed (1992). Thus, I will move among these words carefully. In my opinion, all parties involved in student retention - students, institutions, states, states, communities, and the like - have some role to play in supporting student success. However, in this dissertation, I focus on the role of the institutions, through programming, and the role of the state, in funding higher education.

Theoretical Framework and Background

This study will employ frames from two parts of the higher education literature - the theories and quantitative methods used to identify and study important elements of student persistence and the small body of research on the efficacy of learning centers,

summer bridge programs, and freshman seminars as retention tools. Also important are the trends in state subsidization of post-secondary education. All of these elements will be noted briefly here and in more detail in the subsequent literature review.

Student retention has been examined in a variety of ways. Murtaugh, Burns, and Schuster (1999) found that retention research can be organized into four themes: pre-college characteristics, causes of attrition, interventions, and teaching. Certainly retention is multidimensional (Stady, 1970) and includes institutional, environmental, and personal factors (Cabrera, Castaneda, Nora, & Hengstler, 1992). Woodard, Mallory, and Deluca (2001) agree, further stating that retention is about what happens after students arrive on campus, limiting, but not eliminating, the need for examining entering characteristics. My work acknowledges all three of these perspectives, combining the first three Murtaugh, Burns and Schuster's themes to look at all of Cabrera, Castaneda, Nora, and Hengstler's factors, while considering the importance of programming and state revenues - things that "happen" after students arrive on-campus in congruence with Woodard, Mallory and Deluca's view.

Without question, two of the most cited retention theorists remain Tinto and Astin. Tinto, in developing his theory of student integration (1993), suggested that students must find ways to infiltrate the academic or social cultures of the institution. Once a student successfully integrates with these elements of the institution, they are far more likely to persist. Attrition results when students fail to integrate. Astin's theories are somewhat parallel. Astin suggested a theory of student involvement (1993), whereby students must find a way to get involved with some element of the institution. This

involvement could be membership in a club or subculture, a campus job, or even a relationship with a faculty member. Should a student fail to become involved with some element of the institution, as with Tinto's theory, they are more likely to depart.

The lesson to be learned from these theories is simple - in order to examine student retention with any accuracy, research should include a variety of factors that reflect qualities of the student and of the institution. Therefore, it becomes important to understand what specific elements of the student and institution are worthy of inclusion in a quantitative study. For that we take the theories of Tinto and Astin to view the body of quantitative research on student retention.

Student characteristics seem to be the dominant means through which retention is examined in quantitative work. Several of these characteristics have consistently shown a relationship to persistence. High school grade point average (Tinto, 1975) and standardized test scores (Astin, 1993) are chief among these characteristics. Both are good reflections of the academic aptitude required to be successful in college and both factor into another common element in retention research - selectivity. Astin considered the selectiveness of institutions in his work, acknowledging that the better quality of student an institution admits, the higher retention rate the institution can expect to enjoy (1993).

Both Astin and Tinto considered factors other than student ability in the development of their theories. Tinto (1987) suggested race and ethnicity are important considerations in retention work and Astin (1993) added social class as an additional factor. Again, this is a case where the effects and the variables can overlap and must be

disentangled. Simply put, white students and those students of middle (or better) class will find that higher education is designed and implemented to appeal, first and foremost, to them. Astin included gender among factors in his 1997 research, citing women as more likely to be retained than men. Finally, Tinto (1993) found evidence that attending school full-time improves persistence rates - it is easier to integrate into the social and academic cultures the more time spent immersed in these cultures.

As identified in the theories, elements of the institution, as well as student elements, are important in explaining attrition behavior. The first of these institutional elements is institution size. Intuitively, the size of the institution might impact on the opportunity for a student to get involved with campus life or find students similar to themselves with which to affiliate. Smaller campuses might encourage the kind of community identified as so important by Tinto, but Kamens (1971) noted that larger and more complex campuses provided more opportunity for involvement and greater prestige upon graduation, potentially contributing to an increased retention rate. Similar to size, the type of institution a student attends will impact their persistence, according to Laden, Milem, and Crowson (Braxton, 2000), with prestige contributing to both the quality of the entering class and the likelihood students will graduate. Varying emphases on teaching, research, and service, as well as the types of degree offered, provide varied experiences for students between institutions of different types.

Two more elements of the institution are worthy of consideration. The cost of education would seem likely to enhance or detract from a student's desire to complete their education. Higher cost may suggest a more exclusive campus, with a higher quality

of student, encouraging persistence. However, the higher tuition may also serve to drive away students who are struggling and would choose to persist only should the schooling be more affordable – the result of a cost/benefit analysis. St. John, Paulsen, and Starkey (1996) agree that cost is relevant to student retention. Also relevant is the ratio of students to faculty. As institutions make the choice to hire more faculty or admit more students, this characteristic seems best defined as an institutional element and Tinto (1993) found the ratio between students and faculty important to understanding retention. A low ratio, that is more faculty and fewer students, may encourage the kind of academic integration critical to persistence in Tinto's model.

Finally, two other elements, best described as controlled by a mix of the student and institution are important. First, students can choose to attend a school in their home state or to travel to another state to study. Likewise, institutions can control their mixture of in and out of state students to achieve a desirable formula. Regardless of responsibility, Murtaugh, Burns, and Schuster (1999) found that in-state students are retained more effectively, probably due to the proximity of their support systems, such as friends or relatives. Likewise, whether students choose to attend full or part time, or institutions choose to serve primarily full or part time students, Tinto (1993) found that full time students are more likely to persist and graduate. Attending school full time allows for greater immersion into the campus culture, increasing the likelihood of the integration Tinto finds critical to student persistence.

Little is known about learning centers, summer bridge programs, and freshman seminars as retention support mechanisms. Beal and Noel (1980) loosely identified these

three programs as important retention tools when they suggested that retention success is boosted by programs that include learning support, advising, and orientation. Each of these functions can be found in learning center, summer bridge, and freshman seminar functions. Moreover, the slim literature addressing these programs specifically makes it reasonable to believe that these three programs are, indeed, useful in supporting retention. Dale and Zych (1996) found that a learning center model at Purdue improved retention, while Robert and Thompson (1994) found a summer bridge program at Berkeley boosted the persistence of at-risk students. Finally, Beck (1980) described a higher retention rate and better grades for users of a freshman seminar. While all of this research was limited to single institutions, it is compelling enough to suggest that these programs may be retention boosting and are worthy of study. However, research that compares the effectiveness of these programs across institutions is lacking.

For the purposes of this research, institutions that provide learning centers, summer bridge programs, and freshman seminars are considered to be institutions making an investment in student retention. While bridge programs serve smaller numbers and learning centers and freshman seminars reach larger populations, all three efforts represent institutional interest in supporting student success and boosting the likelihood of students persisting. A more cynical view, however, would suggest that these programs are intended to promote that interest to the public, regardless of the actual effectiveness of the programs. Program size, which will be partially addressed in this research, is not as important as the apparent investment in and support of programming that is intended to reduce attrition.

The final underlying piece to the framework of this research is the trends in state funding. While the state once carried a substantial part of the burden in financing higher education, their role has been on the decrease. Chapter Two reviews the literature on this phenomenon, but the data collected for this research also illuminated this trending in shifting revenue sources. In 1991, the schools in the sample of 428 public institutions had a mean state contribution of \$5,540 per full time, enrolled (FTE) students (adjusted for inflation to 1996 dollars). This state contribution represented 42% of the mean total expenditures per FTE of \$13,194. While the mean total dollars expended per FTE in 1996 (using a sample of 429 schools) increased to \$14,895, the state contribution was only \$5,482, 37% of the total. Institutions were securing more funds, but the state was not the source of these funds. Did this decrease in real state dollars, or in the percentage of state dollars comprising total expenditures, have consequences for freshman to sophomore retention or retention programming?

Other types of money have been shown to impact persistence. A recent study by Kim, Rhoades, and Woodard (2003) found a positive relationship between research expenditures, overall institutional wealth, and graduation rates, so a model exists for finding a relationship between dollars and student retention. While Kim, Rhoades, and Woodard were addressing institutional wealth and research revenues to examine the relationship between support of the research function and student persistence, my research will substitute state support for research expenditures. Arguably, states have some responsibility to bear when funding decisions impact their support of the educational endeavor. As states contribute most of their funds as “general institutional”

money (Slaughter and Leslie, 1997), this money has discretionary utility beyond research money or other grant revenue. The state may reasonably expect that this money is spent on students, through the hiring of more faculty, maintaining reasonable tuition levels, or supporting programming. As state support has declined, however, the role of this money takes on greater significance, for if the state is the only entity (aside from tuition, through which students support themselves) interested in supporting student success, and their contribution is diminishing, is not student retention, and efforts allegedly supporting student retention, in danger?

Brief Method

The quantitative data for this research was collected from the College Board annual survey of institutions, from WebCASPAR, from Barron's college guides, and from several email surveys of institutions in the College Board sample. The final working data set was comprised of the variables of interest for 428 institutions in 1991 and 429 institutions from 1996 with considerable overlap of institutions between the two sets. These two sets of data were then combined or further culled in order to perform the statistical analysis.

In order to compose the data sets, several criteria were applied to include institutions in the samples. The population for this work was public, four-year institutions of higher education in the United States. The participants were chosen for the sample based upon the completeness of the data in the College Board and WebCASPAR data sets, as well as institutional responsiveness to the email surveys about retention programming. Some institutions were eliminated due to their service to only upper or

lower division students, their location outside of the 50 United States, or the lack of complete, available data on key variables. Both the 1991 and 1996 samples contain data pertaining to the institutions, their students, their freshman populations, their revenue sources, and their programming. The data sets are comprised of 16 independent variables and the dependent variable, freshman to sophomore retention, to be used in total or in some combination in the analysis. Email surveys provided data for three of the 16 independent variables – the data on learning centers, summer bridge programs, and freshman seminars.

The four research questions were addressed using a combination of descriptive statistics, multiple regressions, and fixed effects regressions. Of particular interest were the regressions used to measure the impact of programming and of state allocations on student retention. The fixed effects method requires panel data - a data set that includes the same institutions, with the same variables measured, minimally, at two different points in time. The benefit of this approach is the opportunity control for otherwise unobserved variables that vary between institutions, but not over time. The available data allowed for the use of fixed effects analysis and will provide for the opportunity to evaluate the method as a tool for studying retention.

Research Questions

The four questions addressed in this work were developed first from an interest in the relationship between state financial support and freshman to sophomore retention in higher education. Initially, only this relationship was of interest. However, after gathering data to address this question, it became clear that the trends in retention

programming, in the face of limited state contributions, were also worth examining. The research questions and propositions follow:

Question 1:

1) How many public, four-year institutions of higher education utilized learning centers, summer bridge programs, and freshman seminars over the last 50 years?

Did the frequency of learning centers, summer bridge programs, and freshman seminars at public, four-year institutions of higher education change during the 1991 to 1996 time period?

Proposition 1:

1) Public, four year institutions of higher education are increasingly turning to retention programming to improve retention rates.

Question 2:

2) Among the public, four-year institutions using, or not using, learning centers, summer bridge programs, and freshman seminars, are their common traits in their student populations, their institutional characteristics, or their state revenues?

Proposition 2:

2) No common characteristics exist - institutions of all types, educating all kinds of students, are turning to learning centers, summer bridge programs, and freshman seminars to address retention.

Question 3:

3) Is there a statistically significant relationship between four-year, public

institution's freshman to sophomore retention rate and the state appropriations provided to the institution?

Proposition 3:

3) As state revenues decrease, either in real dollars, or as a share of total revenue, freshman to sophomore retention decreases.

Question 4:

4) Do learning centers, summer bridge programs, and freshman seminars improve freshman to sophomore retention at public, four-year institutions of higher education?

Proposition 4:

4) The presence of learning centers, summer bridge programs, and freshman seminars improves freshman to sophomore retention rates.

Scope and Limitations

This research considered four-year, public institutions of higher education from 1991 to 1996. As the initial interest was in the impact of state dollars on retention, it was inappropriate to consider private institutions as part of the sample. While data was available for public, two-year institutions, their focus on community service and college preparation differs substantial from the mission of four-year public institutions, making comparison of the two inappropriate.

As to the choice of the 1991-1996 timeframe, the available data sets coupled with the documented decline of state funding as a share of total revenue in the early nineties made this time frame appropriate for comparing retention rates, retention programming,

and state dollars. In addition, data was available for key retention variables and the three retention programs for this timeframe. Data for these key variables, particularly selectivity, faculty populations, and revenue, are not as readily available for more current timeframes. Reviewing the available data, and historical trends, suggested the early nineties was a good time period to examine.

One drawback, however, of choosing this timeframe was in collecting data on learning centers, summer bridge programs, and freshman seminars. On some campuses, the originators of these programs have since moved on, making it difficult to collect information on the existence and content of these programs more than ten years ago. As a result, there is likely to be errors in the collected data. Email responders may have been forced to speculate about the programs in their responses. In some cases, multiple emails to the same institution yielded the same data reports from two different individuals, allowing for corroboration of the facts. However, in most cases, there was no way to confirm that the reported data was correct, suggesting that it is likely some inaccurate data was reported. This will bear on interpreting the results of the analysis.

Other limitations existed in the data collection and use. First, the retention predictors used in the equations are not all encompassing. To include them all, even if they could be identified, would create an unwieldy analysis. Instead, only the factors identified in the higher education literature as strongly associated with persistence were included. Even among these chosen variables, the reported data may not have been accurate. A glance at the raw data showed that some institutions reported no change in freshman to sophomore retention from 1991 to 1996. While it is possible that the

institution neither retained more effectively nor less effectively across those two years, it is also possible that lazy data reporting to the College Board resulted in the same retention rates being recorded for several years, despite actual deviations in the rates.

Considering only freshman to sophomore retention is also a limiting factor in this work. Retention extends throughout class levels and while most students are lost in the first year (Tinto, 1987), it is important to consider that freshman to sophomore retention does not account for institutional or student success or failure at other points during a student's tenure at the institution. Freshman to sophomore retention served as a proxy for retention in general for this work, as did variables for socioeconomic status and the selectivity of the institution. When using proxies, variables intended to represent a construct when no direct measure of the construct is available or measurable, interpretation can be a challenge since it can not be certain the proxy is representing the appropriate construct. These issues must be considered when attempting to make meaning of the result of the analysis.

Implicit in this work is notion that learning centers, summer bridge programs, and freshman seminars are primarily intended to support retention. In fact, these programs support and engage students in many ways, some of which certainly contribute to persistence, but others of which may simply enhance student learning and their experience. The implementation and use of these programs may occur with student benefit in mind, but may also be political in nature. Institutions may receive funds earmarked for only these efforts, thereby practically requiring their use, or may choose to use some of these programs in an attempt to gain favor in the community for trying to

assist students. In these cases, the programs are as much for show as they are for any type of real attrition abatement. When gauging the value of these programs with this analysis, these alternate explanations for the existence and use of learning centers, summer bridge programs, and freshman seminars will prove useful.

Summary

This quantitative study is intended to explore the ways in which public, four-year colleges and universities responded to the state funding stagnation and reduction of the early nineties. These reductions may have served to reduce retention. However, institutions implemented a common set of programs - learning centers, summer bridge programs, and freshman seminars - which while intended to support retention and boost the public perception of the institution, may have also been victimized by the funding cuts, further impacting student persistence. From this complicated relationship emerge several entangled questions regarding the relationship between state funding and student retention and retention programming, the effectiveness of that programming, and the types of institutions implementing the programming.

CHAPTER TWO – REVIEW OF RELEVANT LITERATURE

In order to design and inform the analysis to come, it is important to examine the research that has been conducted in the past related to four salient areas. I begin with a review of the financial behavior of the states during the early nineties, particularly as it pertains to public higher education. Next, I will analyze the theories pertaining to student retention in four-year colleges and universities. Third, I will examine the variables used in previous, quantitative retention research that are either common or have been shown to have impact on student retention. Finally, I conclude by reviewing the small amount of literature available, concerning both programmatic elements and effectiveness, for the three retention programs in question: learning centers, summer bridge programs, and freshman seminars.

State Allocations and Higher Education

The time period in question, 1991 to 1996, recorded substantial decline in state funding in terms of percentage of institutional revenues coming from the state and the percentage of state monies allocated to higher education, resulting in a shift of the financing burden from state money to other revenue sources. In some states, the late 1980's and early 1990's marked the first time since the Great Depression that state allocations to higher education declined in absolute terms. Breneman and Finney (Callan & Finney, 1997) note that tuition was beginning to bear more of the burden of cost, increasing from 25% to 27% of revenue while the share of state's contributions were declining from 27% to 23% from 1990 -1994. States were continuing the trend observed by Hossler, Lund, Ramin, Westfall, and Irish (1997) whereby \$11.22 per \$1000 of

personal income was allocated by the state for higher education in 1978/79, but only \$7.96 was similarly allocated in 1993/94. This represented a decline of more than 29%. Over the five year period from 1990 to 1994, Roherty (Callan & Finney, 1997) found that state funding for public institutions fell from 46% to 36% of total revenue, a 21% drop. From a state perspective, legislatures were contributing 14% of their budgets to higher education in 1990, but only 12.5% of their budgets in 1994 (Gold & Ritchie, 1995). Slaughter and Leslie (1997) noted that state funding per student appeared to stabilize in the mid-eighties but then began an ongoing decline in 1988. Legislators were shifting the burden of cost away from the state, and institutions were searching for ways to increase alternative revenue streams.

Specific states were feeling the crunch as higher education support from the legislature declined. Sanchez-Penley, Martinez, and Nodine (Callan & Finney, 1997) found that Florida's allocations per FTE (full time enrolled student) dropped from \$5586 in 1990/91 to \$4121 in 1995/96, representing a 26% decrease. Likewise, in New York, Bracco and Sanchez-Penley (Callan & Finney) found that K-12 and higher education constituted 1/3 of the state budget in 1990 but only 28.6% in 1995. States were finding elsewhere to spend their money.

Higher education suffers in the competition for funding for several reasons. As educational levels increase, the exact benefit to society for supporting the education becomes less clear. As a result, K-12 has relatively little trouble gaining support, but higher education's importance is much less clear (Fischer, 1990). Moreover, many people are over-educated for their current work, making their college education seem a

waste to the public that partially funded it (Fischer, 1990). More attractive spending avenues led to a decline in state support, recorded by Melton (2001) as a decline from 42% of higher education revenue coming from states in 1992, to only 37% in 1997. There were other priorities more easily seen and more politically compelling – therefore, these priorities started receiving more support.

A state government financially supports four basic enterprises: higher education, health care, law enforcement and public assistance, and K-12 education (Callan & Finney, 1997). The focus on these four remains in constant flux – the rising elderly population, for example, has driven states towards health care in recent years (Lowry, 2001). As public perception is often that states are failing in developing and supporting their four functional areas (Callan & Finney, 1997), funding decision take on an increasing political importance. As noted, since higher education can be regarded as the least important of the four central operations, it is easy to see how it has been losing ground in the state funding struggle.

Retention Theory

While retention has been examined in a myriad of settings, using a variety of theories and techniques, the construct continues to be defined and studied from a few major perspectives. We still do not fully understand the elements that encourage or discourage students to remain at institutions and graduate. Yet, retention has been heavily theorized and empirically studied in an effort to understand the forces at work. Part of the limitations in our understanding stem from the prevailing conceptual frameworks that define most work in this field.

An analysis of student retention must begin with a review of the key theories on which most of the current thinking and research is based. Tinto's work on retention is the first of these theories. Tinto (1975) began by addressing the integration of the student into the culture of the university. He suggested that this integration is both academic and social, with academic integration comprised of structural integration and normative integration (Braxton, 2000). Structural integration is the adaptation to the explicit standards of the institution while normative integration is identification with the academic systems of the institution. Tinto further refined his theories several times over the next 20 years (1987; 1983). Using Van Gennep's social rights of passage and Durkheim's suicide theories, he described institutions of higher education with distinct social and academic systems – a student could be integrated into one system but not the other (Tinto, 1987). Integration into one or both of these systems was critical to persistence. In essence, if a student did not feel she was a part of either the academic or social cultures of the institution, she was more likely to leave the institution. As Tinto continued to refine his work, he identified the first year as the most crucial time for this student integration to occur (Tinto, 1993).

Tinto suggested other important concepts that occur throughout subsequent retention research and practice. First, the retention puzzle is best viewed as a combination of institutional and student behavior (Tinto, 1987). To call all students “drop-outs” is to absolve institutions of their responsibility to help students persist. Moreover, retention can't simply be attributed to demographics. Student intentions and commitment, to the institution and to higher education at large, both play a role in the

student's ultimate decision to finish their studies (Tinto, 1987). Finally, Tinto (1987) conceded that events external to the institution, out of the institution's control, might also lead to student departure.

Pascarella and Terenzini (1980) are among many who have found some of Tinto's theories valid. They note the similarities of Tinto's integration concepts and Astin's involvement theories (1984), suggesting that Tinto implied the involvement that Astin was explicit in describing. Braxton, Johnson, and Sullivan (1997) concurred with Tinto's belief that entry characteristics affect commitment, which, in turn, affects persistence. Others have found it necessary to supplement Tinto's theories with their own or combine it with different schools of thought. Cabrera, Nora, and Castaneda (1993) combined Bean's student attrition work with Tinto's integration model, as they felt Tinto ignored external factors in his model, and found that while Bean's model (1980, 1985) explained more of the variance, Tinto's integration model had more hypotheses validated in the structural equations model. Their combined model was better than either individual model, explaining 45% of the variance in persistence. Bean's work makes ample use of environmental factors, like family support, making it a good compliment to Tinto. However, Stady (1970), upon whom Tinto based his theories, critiqued the idea of social and academic integration, suggesting that by committing time to one, a student is subtracting time from the other. Therefore, simultaneous academic and social integration is difficult for most students to achieve.

Still others have developed their own approaches to researching and improving student retention. Chief among them is Alexander Astin, who posited the theory of

student involvement (1984, 1993). Astin suggested that the more involved a student is with the academic life of their school, the more likely they would persist. He preferred to view the college experience as a sequence of inputs, environment, and outcomes, with student characteristics as the inputs and the institution as the environment (Astin, 1993). The outcomes, graduation, drop-out, stop-out, and others, were a result of the inputs and environment interacting with each other.

Kuh, Schuh, and Whitt (1991), in their seminal work “Involving Colleges”, agreed with Astin, stating that involvement with various aspect of college life leads to a more rewarding and fulfilling experience. In contrast to most work in the field, which focuses on individual students fitting into and becoming involved in the institution, Kuh, Schuh and Whitt focus attention on what the college can do to enhance involvement. Implicit in this observation is the responsibility that institutions bear for promoting retention – it is not simply the student’s responsibility to persist, but it is the institution’s responsibility to retain. Institutions should not only provide opportunity for involvement, but should actively encourage students to take advantage of these opportunities. Astin (1993) suggested the importance of student satisfaction as a predictor of retention, making Kuh, Schuh, and Witt’s observation a statement not only on the value of involvement, but its utility as a retention promotion tool.

Still other theories introduced important ideas concerning retention. Noel, Levitz, and Saluri (1985) suggested that there must be a “critical mass” of students on campus. There must be enough members of a particular student group or culture in order to make it visible and viable to other, similar students. Many models assume what has been

labeled the “preeminence of the institution” – an assumption that the institution is providing what students need; it is the students who are failing by not taking advantage of it (Woodard, Mallory, & Deluca, 2001). Finally, Noel, Levitz, and Saluri (1985) suggested that retention is simply an issue of quality. If the quality of the institution improves, one can expect the retention rate to do the same.

It is likely that retention may never be fully understood and the loss of students completely prevented. Lenning, Sauer, and Beal (1980) suggest that student aspirations for college change as they matriculate, making their motivations very difficult for institutions to ascertain. Beal and Noel (1980) concede that each institution may have unique conditions that contribute to attrition, making any sort of macro research useless for solving institution level problems. Moreover, intent to persist has been found to be an important predictor of persistence (Cabrera, Nora, Castaneda, 1993). It is unlikely that institutions will ever have complete knowledge of the intent of their students.

Retention has been so widely theorized about and studied because of its importance to both institutions and the populations they serve. From a student perspective, 41 of every 100 who begin higher education do not leave with a degree (Tinto, 1987). Here are 41 students who did not attain a goal they implicitly stated by enrolling in higher education. It is important to consider that these students may represent failure on the part of the institution. The consequences of this failure for institutions are manifold. There is the loss of revenue associated with the departing students. Glennen, Farren, and Vowell (1996) found in their single institution study that a small increase in retention would result in a \$7.5 million increase of revenue for the

institution over a nine-year period. Uncalculated was the revenue that would also have been generated by these lost students paying fees, buying books, and living on-campus. Replacing lost students is often not an option as Tinto (1987) noted that half of colleges and universities admit everyone who applies, meaning there are no students standing in line, waiting to replace those lost through attrition. Institutions clearly have a fiscal concern in students' persistence.

Public confidence is another casualty of attrition. Callan and Finney (1997) state that the public has already lost confidence in the core businesses of the state, higher education among them. Legislators and voters may believe students leaving the local college or university must be doing so due to some failure on the part of the institution. Within the institution, retention plays a role in student morale (Lenning, Sauer, & Beal, 1980). High campus morale encourages more positive interaction among employees and students, as well as satisfies alumni, who serve as another financial support for institutions. Retention is also oft used as a measurement in college rankings. DesJardins, Ahlborg, and McCall (2002) note that retention rates constitute 20% of the score US News and World Report compiles for each school in its annual ranking issue. An increase in the rankings in this and other, similar reports can increase applications and enrollment, improve the quality of the student body, and even reduce grant expenditures as students are more willing to bear the cost of a more prestigious institution. All of these outcomes can have substantial financial benefits to the institution and the cyclical nature of retention and these benefits, as retention rises or falls, is clear. An understanding of retention and its components is crucial for higher education institutions.

Retention Variables

A synthesis of the work of Tinto, Astin, and others suggests that retention research should be concerned with a combination of factors. Some will serve to define the student, such as academic aptitude. Others will delineate the institution, such as population size and institutional mission. Still others will address environmental elements, such as economic climate. The retention literature suggests elements in all three categories that should be considered in any study of retention.

Student demographics are common variables in the literature on college student persistence. Race and ethnicity is one such example. Numerous studies have used race/ethnicity as a variable (Ryland, Riordan, & Brack, 1994; Thomas, 2000) in retention analyses and it is clear that race plays a role (Braxton, 2000; Murtaugh, Burns, & Schuster, 1999; Berger & Braxton, 1998) in predicting persistence. White students (Milem & Berger, 1997; Tinto, 1987) and Asian students (DesJardins, Ahlburg, & McCall, 1999) persist and graduate at higher rates than all other students of color (Berger & Milem, 1999). As most institutions function according to white culture in many explicit and implicit ways, it is easy to envision the difficulties students of color may encounter when trying to navigate an already difficult and complicated administrative structure.

Tinto (1987) argues that race is not the most crucial concern – race is, in fact, a proxy for social class or socioeconomic status. There is general agreement that social class is an important component of understanding why students persist. Sewell, Haller, and Straus (1957), Sewell and Shah (1967), and Sewell (1971) all suggested that social

class is among the most powerful predictors of persistence, even more than race or ability. Astin (1993) found that high school performance and standardized test performance are both more powerful predictors, but that socioeconomic status followed closely. In fact, socioeconomic status, defined by family income, parental education, parental occupation, or some combination of these is represented in numerous retention studies (St. John, Hu, Simmons, & Musoba, 2000; Woodard, Mallory, & DeLuca, 2001; Braxton, Milem, & Sullivan, 2000; McGrath & Braunstein, 1997; Nora, Cabrera, Hagedorn, & Pascarella, 1996). It is reasonable to believe that the more educated and/or wealthy a family, the more likely a student from that family will have both the resources and encouragement required to complete a degree. Regardless of the ranking and role of race and social class as predictors, both are critical to predicting and understanding retention and should be central to any persistence study, although circumstances precluded their inclusion in this study.

Pascarella and Terenzini (1991) suggest three other retention factors that research should always include: high school achievement, college size and selectivity. Size will be dealt with later, but high school achievement is perhaps the most studied element of persistence. Past academic performance is, logically, a good indicator of future academic success. As a result, high school grades have frequently appeared, as a variable, in retention research (Nora, 1987; DeBerard, Spielmans, & Julka, 2004). Cambiano, Denny, and DeVore (2000) found that high school grades are a good predictor of retention, as did Lenning, Sauer, and Beal (1980), Elkins, Braxton, and James (2000), and Smith, Edminster, and Sullivan (2001). However, high school performance accounts for

only 12% of the variance in attrition in Tinto's work (1987), leaving a great deal of variance to be explained by other variables.

Selectivity of the institutions, the rigor of the criteria used to admit students, also bears heavily on persistence. Tinto (1993) speaks directly to selectivity in his work, stating that it is clear that as institutions are more selective, attrition decreases. Choosing students with better academic preparation and better past performance naturally increases retention. Both Beal and Noel (1980) and Gaither (1992) cite a close relationship between the selectiveness of an institution and the retention/graduation rates of that same institution. Noel (1976) also noted that retention studies should be conducted considering the ability of the participants in intervals. In other words, it is inappropriate to compare low ability students and high ability students. Therefore, it is inappropriate to compare institutions that select or admit low ability students with institutions that select only high ability students. The selectivity of the institution will play an important role in its retention rate.

Other student demographics are useful in retention research. Gender is a criterion worthy of inclusion in persistence studies (Murtaugh, Burns, & Schuster, 1999; Allen, 1999; Braxton, Vesper, & Hossler, 1995). Most recent work finds that women are more likely to persist than men (Smith, Edminster, & Sullivan, 2001, Berger & Milem, 1999), reversing earlier studies that showed men persisted at higher rates (Sewell, 1971). Ultimately, the bulk of the canon finds that women persist at higher rates than men (Tinto, 1993; Gaither, 1992; Astin, 1993). While more women leave voluntarily while men must be forced to leave (Tinto, 1987), women appear more suited to success in

higher education. Similar to race, gender can be mitigated by social class to some extent (Lenning, Sauer, & Beal, 1980), but gender remains relevant enough to consider independent of socioeconomic status in retention research.

Students who live in the same state as their institution of choice appear more likely to persist (Murtaugh, Burns, & Schuster, 1999). The familiarity with the surroundings and easier access to their support system may be contributing factors to this phenomenon, but several works have found that choosing an institution in their home state results in a greater likelihood of remaining in school (Bean, 1980; Murtaugh, Burns, & Schuster, 1999; DesJardins, Ahlburg, & McCall, 1999).

The importance of student ability is reflected in both high school grades and institution selectivity as important predictors of retention. Similarly, student performance on standardized tests – the Scholastic Aptitude Test (SAT) or American College Testing Assessment (ACT) – has been shown to predict student persistence with some accuracy. Standardized test scores are extremely common criteria in retention research (Astin, 1997; Somers, 1996; Adelman, 1999). As with high school grades, it is reasonable to assume that students who perform well on measures of aptitude and ability are also likely to be successful in the college environment. Hence, standardized tests have some utility as predictors of retention (Smith, Edminster, & Sullivan, 2001; Cambiano, Denny, & DeVore, 2000).

A student's commitment to their studies and their institution of choice is an important factor when predicting retention (Bean, 1980). One way such commitment can be expressed is through full or part time study. Tinto (1993) suggests that part-time

students are less attached to institutions and both St. John, Kirshon, and Noell (1991) and Somers (1996) found a positive relationship between full-time attendance and retention. A student attending full time may have fewer distractions and has demonstrated a desire to prioritize academic effort. Part time students may have external influences, such as jobs or family, that do not allow for maximum investment or effort, detracting from their opportunity to graduate.

Not to be ignored are the elements that the institution brings to the retention puzzle. The size of an institution is important in predicting retention, as already noted by Pascarella and Terenzini (1991). Pantages and Creedon's synopsis (1978) of critical factors in the retention literature includes size as an important factor. Gaither (1992) also found a correlation between institution size and retention. Astin (1993) used FTE in his work detailing the importance of student involvement as a retention support mechanism. Ryan's recent research (2004) on expenditures and attainment considered size as a variable in his work and Berger and Braxton (1998) noted that the literature of organizations suggests that attributes such as size contribute to satisfaction and attrition. Campus size suggests many things, including the potential number of options for students to become involved in campus life, the size of classes students may take, the likelihood students will interact with faculty in an intimate fashion, and the variety of subcultures students may choose to ally with. All of these opportunities contribute to students' successful integration and involvement, supporting their persistence.

Other institutional elements are also worthy of inclusion in retention studies, according to the literature of higher education. The type of institution a student attends,

pertaining to its mission and role in the community, has shown to be related to persistence. Astin (1993) found that institution type has indirect effects on persistence – the type of institution creates other environmental factors that have direct bearing on retention. Hu and St. John (2001) and Braxton (2000) also found that type of institution is a valuable construct in conducting retention research. The balance of research and teaching and the responsibilities of the institution to the community both trickle down in the institution, determining the support services available, the type of student enrolled, and even the quality of the learning experience. While the type of institution doesn't directly impact persistence, it does reach into areas that have more tangible impact on the student experience.

St. John, Cabrera, Nora, and Asker (Braxton, 2000) lament the lack of financial variables included in most studies of retention. They suggest that tuition ought to be considered in all persistence studies. St. John, Paulsen, and Starkey (1996) found that college cost was significant to within year attrition and included tuition as a variable in their work. When considering rational choice theory, it is reasonable to assume that tuition is an important influence in retention. Should a student find the cost of higher education is not worth the outcome, rational choice suggests the student will depart the institution.

Another important financial element in retention is financial aid. While this construct is not included as a variable in this study, it is important to note the role of aid when exploring how money impacts attrition. For example, Hu and St. John (2001) found that aid can equalize persistence between ethnic groups, making it a powerful tool

in retaining groups of students that traditional suffer higher attrition. St. John (2000) posited that aid plays a part in student's decisions to remain enrolled. If the cost of the institution, adjusted by aid, remains reasonable, students are more likely to continue their studies. The effectiveness of aid as a retention tool may spring from its indirect effects on available time (Cabrera, Nora, & Castaneda, 1992). Since aid may decrease a student's need to work while enrolled, they have more time to devote to academic and social integration, which in turn promotes persistence.

Finally, faculty-student ratio, a comparison of faculty and student populations at a given institution, has shown to have some relationship with retention. Tinto (1993) asserts that student interaction with faculty is important in that the student believes it is a reflection of the institution's care for the student. Student commitment to the institution increases or decreases according to this perception of care. Berger and Braxton (1998) and Astin (1993) concur, having used interactions with faculty in their retention work. As faculty are the primary contact point for the institution – the only university personnel a student must come into contact with – it is reasonable that the quality and quantity of this interaction may impact a student's desire to persist.

The institutional and student elements noted above are what might simply be labeled a "frame" – they are the different elements that contribute to the student-institution interaction but none are necessarily designed or managed with student retention in mind. They simply define the basic parameters of the student-institution interaction. Within that "frame", however, there exist direct institutional actions intended to aid in persistence. While these actions are limited by the "frame" – money, size,

student characteristics, and the like all dictate the types of actions both available and taken – there is sufficient room within the “frame” to impact the student experience. It is these limited, focused actions, in the form of programming, which may be the key elements in boosting student retention, given the relatively fixed nature of the “frame” itself. We now turn our review to three programmatic elements that institutions use to boost retention.

Retention Programs

Limited research has been conducted on learning centers. Synthesis of this literature produced some important traits that appear to be consistent in defining learning centers and differentiating them from other campus programs. These traits were used to identify learning centers at the public, four-year institutions included in the sample. The first of these key elements is a physical location. While services such as academic counseling, tutoring, and advising are offered on most campuses, learning centers provide these and other services in one physical location. Beal and Noel (1980) posit that the combination of these services serves to augment their effectiveness and is the ideal approach to providing these student support elements.

In a single location, a combination of several services needed to be available in order to fit the working definition of a learning center. First, students needed opportunity for study skill development (Reyes, 1997; Robert & Thompson, 1994; Martin & Blanc, 1981; Dale & Zych, 1996;). Centers often assist students in becoming more effective learners through developing better reading and note-taking skills, improving study and test-taking strategies, and teaching time management. Second, tutoring was available at

many learning centers described in the literature (Robert & Thompson, 1994; Martin & Blanc, 1981; Dale & Zych, 1996). Students seeking individual or small group assistance in particular subject areas were served in the campus learning center. Third, learning centers provided remediation for students that were academically unprepared for the university classroom (Martin & Blanc, 1981; Noel, Levitz, Saluri, & Associates, 1985; Dale & Zych, 1996). As institutions continue to enroll more students, many arrive without the requisite knowledge to be successful in college-level classes. Learning centers have taken the responsibility of developing student knowledge to a point that success is more likely. Finally, learning centers often provide academic advising for students (Dale & Zych, 1996; Beal & Noel, 1980). As students try to navigate the complicated college bureaucracy, they need professional guidance. Academic advising can be crucial for students as they select classes or try to understand policies.

Some evidence exists concerning the effectiveness of learning centers as retention programs. One center moved to identify at-risk courses instead of at-risk students – the courses that traditionally caused student to struggle or fail became the central focus of the learning center. The result was an increase in B's in the difficult courses and an overall increase in the retention rate of students taking these courses (Martin & Blanc, 1981). The HORIZONS program at Purdue University matched a group of learning center users with a group of non-users and found that users were retained or graduated at 85% through ten semesters while non-users were retained at only 47% over the same ten semesters (Dale & Zych, 1996). Narrowing the time frame to only the critical first and second semesters found that 100% of center users were retained while non-users persisted at

89% (Dale & Zych, 1996). Single institution studies appear to support learning centers as a retention tool.

Similar evidence exists regarding summer bridge programs as effective retention programming. Robert and Thompson (1994) found that bridge participants at Berkeley were retained at the same rate as non-participants despite the lower high school grade point averages and standardized test scores of the participants. The Berkeley bridge program served to mitigate gaps in the entering students aptitude and knowledge, bringing them to a skill level comparable with the rest of the student body. At the University of Virginia, bridge program students persisted at 76% while matched students who did not use the summer bridge option persisted at only 55% (Simmons, 1994). Again, this research addresses only single programs and institutions, but there is some compelling data on bridge programs as retention efforts.

Research on these and other summer bridge programs again elicits some traits that appear to be common and served to define summer bridge programs for this research. The first element is on-campus residence (Robert & Thompson, 1994). Summer bridge programs often function as extended orientation experiences, acclimating students to campus culture. The most efficient way to integrate bridge participants is to house them on the campus, allowing them to experience all elements of campus life. Bridge programs also facilitated contact between students and faculty/staff (Robert & Thompson, 1994; Kluepfel, 1994; Beal & Noel, 1980). The importance of student contact with faculty and other university personnel is well established in the retention literature (Astin, 1993; Pantages & Creedon, 1978). Bridge programs, because they

occur during the summer, are ideal for allowing faculty to lavish more attention on the participants. A third element of bridge programs necessary to include them in this research was remediation. Summer bridge programs, often focused on under prepared or at-risk students (Reyes, 1997), attempt to increase important knowledge, such as mathematics and writing, and develop learning skills in order to facilitate the transition to higher education. Robert and Thompson (1994) and Kluepfel (1994) both noted the remediation elements of the bridge programs they studied. Finally, bridge programs provide an overview of and orientation to campus life (Beal & Noel, 1980; Kluepfel, 1994). The university environment can be overwhelming, particularly to students already lacking in some requisite skills. The head start on learning the layout of a campus, sampling its culture, and identifying its resources that summer bridge programs provide can facilitate successful social and academic integration.

Freshman seminars were the third program of interest for this research and they, too, have some common elements. Freshman seminars are often offered for academic credit (Shanley & Witten, 1990; Mark & Romano, 1982; McIntire, Pumroy, Burgee, Alexander, Gerson, & Sadoris, 1992). The credit element lends the course respectability and also forces students to engage in the content since a grade will result from their efforts. Moreover, it reinforces for students the importance of the information delivered in the seminar. Mark and Romano (1982) and Shanley and Witten (1990) found that seminars, similar to bridge programs, also serve to orient students to the campus. On some campuses, the freshman seminar replaced traditional orientation while at others it supplemented or continued orientation for students. In either case, again, acclimating

students to the campus community can have positive effects on retention (Astin, 1993). Like learning centers freshman seminars provide opportunity to improve the skills students require to be successful in the classroom (Thompson, 1980; Simmons, Wallins, & George, 1995; Mark & Romano, 1982). Finally, seminars offer the opportunity to connect students to faculty and staff (Mark & Romano, 1982), similar to summer bridge programs.

Pascarella and Terenzini (1991) suggest freshman seminars are the most effective retention activity. Brotherton (2001) agrees, noting that seminars are important academic programs for promoting retention. Other researchers have found some evidence that seminars increase the likelihood of persistence for participants. At the University of Maryland, students enrolled in a seminar had a full point increase in their GPA over the control group and were retained at 100%, while the control group students were retained at only 70% (McIntire, Pumroy, Burgee, Alexander, Gerson, & Saddoris, 1992). Shanley and Witten (1990) found that seven-year graduation rates for seminar students were 56% compared to only 51% for students who did not take the seminar. Beck (1980) noted that seminar participants enrolled in more hours and completed more hours than those that didn't take the seminar. In addition, seminar students were retained at 90% for their first year, a 9% better rate than students who did not take the seminar. Boudreau and Kromrey (1994) matched participants with non-participants to form an effective control group and concluded that freshman seminars contribute to retention, if only for a couple of semesters. As with learning centers and summer bridge programs, the small amount of research done on freshman seminars suggests they serve an important retention function.

CHAPTER THREE - METHODS

Four questions of interest have emerged from the literature on state funding, student persistence, and retention programs, and from examining the available data. First, have retention programs grown in number over time? Second, are there common traits among the institutions that choose to use learning centers, summer bridge programs, and freshman seminars? Third, do state allocations to institutions of higher education assist in student retention? Finally, are learning centers, summer bridge programs, and freshman seminars effective tools in promoting student persistence?

These four questions will be addressed through the use of descriptive statistics, multiple linear regressions, and fixed effects regressions. I will begin this chapter by describing the data collected and the method of collection. Next, I will identify and discuss the variables used to address the research questions. I will follow by addressing the specific statistical methods used for each of the four research questions. Finally, I will conclude by exploring some of the limitations of the data and methods and explaining some of the delimitations imposed.

Data Sources

The data was culled from several sources: the College Board, WebCASPAR, Barron's Profiles of American Colleges, and surveying of public, four-year institutions of higher education. The College Board conducts yearly surveys collecting data on institutional characteristics. WebCASPAR, an online repository of data managed by the National Science Foundation, provides statistics on institutional revenues and expenditures, as well as populations of women, students of color, full/part time students, and faculty for all institutions of higher education. Barron's Profiles of American

Colleges offers an annual accounting of institutions of higher education willing to share their demographics and calculates its own measure of institutional selectivity. Finally, I constructed two surveys and distributed them to institutions in the College Board sample in order to gather data on learning centers, summer bridge programs, and freshman seminars.

Data Collection

While the College Board, Barron's, and WebCASPAR data was readily available, there was no known data set that compiled information on learning centers, summer bridge programs, and freshman seminars at public, four-year institutions of higher education. It was necessary to collect such data and it was decided that using the Internet and email would be the most efficient means of doing so. Two surveys were designed to address first the existence of these programs and then their funding and usage.

It is important to note that these surveys were not attitude or behavior measures. As such, they were not tested for validity or reliability. They simply inquired about the operation of programs. However, it is reasonable to assume that there were some reliability issues with the responses. For example, some respondents clearly worked to gather correct information – their emails were copies of dialogue with other campus staff. Other respondents did not consult others for their responses, suggesting they either knew the information or were just guessing at program content, operation, and usage. There is danger in accepting the responses of the campus personnel as completely accurate and I will proceed accordingly.

The first survey was disseminated via email to one individual each at all public, four-year institutions of higher education appearing in the College Board sample (approximately 450 schools) in the spring of 2003. The text of the survey is available in Appendix A. The survey asked if the institution in question used a learning center, summer bridge program, or freshman seminar and during what period of time these efforts were operating. Each of the three programs were operationally defined in the survey so that respondents would understand the criteria that compose the three programs. The programs were not inquired about in name only, but were identified according to their content and composition.

The websites of the institutions in the sample were reviewed for contacts who could comment on the existence and function of learning centers, summer bridge programs, and freshman seminars on their campus. Typically, directors of retention, learning services, advising, or EOP (Educational Opportunity Programs) programs were identified as initial contacts. On occasion, academic or student affairs deans served as first contact points. Often this was the result of underdeveloped websites. Each institutional contact was emailed the initial survey. If the first survey went unanswered, a second email survey was sent to the contact. If the first two emails went unanswered, the institutional website was again consulted for a new contact. The initial survey was sent to the new contact and followed up with the second survey for non-responsive contacts. This cycle of identifying personnel and emailing the survey was repeated a third time for unresponsive contacts. A fourth round of emails was targeted at institutions that had

provided only partial responses to the first three email cycles in order to complete the data set as much as possible.

The survey responses were overwhelmingly from learning center, or the equivalent, personnel. Since the business of these offices is often referral, it was not surprising to find that the directors, assistant directors, or coordinators in these offices were knowledgeable of campus programs directed at supporting student success. The survey also drew an occasional response from an upper level administrator, such as a vice-chancellor. Again, as these administrators likely have many programs under their supervision, it is logical that they would be in a position to comment on several different programs operating on their campuses. Ultimately, it would have been desirable to have complete knowledge of the survey respondent demographics. However, as the survey was sometimes passed to several individuals to get correct answers, and the respondents did not always identify their positions when sending their information, it is impossible to ascertain the specific positions of the responding individuals.

Survey responses were coded as dummy variables into the data set. For each individual year, each of the three programs were coded “0” for no program or “1” for an operating program. The survey response rate, after the four rounds of emailing, was 74%, meaning that almost three-quarters of the sample has either a “0” or “1” in place for all three programs for the 1991-1996 time period. The resulting set of institutions represented 48 states, were mostly Carnegie Classification Comprehensive I, were not very selective according to the Barron’s measure, and retained anywhere from 21% to

94% of their freshmen. The set appears to be representative of public, four-year higher education, writ large.

After reviewing the responses from the first survey attempt, it became apparent that it was not sufficient to simply know of the existence of learning centers, summer bridge programs, and freshman seminars. In order to connect state funding allocations and freshman to sophomore retention, it was necessary to learn if the three retention programs in question were beneficiaries of state funding, and if that funding was increasing or decreasing during the 1991-1996 time period. Further surveying to ascertain program usage and funding was necessary. A second survey was constructed and directed at responsive contacts during the spring of 2004. If an institution had responded to the first survey affirming they offered one, two, or all three of the programs of interest, this institution was automatically sent the second survey. The text of this survey is available in Appendix A. This second survey inquired about the number of students typically using a program from 1991-1996, as well as the composition and status of the program budget during that time. This data was not entered directly into the regressions or panel analysis, but was placed in a distinct data set to be used to add context to some of the analysis. Due to the low response rate, 24% for institutions that reported learning centers in the first survey, 14% for summer bridge programs, and 21% for freshman seminars, this data will not be reported as part of the results, but will only be referenced during the analysis.

Variables

The central questions of this research were the value of learning centers, summer bridge programs, and freshman seminars in improving freshman to sophomore retention rates and the relationship between state financial allocations to higher education and freshman to sophomore retention. The unit of analysis for this research was the institution. In order to address the central questions as accurately as possible, many elements of retention needed to be accounted for. Each of these variables will be noted here with their statistical name used in the calculations (in parentheses), source, range, and construct, as well as a brief reiteration of their role and importance in explaining retention. A more complete examination of the relevance of these variables in retention research is available in Chapter Two. The variables of interest are also briefly described in Table 1.

Retention research has often focused on academic attributes that students bring with them to the institution. Much research has been done using high school grade point averages and/or standardized test scores to predict retention. If a student was an adept student in high school, it is reasonable to assume they will continue to be an adept student in college. For this research, no data was available for average high school grade point averages or average standardized test scores for the freshman class that encompassed a large enough portion of the sample. Another important construct in the persistence literature is institutional selectivity. The more selective an institution is in composing its student body, the more likely the student will graduate. Barron's measure of selectivity (sel), from 0 for non-selective to 8 for the most selective, combined high school grade

point average data and standardized test score data of the institution's students with the selectivity of the institution to meld these three ideas into a single variable.

Other characteristics of the student body were used to account for important elements of retention. As women are retained at a higher rate than men, the percentage of women in the freshman class (wome) was used as an independent variable. The size of the female population, as reported by WebCASPAR, was divided by the undergraduate population, reported by the College Board data, to derive a percentage of women comprising the undergraduate population. As a percentage, this number ranged from 0 to 100.

Full-time students, presumably because of their greater involvement on campus and in their academics, are retained more successfully. The percentage of full-time students (full) in the freshman class will serve as an independent variable. Similar to the percentage of women, this variable was created using WebCASPAR's full-time student numbers with the College Board's undergraduate attendance data to calculate a percentage of student attending full time, ranging from 0 to 100.

Research also suggests that in-state students are retained more successfully (Murtaugh, Burns, & Schuster, 1999) – the percentage of in-state students (enru) accounted for this phenomenon in the equation. This number, 0 to 100, was reported directly by the College Board's data.

Financial characteristics, both of the student and the institution, were central to this research when considering freshman to sophomore retention at public, four-year institutions. Several calculations were applied to the existing WebCASPAR financial

data, using the College Board's institutional population data, to make it useful for this analysis. As institution size varies, it was decided to consider state dollars (asd) and total general and educational expenditures (atd) per student at each institution. Both of these values were expressed in thousands of dollars in the data set. Each institutional total was divided by the full time enrollment of the institutions, calculated as full time students plus one-third of part time enrollment (Ryan, 2004). These per student expenditures were then adjusted to 1996 dollars (in thousands) in order to account for inflation using the Bureau of Labor Statistics data (Borowski, 1998).

The final institutional financial variable was tuition and fees. The cost of an education certainly will impact its desirability, and may impact a student's choice to continue their studies. Adjusted for inflation to 1996 dollars, tuition and fees (tafu) for each institution was included as an independent variable. This data was provided in the College Board data set.

The racial composition of the student body (race) was also included as an independent variable in the various equations. Since research suggested that both white and Asian-American students were more likely to persist in higher education, these two population counts were gathered from WebCASPAR and divided by the total undergraduate enrollment in the College Board data to generate a number from 0-100, representing the percentage of whites and Asian-Americans attending the institution.

Institutional characteristics appear to be important in the retention puzzle. The number of faculty compared to the number of students at an institution implies how much contact students may have with faculty. Faculty contact with students is known to

promote persistence. Student faculty ratio (fsr) was included in the analysis as an independent variable and was calculated by dividing the undergraduate population reported by the College Board by the number of faculty reported by WebCASPAR.

Four dummy variables, one for each level of Carnegie Classification (res, doc, comp, lib), were included in the panel analysis. Each classification is defined by the number of degrees awarded in a diversity of programs, as well as the level of education offered, from baccalaureate to doctoral at the given institution (The Carnegie Foundation, 2003). These distinctions between institutions suggest the type of experience students may have while attending and, in turn, this experience may factor into their persistence. Each institution in the sample was assigned a “1” for its Carnegie class and “0”s in the other three classes and this data was recorded from the College Board survey.

Finally, three more dummy independent variables, representing the existence of learning centers (lrnc), summer bridge programs (smr), and freshman seminars (frs), were used as independent variables. For each case, if the program existed in the given year, a “1” was entered into the data. Institutions without the program received a “0”. This data was gathered via the email surveying process previously described.

Three of these variables rotated in and out of the analyses, depending upon the question being addressed. When state dollars per full time, enrolled student (asd) was added into the question, total dollars per full time, enrolled student (atd) and student/faculty ratio (fsr) were often removed as independent variables. As state dollars contributes substantially to the total dollars expended and state dollars often support faculty salary, the possibility of multicollinearity between state dollars and total dollars

TABLE 1, Variables

VARIABLE NAME	CONSTRUCT	VARIABLE TYPE	SOURCE	VALUE	RANGE	NOTES
sel	Institutional selectivity, high school grade point average, standardized tests	independent	Barron's Guide	Dummy	0-8	Barron's measure combines all three constructs into a single variable
wome	Enrolled female students	independent	WebCASPAR /College Board	Percentage	0-100	
full	Enrolled full-time students	independent	WebCASPAR /College Board	Percentage	0-100	
enru	Enrolled in-state students	independent	College Board	Percentage	0-100	
asd	State allocation per student	independent	WebCASPAR /College Board	Dollars per FTE	0-16	In thousands; all dollars adjusted to 1996 values to account for inflation
atd	Total dollars expended per student	independent	WebCASPAR /College Board	Dollars per FTE	0-88	In thousands; all dollars adjusted to 1996 values to account for inflation
tafu	Tuition and fees	independent	College Board	Dollars	0-8000	all dollars adjusted to 1996 values to account for inflation
race	Enrolled white and Asian students	independent	WebCASPAR /College Board	Percentage	0-100	
fsr	Student/faculty contact	independent	WebCASPAR /College Board	Ratio	0-100	
res	Carnegie Classification	independent	College Board	Dummy	0,1	0 for not Research I/II, 1 for Research I/II
doc	Carnegie Classification	independent	College Board	Dummy	0,1	0 for not Doctoral/II, 1 for Doctoral I/II

Table 1 Continued, Variables

VARIABLE NAME	CONSTRUCT	VARIABLE TYPE	SOURCE	VALUE	RANGE	NOTES
comp	Carnegie Classification	independent	College Board	Dummy	0,1	0 for no Comprehensive I/II, 1 for Comprehensive I/II
lib	Carnegie Classification	independent	College Board	Dummy	0,1	0 for not Liberal Arts I/II, 1 for Liberal Arts I/II
lmc	Learning center	independent	Survey	Dummy	0,1	0 for no program, 1 for program
smr	Summer bridge program	independent	Survey	Dummy	0,1	0 for no program, 1 for program
Frs	Freshman seminar	independent	Survey	Dummy	0,1	0 for no program, 1 for program
Frret	Student retention	dependent	College Board	Percentage	0-100	Freshman to sophomore retention

and/or student faculty ratio was significant. In order to avoid this statistical overlap, these constructs were used both together and separately to address the question of the impact of state dollars on retention, the third research question. This potential overlap will be addressed further in Chapters Four and Five.

The dependent variable in the panel analysis was freshman to sophomore retention rate (frret), expressed as a percentage from 0 to 100. The College Board survey records the percentage of students returning from their freshman year to their sophomore year. While data availability dictated the use of freshman to sophomore retention, this choice of dependent variable also benefits the research design, as well as focuses the research on the time period when most students choose to leave higher education.

Selecting Participants

Choosing institutions to include in the study began with the elimination of private institutions. As such, they were not recipients of state allocations in the same way or to the same degree as public institutions. Next, all institutions that were not four-year, degree granting schools were removed. As community colleges serve different functions than four-year institutions, it was decided that comparing these two differing types was inappropriate. Therefore, community colleges were eliminated from the sample. Also removed were schools such as the University of Houston – Victoria. These schools served only upper division students or served as two-year feeder schools to upper division colleges and universities. Again, it was decided that the functions of these schools was sufficiently different as to not provide for appropriate comparison with traditional four-year institutions.

Finally, a balance between including critical constructs of retention and maintaining a reasonable sample size had to be struck. For example, student financial need was intended to serve as a proxy for socioeconomic status in the analysis. The literature confirming socioeconomic status as an important element of retention is copious (Sewell, Haller, & Straus, 1957; Sewell & Shah, 1967; Sewell, 1971; Astin, 1993; St. John, Hu, Simmons, & Musoba, 2000; Woodard, Mallory, & DeLuca, 2001; Braxton, Milem, & Sullivan, 2000; McGrath & Braunstein, 1997; Nora, Cabrera, Hagedorn, & Pascarella, 1996). However, the measure was available for only a third of the schools in the sample, so the variable had to be excluded. Delaware State and the University of Pittsburgh – Bradford had no data for their state appropriations. In this

case, state appropriations were central to the research questions, these institutions were eliminated.

After selecting the variables and institutions, a time frame for the analysis was required. The time frame originally spanned 1989 to 1996, as the College Board data was only available for those years. However, WebCASPAR, the source for faculty population data used in calculating student/faculty ratios, recorded no faculty data for 1989, so this year was eliminated from the sample. The Barron's data introduced similar problems since their guide was only published once every other year in the early nineties. Selectivity data was only available for 1991, 1993, 1995, and 1996. Therefore, 1990, 1992, and 1994 were eliminated as years of interest in the fixed effects regression. As a final step, 1993 and 1995 were eliminated from the time frame as only two years of data are used. I will explore this further when addressing the methods of data analysis.

What remained were samples of 271 institutions for both 1991 and 1996. The same 271 institutions were represented in both samples. The research questions will be addressed with this group of 271, with the exception of the first question – the growth in retention programming. In this case, the sample of all institutions that responded to the first survey will be employed. This group constituted 316 schools.

Describing the Sample

Descriptive statistics for the 271 institutions for both 1991 and 1996 are noted in Table 2. The statistics can be summarized by saying that the majority of institutions are defined as Carnegie class Comprehensive I/II, average 70% freshman to sophomore retention rate, receive approximately \$5400 per full time, enrolled student from the state, are not very selective in their admissions, and represent 46 of the 50 states.

TABLE 2, 1991 and 1996 Descriptive Statistics (n=271)

	Mean		Standard Deviation	
	<u>1991</u>	<u>1996</u>	<u>1991</u>	<u>1996</u>
Freshman seminar	.439	.619	.497	.486
Summer bridge program	.420	.494	.494	.500
Learning center	.524	.608	.500	.488
Percentage of in-state students	87.42	86.85	11.314	10.769
Percentage of Caucasian/Asian students	84.248	81.541	17.416	17.936
Percentage of female students	55.210	56.170	7.784	7.280
Percentage of full-time students	69.955	71.032	13.176	12.676
Research I/II institution	.125	.162	.331	.369
Doctoral I/II institution	.125	.107	.331	.309
Comprehensive I/II institution	.697	.597	.460	.491
Liberal Arts I/II institution	.051	.132	.221	.340
Barron's selectivity measure	1.85	1.89	1.446	1.424
Full-time enrolled (FTE) students	9455	9385	7833	7677
Tuition and fees	2168	2743	787	949
Total dollars expended per FTE	12.829	14.648	7.866	9.181
Student/faculty ratio	28.283	27.375	8.043	7.307
State dollars allocated per FTE	5.387	5.414	2.313	2.225
Percentage of freshmen retained to sophomores	70.35	70.49	11.772	10.213

Research Questions and Methods

Four questions for study arose from the initial interest in the relationship between state funding, retention programming, and student retention. These questions were addressed using SPSS 11.0, a computer based statistical computation package. Each question required particular methods to resolve and, therefore, I will consider the questions individually and identify appropriate methods of analysis using the described data.

Question 1:

- 1) How many public, four-year institutions of higher education utilized learning centers, summer bridge programs, and freshman seminars over the last 50 years?

Did the frequency of learning centers, summer bridge programs, and freshman

seminars at public, four-year institutions of higher education change during the 1991 to 1996 time period?

The first survey was distributed to more than 450 public institutions of higher education, with 316 responding about the existence and inception of their programs. For campuses that offered the programs, start dates of the programming were collected. A frequency distribution was used to track the increase of programming over the last fifty years and during the time period in question for this work, 1991 to 1996.

Question 2:

2) Among the public, four-year institutions using, or not using, learning centers, summer bridge programs, and freshman seminars, are their common traits in their student populations, their institutional characteristics, or their state revenues?

The 271 institutions that were in both the 1991 and 1996 data sets, using or not using learning centers, summer bridge programs, and freshman seminars, were examined for common characteristics in order to understand why some institutions opted for the programming while others did not. In particular, descriptive statistics for the racial composition of the student body, the selectivity of the institution, the student/faculty ratio, the state dollars collected per FTE student, and the total dollars spent per FTE were compared across institutions who used and didn't use each individual program, for both 1991 and 1996. In addition, institutions using all three programs and none of the three programs were compared on the same descriptives for both 1991 and 1996.

Question 3:

3) Is there a statistically significant relationship between four-year, public

institution's freshman to sophomore retention rate and the state appropriations provided to the institution?

Multiple regressions for 1991 and 1996, applied to characteristics from the 271 institutions in both the 1991 and 1996 data sets, supplemented with correlations for those two years were the first method in addressing this question. Ten variables, and then twelve variables, believed to be predictors of retention rates were regressed against freshman to sophomore retention for 1991 and 1996. In all of the equations, state dollars allocated per full time enrolled (FTE) student was the new independent variable added to the analysis. These basic analyses provided context and contrast for the more sophisticated analysis suggested by the unique nature of the available data and research question.

Time is the unique component of this research question and it required a distinctive method of analysis. Since the data collection resulted in the opportunity to examine change over time, it was decided to use a fixed effects regression to conduct the analysis, otherwise referred to as a panel data method.

Panel methods are best employed when the same cases and variables are viewed at several points in time (Finkel, 1995). It is differentiated from a time series analysis by the number of observations – time series usually involves fewer entities with more observations while panel data uses more entities with fewer observations (Markus, 1999). In this case, data for four-year, public institutions of higher education was available for 1991 and 1996. Causal effects are more apparent since changes in Y (the dependent variable) can be observed over time (Finkel, 1995). Essentially, the panel method

incorporates multiple regression analysis with the addition of a binary variable. The binary variable will absorb the effects of all of the omitted variables that differ between the cases (institutions) but do not vary over time (Dorans, Lyu, Pommerich, & Houston, 1997).

There exist infinite subtleties between institutions of higher education. These subtleties sometimes defy quantification. For example, the customer service orientation of a campus may have a profound influence on freshman to sophomore retention. Many characteristics between a pair of public, four-year institutions can appear the same, but if the behavior of service personnel is different, retention rates could differ. The panel method with fixed effects accounts for such possibilities. The binary variable included in the fixed effects regression can absorb the effects of customer service orientation, allowing the other independent variables to function free of the bias of good or bad service. Again, this analysis is uncommon, as it requires data that defines the same group of institutions over several points in time. There was, however, excellent opportunity to use this method here since complete data was available for 271 institutions in both 1991 and 1996.

As only two years, 1991 and 1996, were used in the analysis, the fixed effects model could be simplified. For each variable, dependent and independent, the delta (difference) was calculated. For example, if freshman to sophomore retention for an institution was 80% in 1991 and 85% in 1996, the delta was calculated at 5%, the difference between 85% and 80%. These deltas became the new variables in the

regression. Expressed as formulas, the first two equations represent 1991 and 1996. The third equation represents the combination of the first two, using the deltas:

$$\text{frret}_{1991} = \beta_0 + \beta_1 \text{sel}_{1991} + \beta_2 \text{wome}_{1991} + \beta_3 \text{full}_{1991} + \beta_4 \text{fsr}_{1991} \dots + E$$

$$\text{frret}_{1996} = \beta_0 + \beta_1 \text{sel}_{1996} + \beta_2 \text{wome}_{1996} + \beta_3 \text{full}_{1996} + \beta_4 \text{fsr}_{1996} \dots + D_{1996} + E$$

$$(\text{frret}_{1996} - \text{frret}_{1991}) = \beta_1(\text{sel}_{1996} - \text{sel}_{1991}) + \beta_2(\text{wome}_{1996} - \text{wome}_{1991}) + \beta_3(\text{full}_{1996} - \text{full}_{1991}) + \beta_4(\text{fsr}_{1996} - \text{fsr}_{1991}) + D_{1996} \dots + E$$

With only two years observed, this method of calculating deltas (changes between the two years) is identical to a panel approach with fixed effects, but is computed using only a standard regression. It is this equation that was calculated to determine the coefficients and significance of the models.

Question 4:

4) Do learning centers, summer bridge programs, and freshman seminars improve freshman to sophomore retention at public, four-year institutions of higher education?

Again, the same 271 institution that had complete data for 1991 and 1996 were the sample used for the multiple and fixed effects regressions. In this case, learning centers, summer bridge programs, and freshman seminars were added as the independent variables of interest to the variables used in the regressions for Question 3. Correlations among the variables of interest also served to address the question. As with Question three, variables used for the multiple regressions were chosen from theory, intuition, and past experience (Ramanathan, 1998). Multiple regressions measure not only the direction of change in the relationship between three or more variables, but also measure the amount of that change (Studenmund, 2001). Evaluating the coefficients and significance

generated by the multiple regression allowed for a greater understanding of the importance of learning centers, summer bridge programs, and freshman seminars to freshman to sophomore retention, particularly across public institutions. Fixed effects regressions function similarly, but also account for variations among the institutions that do not vary over time, potentially reducing the influence of omitted variables.

Limitations

Several limitations in the analysis emerged as part of this research. While it would have been preferable to use variables that corresponded directly to the constructs they represented, available data made this impossible. Proxy variables were required to include and represent some constructs. For example, complete data on high school grade point averages or standardized test scores was not available for each institution. While these characteristics are critical to a quantitative retention study, using these numbers would have restricted the sample size substantially. However, without these measures, the quality of the student body would not be represented.

Selectivity is critical to retention rates as the higher quality of student admitted, the more likely the student will persist and graduate (Astin, 1993). In order to include some measure of the selectivity construct and aptitude (high school grade point average and standardized tests) construct, the Barron's measure of selectivity was employed. This measure is a combination of the standardized test scores, high school grade point averages, and acceptance rate at the given institution, rated on a nine-point scale ranging from 0 for non-selective to 8 for most selective (Barron's Profiles, 1997).

In the case of socioeconomic status, however, a critical construct had to be eliminated entirely due to lack of available data. The College Board survey did report the percentage of students at a given institutions who were eligible for need-based financial aid. It was hoped that this variable was an appropriate proxy for socioeconomic status. However, using this variable would have narrowed the sample from 271 institutions to 93 institutions. This enormous erosion of the sample size was deemed too high as price to pay in order to include some measure of socioeconomic status. Therefore, the model lacks a representation of this construct – a regrettable and significant omission.

The fixed effects regression method of analyzing the panel data has inherent weaknesses. Like most methods, omitted variable bias may still serve to skew the results (Stock & Watson, 2003). The panel method is designed to account for unidentified variables that remain constant over time, but if some key variables vary over time, bias will result. Since retention research continues to evolve, it is likely that not all critical retention variables have been included. This bias has been considered in the interpretation of the model. The panel model also suffered from participant attrition. In some cases, data for a single institution was available for 1991, but not for 1996, or the reverse was true. If those institutions in the sample that are all missing data have some common trait, the randomness of the sample is lost.

Another weakness of the design was a failure to account for varying program sizes. At some institutions, learning centers serve thousands while summer bridge programs may only assist dozens. However, in the data, both of these programs were represented only by dummy variables. Clearly a program that serves thousands has a

much greater likelihood of improving retention than a program that served only a few. Since the response rate for the surveys collecting data on program service numbers was poor, the dummies had to suffice. During the discussion of the results of the analysis (Chapter Five), the limited data pertaining to the difference in program service numbers was used to try to understand the differing impacts of the programs.

A final design issue worthy of consideration was the data collection method for the three retention programs. Since the data was collected via survey from personnel, there was potential for answers that were inaccurately reflecting the state of retention programming at the institution. For example, administrators may have reported a program where none existed or may have misreported the start data of a program. While identifying the programs, using the given definition, should have proved easy, the amount of effort placed into answering the survey questions certainly varied and the potential for some misinformation was high.

CHAPTER FOUR - RESULTS

Following the various statistical procedures outlined in Chapter Three, the results of these calculations can now be reported. This chapter provides specific measures that address the research questions. Commentary on the data and measures is largely reserved for Chapter Five, although some comment is unavoidable, as specific outcomes are highlighted as notable and interesting.

I begin by examining the data sets for the 1991 and 1996 time frames. As these two years represent the beginning and ending points most of the analyses, and the fixed effects regressions rely upon these two years, it is important to note differences between them. Next, I look at the outcomes for each method used to analyze the research questions. The growth in numbers of learning centers, summer bridge programs, and freshman seminars are presented using descriptive statistics. Descriptive statistics will also serve to examine the institutions that choose to implement the three retention programs, in relation to those that did not. Next, multiple and fixed effects regressions will describe the role of state financing in freshman to sophomore retention at public, four-year institutions of higher education. Finally, the effectiveness of learning centers, summer bridge programs, and freshman seminars as retention tools is addressed, beginning with a regression using only the three programs, then adding the variables associated with retention in the literature and this research, followed by a regression combining the three programs in various ways.

1991 and 1996

The sample began as public institutions of higher education that provide four-year degrees as recorded by the College Board survey. As noted in Chapter Three, the initial sample was pared down, using the various criteria of available data and survey responses. What was left was 271 institutions with “complete” data for 1991 and 1996. “Complete” indicates that all of the variables of interest had appropriate values for each institution in question for both 1991 and 1996. Descriptive statistics for both years are available in Table 2 from the previous chapter. In addition, the 271 institutions used in the sample are listed in Appendix B.

For both 1991 and 1996, the majority of the institutions were Carnegie classified as Comprehensive I or II. However, the number of Doctoral and Comprehensive institutions drops from 1991 to 1996, with the reclassified institutions distributed into the Research and Liberal Arts classifications. This redistribution can be attributed, in part, to the shifting of Carnegie Classifications in 1994. The Carnegie Foundation undertakes periodic revisions of its Classifications – the 271 institutions in the 1991 sample were defined by the 1987 Classifications, while the 1996 institutions used the 1994 revised standards (The Carnegie Foundation for the Advancement of Teaching, 2005). The frequencies of the institutions’ classifications, and the percentage they constituted of the whole sample are noted below:

TABLE 3, Carnegie Classifications of Institutions in Sample

	1991		1996	
	Number	Percentage		Number
		Percentage		
Research I and II	34	12.5%	44	16.2%

Doctoral I and II	34	12.5%	29	10.7%
Comprehensive I and II	189	69.7%	162	59.8%
Liberal Arts I and II	14	5.2%	36	13.3%

As the fixed effects regression method relies upon changes over time to spearhead the analysis, it is worth considering if the two years show any notable differences by comparing the descriptive statistics. In terms of dollar amounts, the mean support per full-time, enrolled student increased from \$5,387 in 1991 to \$5,414 in 1996 (asd), although this difference is obviously insignificant. Total dollars expended per full-time, enrolled student (atd) also increased in the same span. However, combining these two means into a representation of the percentage of total expenditures comprised by state dollars, I found that institutions were relying less upon state dollars to pay their bills. In 1991, state money made up 41.9% of total expenditures, but in 1996, state dollars was only 36.9% of total dollars spent. This five-year period saw institutions increasingly turning to other revenue sources to pay for their services, a phenomenon worth considering as this analysis proceeds.

Continuing with a review of the descriptive statistics, all three retention programs of interest increased in frequency from 1991 to 1996 (lrnc, smr, frs). Freshman to sophomore retention (frret) remained relatively constant between the two years, showing a slight increase in 1996 that is not significant. All other variables of interest showed very slight changes, but none are particularly central to this research – they serve to control for the important elements of retention already recorded in the literature of higher education. Small changes are all that should be expected as the same 271 institutions are

used in the 1991 and 1996 samples. However, the two years showed enough variance in key variables to suggest that a fixed effects regression might yield usable results.

The Growth of Retention Programming

The first research question considers whether there was an increase in frequency of learning centers, summer bridge programs, and freshman seminars both historically and from 1991 to 1996. Figures 1 and 2 note the increasing numbers of these programs in operation for the last 54 years and for the 1991 to 1996 time frame, using all 316 institutions that responded to the email surveys.

Figure 1 displays that summer bridge programming was the first to begin growth in the 1960's, but bridge programming also showed the flattest growth – once learning centers and freshman seminars became viable options for retention programming, it appears their numbers grew more swiftly. In fact, learning centers became more numerous than bridge programming in the mid 1970's and freshman seminars outpaced bridge programs in the mid 1990's. So, while bridge programming was the first of the three programs to rise in prominence, it also appears that institutions regard it as least important, based upon both frequency and growth rate.

Figure 2 compresses the time frame to just the five years in question – 1991 to 1996. At this point, both learning centers and freshman seminars had already outpaced summer bridge programs in sheer numbers. In fact, the rate of growth for these two programs continued to outpace bridge programming during these five years. Apparently, institutions, when considering adding some or all of these three programs, were still

Figure 1
The Growth in Learning Centers, Summer Bridge Programs, and Freshman Seminars, 1950-2004

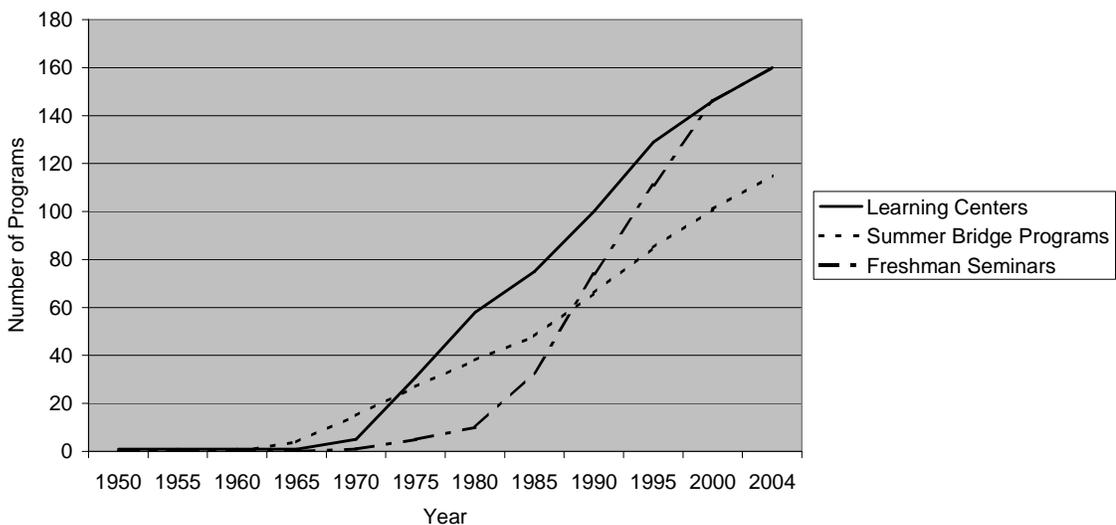
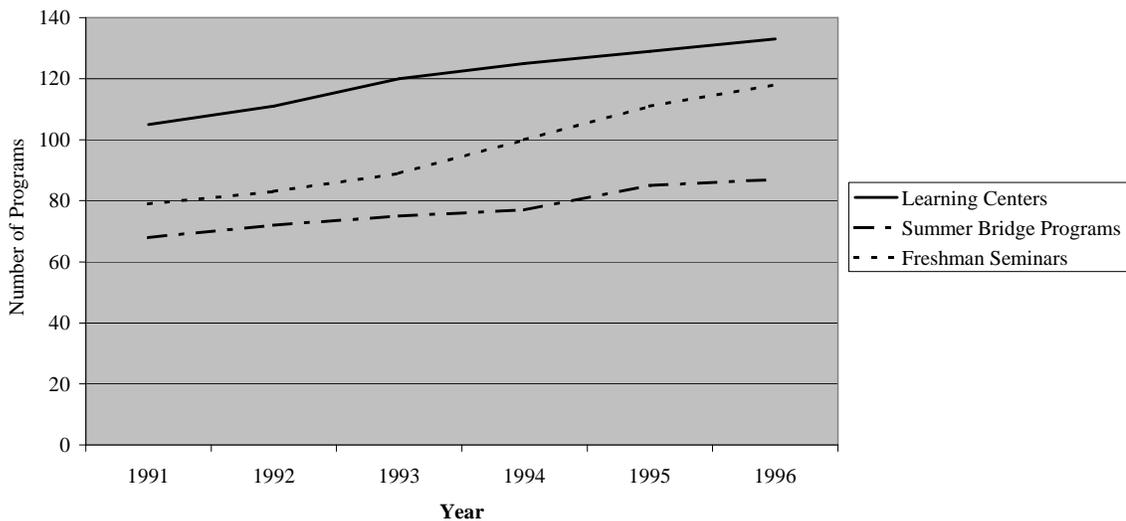


Figure 2
The Growth in Learning Centers, Summer Bridge Programs, and Freshman Seminars, 1991-1996



leaning towards learning centers and freshman seminars as retention or public relations initiatives over the already lagging numbers of summer bridge programs

As learning centers, summer bridge programs, and freshman seminars have been on the increase, historically, and during the 1991 to 1996 time period in question, the next question is one of implementation. What are the defining characteristics of institutions that chose to use, or not use, the programming in 1991 and 1996?

Users of Retention Programming

To begin, institutions implement the three programs, learning centers, summer bridge programs, and freshman seminars, in various combinations. Once the 1991 and 1996 samples are separated into users of some or all of the programs, and those who do not use any of the programs, they can be more easily examined for common characteristics of users and non-users. Below are the frequencies of users and non-users:

TABLE 4, Users of Retention Programming (n=271)

	1991		1996	
	Use	Didn't use	Use	Didn't use
Learning centers	142	129	165	106
Summer bridge programs	114	157	134	137
Freshman seminars	119	152	168	103
All three programs	38	56	60	34

Note that the last line of the table, those that used all three programs, indicates the number of institutions that used all three programs and the number of institutions that did not use any of the three programs. These results both further elucidate the results for the first research question concerning the growth of programming and also create the disaggregation required to understand the characteristics of the institutions using and not using the programming. To address this research question, I will proceed to report

descriptive statistics for each individual program and then conclude with descriptive statistics for those using all three programs.

Learning Center Users/Non-users

Learning centers, defined as a physical location offering some combination of study skill development, remediation, tutoring, and academic advising, saw moderate growth from 1991 to 1996, with 23 additional institutions implementing the program. Following is some demographic data for the users and non-users of learning centers for both 1991 and 1996, focusing on the racial composition of the student body, the selectiveness of the institution, the ratio of students to faculty, the state financial contributions to the institution per full-time, enrolled student (FTE), and the total dollars expended per FTE.

TABLE 5, Mean Descriptive Statistics for Institutions Using/Not Using Learning Centers

	1991		1996	
	Users (n=142)	Non-users (n=129)	Users (n=165)	Non-users (n=106)
% of Caucasian/Asian students	83.86	84.67	80.65	82.92
Barron's selectivity measure	1.99	1.69	1.92	1.84
Student/faculty ratio	29.28	27.17	28.09	26.25
State dollars per FTE	5490	5274	5356	5504
Total expenditures per FTE	12941	12706	14584	14747

While attempts at making meaning of these demographics will be primarily reserved for Chapter Five, two observations of interest emerged from these data. First, institutions that choose to offer learning centers have larger populations of students of color (excluding Asian students, as noted). While this discrepancy is more easily seen for the 1996 data, the same trend is evidenced in smaller terms for 1991. Interestingly, the

selectivity numbers run contrary to the race numbers as institutions that are more selective appear more likely to use learning centers. This is unexpected as selectivity and race are intuitively correlated – the more students of color admitted to an institution, the less likely the institution is selective.

While state revenues and institutional expenditures appear to have little to do with learning centers implementation, student/faculty ratio also showed a trend favoring a higher ratio for institutions using learning centers and a lower ratio for those that do not. Perhaps learning centers, in the eyes of institutions, serve to compensate for a faculty that may be slightly less accessible to students.

Summer Bridge Program Users/Non-users

Of the three programs examined, summer bridge programs saw the slowest growth between 1991 and 1996, with only 20 schools adding summer bridge programs to their student support efforts. For the purposes of this research, summer bridge programs were defined as pre-freshman year, residential programs that provide some combination of faculty/staff contact, study skill development, math/English remediation, and campus life orientation. The same institutional characteristics were observed for summer bridge programs as were for learning centers – racial composition of the student body, institutional selectivity, student/faculty ratio, and the financial components of state contributions and institutional expenditures.

TABLE 6, Mean Descriptive Statistics for Institutions Using/Not Using Summer Bridge Programs

1991		1996	
Users	Non-users	Users	Non-users

	(n=114)	(n=157)	(n=134)	(n=137)
% of Caucasian/Asian students	81.73	86.07	79.47	82.92
Barron's selectivity measure	2.32	1.50	2.24	1.54
Student/faculty ratio	27.32	28.97	27.17	27.57
State dollars per FTE	6162	4824	5862	4975
Total expenditures per FTE	14489	11624	16385	12949

As with learning centers, summer bridge programming appears more prominent at institutions enrolling more students of color (again, excluding Asian students). In this instance, however, the difference appears more pronounced, with 1991 showing a nearly 5% gap and 1996 a 3% gap between users and non-users of bridge programming. Again, as with learning centers, the selectivity measures run in contrast to the race observations, with more selective institutions more likely to employ summer bridge interventions.

However, institutions offering bridge programs appear to spend substantially more money on their students – in both years, approximately \$3,000 more per student, and also receive more support from the state. This result is not congruent with the learning center data. Finally, also in contrast with institutions using learning centers, users of bridge programs have slightly lower student/faculty ratios. So, unlike learning centers, bridge programs do not appear to be viewed as a substitute for accessible faculty.

Freshman Seminar Users/Non-users

Of the three programs studied, freshman seminars showed the most explosive growth in usage as 1/3 of the institutions not using seminars in 1991 were using them in 1996. Freshman seminars were operationally defined as a for-credit, first year course offering some combination of study skill development, faculty/staff contact, campus resource orientation, and major/career exploration. The same five institutional characteristics were observed as with learning centers and summer bridge programs.

TABLE 7, Mean Descriptive Statistics for Institutions Using/Not Using Freshman Seminars

	1991		1996	
	Users (n=119)	Non-users (n=152)	Users (n=168)	Non-users (n=103)
% of Caucasian/Asian students	81.51	86.38	80.38	83.42
Barron's selectivity measure	1.87	1.83	1.80	2.02
Student/faculty ratio	27.32	29.03	26.63	28.57
State dollars per FTE	5480	5314	5425	5394
Total expenditures per FTE	12623	12991	14406	15042

A trend has appeared in that users of retention programs have a higher population of minority students than those who do not use the programs. This trend is in strong evidence with freshman seminars, with 1991 users have a 5% larger population of student of color and 1996 users having a 3% larger population. For the first time, however, selectivity measures appear mixed between the years, with freshman seminar users in 1991 more selective, but users in 1996 less selective.

Observations of state revenues and institutional expenditures show no congruence with the other two programs. Users enjoy a slight advantage in state allocations for both years, but spend slightly less on their students for both years. As for student/faculty ratio, the results are more similar to summer bridge programs, as users of seminars for both 1991 and 1996 have a lower ratio of students to faculty.

Users of All Programs or None of the Programs

Among the 271 institutions used to examine the research questions, there were institutions that were using a learning centers, summer bridge programs, and a freshman seminar simultaneously, and there were schools using none of these three programs for

1991 and/or 1996. There were significant numbers for both cases, so it became appropriate to examine this class of users as well.

TABLE 8, Mean Descriptive Statistics for Institutions Using All Programs or None of the Programs

	1991		1996	
	Users (n=38)	Non-users (n=56)	Users (n=60)	Non-users (n=34)
% of Caucasian/Asian students	75.64	87.06	76.18	85.56
Barron's selectivity measure	2.11	1.41	1.93	1.50
Student/faculty ratio	27.72	27.80	27.62	28.01
State dollars per FTE	6482	5171	5638	4929
Total expenditures per FTE	13684	12880	13993	12030

The discrepancy between users and non-users regarding the racial composition of the student body became very pronounced with this configuration of the analysis. Non-users enrolled 12% more Caucasian/Asian students in 1991 and 9% more in 1996. Both of these percentages reflected the individual program trends but were far more pronounced in scale. However, as with learning centers, a counterintuitive result occurred for selectivity as significantly more selective institutions employed the programming – differences of approximately half a point for both years.

The gap student/faculty ratio was smallest when considering institutions employing all or none of the programs. For the most part, with individual programs, differences between users and non-users were at least a student or more when observing the ratio. The exception was for summer bridge programs in 1996. When considering all three programs, however, there is only a .08 gap in 1991 and a .39 gap in 1996, suggesting that student faculty ration doesn't really differ across institutions using or not using the programs.

As for state revenues and total expenditures, users enjoyed a substantially higher state allocation per student and also spent many more dollars per student. On its face, the expenditure result is to be expected for any of three reasons. First, more state revenue means more money to spend on students. Second, it costs money to offer all three programs so institutions offering them simply must spend more money and institutions that do not would enjoy cost savings. Third, following resource dependency theory, the state may be demanding more of an effort at retaining students, so those users of the programming may be enjoying financial generosity from the state as a result of implementing the programming. This theory, however, does not appear to apply at all for freshman seminars and fails to work for at least some of the learning center user/non-users.

Summary

In sum, there are measurable differences in several different institutional characteristics among schools that use retention programs and those that do not. While some of these differences vary in scale and direction when considering different programs, institutions that use the programming consistently appear to have larger populations of students of color. Correlations between the programs and the racial composition of the student body are all negative for 1991 and 1996, confirming this relationship (Tables 9 and 10). When considering individual programs, the relationships vary in direction and scale, suggesting that each individual program suggests unique things about its offering institution. When considering colleges and universities that either offer all three programs or none of the three programs, however, it is clear that

TABLE 9, 1991 Correlations

	frs	smr	lrnc	frret	fsr	enru	fte	race	wome	full
frs	1	0.059	0.129	0.035	-0.106	0	0.013	-0.139	0.063	0.025
smr	0.059	1	0.199	0.282	-0.102	0.036	0.283	-0.123	-0.016	0.011
lrnc	0.129	0.199	1	0.111	0.131	-0.006	0.122	-0.023	0.015	-0.052
frret	0.035	0.282	0.111	1	-0.358	-0.136	0.334	0.098	-0.228	0.318
fsr	-0.106	-0.102	0.131	-0.358	1	0.226	-0.039	-0.005	0.158	-0.686
enru	0	0.036	-0.006	-0.136	0.226	1	-0.03	-0.082	0.26	-0.297
fte	0.013	0.283	0.122	0.334	-0.039	-0.03	1	0.037	-0.322	0.097
race	-0.139	-0.123	-0.023	0.098	-0.005	-0.082	0.037	1	-0.137	0.072
wome	0.063	-0.016	0.015	-0.228	0.158	0.26	-0.322	-0.137	1	-0.282
full	0.025	0.011	-0.052	0.318	-0.686	-0.297	0.097	0.072	-0.282	1
res	0.069	0.219	0.116	0.311	-0.143	-0.148	0.714	0.027	-0.345	0.186
doc	-0.043	-0.052	-0.107	0.065	-0.076	-0.092	0.125	0.058	-0.145	-0.012
comp	0.032	-0.073	0.032	-0.209	0.199	0.187	-0.489	-0.116	0.32	-0.149
lib	-0.106	-0.098	-0.078	-0.129	-0.083	-0.029	-0.241	0.113	0.069	0.05
tafu	-0.042	0.131	0.018	0.389	-0.177	-0.172	0.072	0.23	-0.168	0.069
asd	0.036	0.286	0.047	0.369	-0.335	0.042	0.445	-0.148	-0.236	0.109
atd	-0.023	0.18	0.015	0.352	-0.251	-0.112	0.487	-0.007	-0.309	0.124
sele	0.015	0.281	0.105	0.546	-0.231	-0.131	0.33	0.09	-0.28	0.184

Correlation is significant at .05 level (two-tailed)

Correlation is significant at .01 level (two-tailed)

TABLE 9 Continued, 1991 Correlations

	res	doc	comp	lib	tafu	asd	atd	sele
frs	0.069	-0.043	0.032	-0.106	-0.042	0.036	-0.023	0.015
smr	0.219	-0.052	-0.073	-0.098	<i>0.131</i>	0.286	0.18	0.281
lrnc	0.116	-0.107	0.032	-0.078	0.018	0.047	0.015	0.105
fret	0.311	0.065	-0.209	<i>-0.129</i>	0.389	0.369	0.352	0.546
fsr	<i>-0.143</i>	-0.076	0.199	-0.083	-0.177	-0.335	-0.251	-0.231
enru	<i>-0.148</i>	-0.092	0.187	-0.029	-0.172	0.042	-0.112	<i>-0.131</i>
fte	0.714	<i>0.125</i>	-0.489	-0.241	0.072	0.445	0.487	0.33
race	0.027	0.058	-0.116	0.113	0.23	<i>-0.148</i>	-0.007	0.09
wome	-0.345	<i>-0.145</i>	0.32	0.069	-0.168	-0.236	-0.309	-0.28
full	0.186	-0.012	<i>-0.149</i>	0.05	0.069	0.109	<i>0.124</i>	0.184
res	1	<i>-0.143</i>	-0.575	-0.088	0.164	0.496	0.606	0.364
doc	<i>-0.143</i>	1	-0.575	-0.088	<i>0.144</i>	0.192	0.193	0.163
comp	-0.575	-0.575	1	-0.354	-0.229	-0.48	-0.552	-0.308
lib	-0.088	-0.088	-0.354	1	0.014	-0.032	-0.05	<i>-0.149</i>
tafu	0.164	<i>0.144</i>	-0.229	0.014	1	-0.016	0.283	0.366
asd	0.496	0.192	-0.48	-0.032	-0.016	1	0.751	0.424
atd	0.606	0.193	-0.552	-0.05	0.283	0.751	1	0.431
sele	0.364	0.163	-0.308	<i>-0.149</i>	0.366	0.424	0.431	1

Correlation is significant at .05 level (two-tailed)

Correlation is significant at .01 level (two-tailed)

TABLE 10, 1996 Correlations

	frs	smr	lrnc	frret	fsr	enru	fte	race	wome	full
frs	1	0.029	0.089	-0.034	-0.129	0.002	-0.038	-0.082	0.064	0.046
smr	0.029	1	0.233	0.259	-0.027	0.021	0.251	-0.114	-0.04	0.002
lrnc	0.089	0.233	1	0.095	0.124	0.021	0.077	-0.062	0.046	-0.018
frret	-0.034	0.259	0.095	1	-0.224	-0.122	0.397	0.053	-0.224	0.339
fsr	-0.129	-0.027	0.124	-0.224	1	0.255	0.022	-0.084	0.184	-0.623
enru	0.002	0.021	0.021	-0.122	0.255	1	-0.046	-0.153	0.259	-0.243
fte	-0.038	0.251	0.077	0.397	0.022	-0.046	1	0.009	-0.289	0.113
race	-0.082	-0.114	-0.062	0.053	-0.084	-0.153	0.009	1	-0.208	0.182
wome	0.064	-0.04	0.046	-0.224	0.184	0.259	-0.289	-0.208	1	-0.324
full	0.046	0.002	-0.018	0.339	-0.623	-0.243	0.113	0.182	-0.324	1
res	-0.026	0.225	0.025	0.383	-0.178	-0.21	0.707	0.055	-0.359	0.21
doc	0.074	-0.032	-0.065	0.059	0.051	-0.04	0.094	0.049	-0.1	-0.146
comp	0.009	-0.017	0.052	-0.152	0.18	0.213	-0.34	-0.083	0.256	-0.133
lib	-0.052	-0.191	-0.043	-0.25	-0.114	-0.044	-0.363	0.015	0.111	0.096
tafu	-0.12	0.12	0.111	0.407	-0.158	-0.127	0.109	0.237	-0.201	0.113
asd	0.007	0.2	-0.033	0.369	-0.253	0.02	0.429	-0.148	-0.221	0.057
atd	-0.034	0.187	-0.009	0.369	-0.22	-0.158	0.477	-0.002	-0.298	0.146
sele	-0.075	0.246	0.025	0.598	-0.206	-0.213	0.417	0.048	-0.304	0.244

Correlation is significant at .05 level (two-tailed)

Correlation is significant at .01 level (two-tailed)

TABLE 10 Continued, 1996 Correlations

	res	doc	comp	lib	tafu	asd	atd	sele
frs	-0.026	0.074	0.009	-0.052	-0.12	0.007	-0.034	-0.075
smr	0.225	-0.032	-0.017	-0.191	0.12	0.2	0.187	0.246
lrnc	0.025	-0.065	0.052	-0.043	0.111	-0.033	-0.009	0.025
frret	0.383	0.059	-0.152	-0.25	0.407	0.369	0.369	0.598
fsr	-0.178	0.051	0.18	-0.114	-0.158	-0.253	-0.22	-0.206
enru	-0.21	-0.04	0.21	-0.044	-0.127	0.02	-0.158	-0.213
fte	0.707	0.094	-0.34	-0.363	0.109	0.429	0.477	0.417
race	0.055	0.049	-0.083	0.015	0.237	-0.148	-0.002	0.048
wome	-0.359	-0.1	0.256	0.111	-0.201	-0.221	-0.298	-0.304
full	0.21	-0.146	-0.133	0.096	0.113	0.057	0.146	0.244
res	1	-0.152	-0.537	-0.172	0.192	0.591	0.699	0.42
doc	-0.152	1	-0.422	-0.135	0.191	0.076	0.062	0.152
comp	-0.537	-0.422	1	-0.477	-0.212	-0.411	-0.468	-0.321
lib	-0.172	-0.135	-0.477	1	-0.076	0.117	-0.141	-0.131
tafu	0.192	0.191	-0.212	-0.076	1	0.053	0.324	0.339
asd	0.591	0.076	-0.411	-0.117	0.053	1	0.721	0.422
atd	0.699	0.062	-0.468	-0.141	0.324	0.721	1	0.455
sele	0.42	0.152	-0.321	-0.131	0.339	0.422	0.455	1

Correlation is significant at .05 level (two-tailed)

Correlation is significant at .01 level (two-tailed)

users have a larger population of minority students, are more selective, receive more money from the state, and spend more money on their students.

State Appropriations and Student Retention

Another critical issue to be explored by this paper is the potential relationship between state allocations to higher education and student retention. In order to address this question, I will begin by examining correlations between retention and state funding for 1991, 1996 and the panel data to be used in the fixed effects regression. While correlations alone are not enough to establish a relationship, they are appropriate starting point. Following, I will disclose results for regressions using the 1991 data and the 1996. I will conclude with results for the fixed effects regression.

Correlations

Simply correlating the variable for freshman to sophomore retention (frret) with the variable for state dollars per full-time enrolled student (fte), adjusting for inflation, yielded solid, statistically significant relationships. For 1991, the two were correlated at .369, significant at .01 (Table 9). For 1996, retention and state allocations were again correlated at .369, also significant at .01 (Table 10). While .369 is not an overwhelming correlation in terms of strength, it is very solid and tested to be significant. Moreover, the positive correlation coefficient suggests that as state dollars increase, so, too, does student retention.

The panel data, however, did not yield as strong a relationship. In fact, retention and state dollars were slightly negatively correlated (-.017), but this coefficient was highly statistically insignificant (Table 11). As the panel data represents change over

TABLE 11, Panel Correlations

	frs	smr	Lrn	frret	fsr	enru	fte	race	wome	full
frs	1	0.076	0.055	-0.137	0.091	-0.074	-0.047	-0.043	-0.049	-0.009
smr	0.076	1	-0.029	-0.036	-0.056	0.058	0.163	-0.108	0.087	0.077
lrnc	-55	-0.029	1	0.018	0.068	0.025	0.046	0.115	-0.04	-0.017
frret	-0.137	-0.036	0.018	1	0.004	-0.02	0.104	0.014	-0.06	0.068
fsr	0.091	-0.056	0.068	0.004	1	0.109	0.242	-0.057	0.063	-0.326
enru	-0.074	0.058	0.025	-0.02	0.109	1	-0.029	0.042	-0.023	-0.057
fte	-0.047	0.163	0.046	0.104	0.242	-0.029	1	0.024	-0.005	0.046
race	-0.043	-0.108	0.115	0.014	-0.057	0.042	0.024	1	-0.097	-0.096
wome	-0.049	0.087	-0.04	-0.06	0.063	-0.023	-0.005	-0.097	1	-0.295
full	-0.009	0.077	-0.017	0.068	-0.326	-0.057	0.046	-0.096	-0.295	1
res	0.058	0.086	-0.055	-0.004	0.053	0.012	0.031	-0.024	0.04	0.021
doc	-0.004	0.075	0.074	-0.021	0.01	-0.027	0.059	-0.011	0.004	-0.023
comp	0.055	-0.247	-0.067	0.095	-0.028	0.034	-0.077	-0.002	-0.066	0.11
lib	-0.095	0.151	0.048	-0.084	-0.013	-0.022	0.014	0.027	0.042	-0.114
tafu	-0.088	-0.067	-0.117	-0.008	-0.003	-0.058	-0.244	-0.031	-0.029	0.139
asd	-0.01	0.064	-0.04	-0.017	-0.365	0.032	-0.181	0.052	0.018	-0.105
atd	-0.074	0.03	-0.148	-0.046	-0.156	-0.001	-0.237	0.031	0.043	-0.007
sele	0.063	0.017	0.057	-0.021	-0.022	-0.02	0.011	-0.157	0.159	0.064

Correlation is significant at .05 level (two-tailed)

Correlation is significant at .01 level (two-tailed)

TABLE 11 Continued, Panel Correlations

	res	doc	comp	lib	tafu	asd	atd	sel
frs	0.058	-0.004	0.055	-0.095	-0.088	-0.01	-0.074	0.063
smr	0.086	0.075	-0.247	<i>0.151</i>	-0.067	0.064	0.03	0.017
lrnc	-0.055	0.074	-0.067	0.048	-0.117	-0.04	<i>-0.148</i>	0.057
fret	-0.004	-0.021	0.095	-0.084	-0.008	-0.017	-0.046	-0.021
fsr	0.053	0.01	-0.028	-0.013	-0.003	-0.365	-0.156	-0.022
enru	0.012	-0.027	0.034	-0.022	-0.058	0.032	-0.001	-0.02
fte	0.031	0.059	-0.077	0.014	-0.244	-0.181	-0.237	0.011
race	-0.024	-0.011	-0.002	0.027	-0.031	0.052	0.031	-0.157
wome	0.04	0.004	-0.066	0.042	-0.029	0.018	0.043	0.159
full	0.021	-0.023	0.11	-0.114	<i>0.139</i>	-0.105	-0.007	0.064
res	1	-0.819	0.063	-0.056	0.032	-0.017	0.214	-0.033
doc	-0.819	1	-0.278	0.022	-0.025	0.051	-0.241	0.06
comp	0.063	-0.278	1	-0.902	0.079	-0.031	0.089	0.017
lib	-0.056	0.022	-0.902	1	-0.087	0.004	-0.04	-0.045
tafu	0.032	-0.025	0.079	-0.087	1	-0.265	0.119	<i>-0.138</i>
asd	-0.017	0.051	-0.031	0.004	-0.265	1	0.343	0.159
atd	0.214	-0.241	0.089	-0.04	0.119	0.343	1	0.1
sele	-0.033	0.06	0.017	-0.045	<i>-0.138</i>	0.159	0.1	1

Correlation is significant at .05 level (two-tailed)

Correlation is significant at .01 level (two-tailed)

time, retention rates and state contributions were calculated by subtracting 1991 values for these two variables from the 1996 values for the same variables. So, what the correlation numbers represent is not the correlation between retention and state dollars, but the correlation between the change in retention and the change in state dollars. The results suggest that changes in one do not lead to changes in the other, potentially a better measuring stick than simply considering the data points in a cross-section.

Regression Results: 1991

Two linear, multiple regressions were run for 1991. One used only the variables associated with retention noted as important in the literature. These variables are the percentage of Caucasian/Asian students in the student body (race), the percentage of women in the student body (wome), the percentage of full-time students in the student body (full), the Carnegie classification of the institution as four dummy variables (res,doc,comp,lib), the selectivity of the institution as measured by Barron's (sele), the number of full-time, enrolled students (fte), and the cost of attendance, tuition and fees adjusted for inflation to 1996 dollars (tafu). Added to this mix was the variable of interest – state dollars allocated per FTE student, adjusted for inflation to 1996 dollars (asd). A second multiple regression was run with the same variables and adding variables for total dollars expended per student (atd) and student/faculty ratio (fsr). Both total dollars and student/faculty ratio could be viewed as descendants of state money. That is, the more state money received, the more total dollar expended and the likely the student/faculty ratio is lower. Obviously, as the state contributes more, it is more likely

the institutions will spend more. As for faculty, state funds generally compose a great deal of faculty salary, so the two probably vary together. Correlations appear to cement these two assumptions as state dollars (asd) and total dollars are correlated at .751, significant at .01. State dollars and student/faculty ratio do not have as strong a correlation (-.335, significant at .01), but the correlation is significant and the directional relationship is appropriate. Both total dollars expended per student and student/faculty ratio will be excluded from the first regression and added to the second to see if their presence changes the state dollars regression coefficient.

The complete results for the regressions using the 1991 data can be found in Tables 12 and 13, so I will focus on reporting only the fit of the model and the results for state dollars. The model returned an r-squared of .461, suggesting a good, if not spectacular fit. More promising, however, were the results for the state dollars coefficient. The B was reported at 1.331, with a standard error of .316, and significant at .000. The model suggested that for approximately every \$1,000 per FTE student contributed by the state, the institution's retention rate would rise 1.3 percentage points.

TABLE 12, Multiple Regression, 1991 (n=271)

	r-squared: .461 standard error: 8.822		
Independent Variable	B	Standard Error	Significance
Percentage of in-state students	-.033	.053	.522
Percentage of Caucasian/Asian students	.027	.033	.407
Percentage of female students	.052	.080	.513
Percentage of full-time students	.204	.044	.000
Research I/II institution	-7.101	2.844	.013
Doctoral I/II institution	-4.893	1.906	.011
Liberal Arts I/II institution	-4.008	2.584	.122
Barron's selectivity measure	2.400	.468	.000
Full-time enrolled (FTE) students	.000	.000	.002

Tuition and fees	.004	.001	.000
State dollars allocated per FTE	1.331	.316	.000

*Comprehensive I/II institutions excluded by SPSS

The addition of total dollars per FTE student and student faculty ration did not substantially change the fit of the model of the role of state dollars. This second model had a r-squared of .469, again a solid fit. The B for state dollars remained positive and became slightly larger at 1.678. While the standard error for the coefficient increased to .450, the coefficient remained significant at .000. Both of the coefficients for total dollars expended per FTE and student/faculty ratio were reported as very small and negative (-.214 and -.080, respectively) and both were of dubious statistical significance (.092 and .449, respectively). These results suggest that neither total dollars expended nor student/faculty ratio add much to our understanding of retention in this model. However, state dollars allocated per FTE student appears to be important in retention for 1991.

TABLE 13, Multiple Regression, 1991, Adding Total Dollars and Student/Faculty Ratio (n=271)

Independent Variable	B	Standard Error	Significance
Percentage of in-state students	-.038	.053	.465
Percentage of Caucasian/Asian students	.029	.033	.366
Percentage of female students	.040	.080	.613
Percentage of full-time students	.168	.062	.007
Research I/II institution	-5.474	2.962	.066
Doctoral I/II institution	-4.493	1.913	.020
Liberal Arts I/II institution	-4.147	2.577	.109
Barron's selectivity measure	2.364	.468	.000
Full-time enrolled (FTE) students	.000	.000	.002
Tuition and fees	.004	.001	.000
Total dollars expended per FTE	-.214	.127	.092
Student/faculty ratio	-.080	.106	.449
State dollars allocated per FTE	1.678	.450	.000

*Comprehensive I/II institutions excluded by SPSS

Regression Results: 1996

As with 1991, two linear, multiple regressions were run – one using the original set of variables and a second adding total dollars expended per FTE student and student/faculty ratio. Refer to the explanation above for the reasoning behind these methods. As above, correlations between state dollars per FTE , total dollars per FTE, and student/faculty ratio appear to suggest that the latter two should not automatically be included in the analysis, despite their relationship with retention noted in the literature. State dollars and total dollars were highly correlated in the 1996 data at .721, significant at .01. As with 1991, state dollars and student/faculty ratio did not enjoy as strong a relationship (-.253, significant at .01), but student/faculty ratio will remain excluded from the initial model and be added into a second model.

The 1996 regressions can be found in Tables 14 and 15 and they were very similar to the 1991 regressions. Using only the original variables, this model was a slightly better fit, with r-squared measured at .518. The state dollars coefficient was not as large (.823), but still showed good significance (.003) and the standard error was low at (.277). The 1996 model suggested that for slightly less than a \$1,000 increase in state allocation per FTE, retention could be improved by a single percentage point.

TABLE 14, Multiple Regression, 1996 (n=271)

Independent Variable	r-squared: .518 standard error: 7.243		Significance
	B	Standard Error	
Percentage of in-state students	.000	.046	.987
Percentage of Caucasian/Asian students	-.012	.027	.650
Percentage of female students	.108	.071	.128
Percentage of full-time students	.200	.039	.000

Research I/II institution	-2.455	2.273	.281
Doctoral I/II institution	-2.130	1.661	.201
Liberal Arts I/II institution	-4.970	1.423	.001
Barron's selectivity measure	2.583	.395	.000
Full-time enrolled (FTE) students	.000	.000	.043
Tuition and fees	.002	.001	.000
State dollars allocated per FTE	.823	.277	.003

*Comprehensive I/II institutions excluded by SPSS

When including total dollars expended per FTE student and student/faculty ratio, again the r-squared improved only marginally to .530. However, the state dollars coefficient increased dramatically to 1.348, with a standard error of .341 and significance at .000. Also, as with 1991, the total dollars regression coefficient was small and negative and the student/faculty ratio was small and bordered on insignificance (.123). Neither appears to add much explanatory power to the model, but state dollars showed relevance in predicting retention, similar to the two 1991 models.

TABLE 15, Multiple Regression, 1996, Adding Total Dollars and Student/Faculty Ratio (n=271)

Independent Variable	r-squared: .530 standard error: 7.177		Significance
	B	Standard Error	
Percentage of in-state students	-.020	.046	.660
Percentage of Caucasian/Asian students	-.013	.026	.605
Percentage of female students	.119	.070	.093
Percentage of full-time students	.249	.049	.000
Research I/II institution	-.606	2.403	.801
Doctoral I/II institution	-1.789	1.651	.280
Liberal Arts I/II institution	-5.022	1.410	.000
Barron's selectivity measure	2.569	.392	.000
Full-time enrolled (FTE) students	.000	.000	.110
Tuition and fees	.003	.001	.000
Total dollars expended per FTE	-.188	.086	.029
Student/faculty ratio	.132	.085	.123
State dollars allocated per FTE	1.348	.341	.000

*Comprehensive I/II institutions excluded by SPSS

Fixed Effects Results

Fixed effects methods, using panel data, are designed to explore the effects that changes in the independent variables have on changes in the dependent variable. In this regard, fixed effects models may be better methods to explore retention constructs as practitioners often would like to know what they can change to boost retention. Would the addition of a particular program on the infusion of more money have a positive effect on retention? Multiple linear regressions, considering only single points in time, are not able to fully account for the change in variables, making their explanatory power more limited. What we really want to know is how things will change for the dependent variable as we adjust the independent variables. Therefore, fixed effects regression would appear to be better models. The problem lies in having data for several points in time to use the fixed effect approach. In this case, such data is available for 1991 and 1996. However, noting that we are dealing now only in measuring change, correct interpretation of the coefficients becomes important.

As with 1991 and 1996, I will use only the changes from 1991 to 1996 for the original 11 variables in the first model and add the changes in total dollars expended per FTE and student/faculty ratio to the second model. Correlations between the change in state dollars and the change in total dollars remain relatively strong (.343, significant at .01), especially considering that the correlations are between changes in these two variables and not the full values of these variables. The correlation between state dollars and student/faculty ratio is negative (-.365) and significant (.01), as with 1991 and 1996.

Therefore the approach of continuing to exclude these variables from one equation seems appropriate.

The first model appears to be a bad fit (Table 16). Again, as the calculations are being done using changes in variables, the range of the dependent and independent variables have been dramatically reduced, primarily resulting in a reduced r-squared for this model. While the reported r-squared of .027 seems to suggest that the model is a poor fit, this may be more a function of the variable ranges than the efficacy of the model.

The regression coefficient reported for the change in state dollars per FTE was also reduced, but remained positive (.150). However, the standard error for the coefficient was .535 and the significance level was extremely low at .780. State dollars was the only coefficient that was both positive and larger than .100, suggesting a positive influence, but the evidence is not nearly as strong as compared to the 1991 and 1996 multiple regressions.

TABLE 16, Fixed Effects Regression (n=271)

	r-squared: .027 standard error: 7.881		
Independent Variable	B	Standard Error	Significance
Percentage of in-state students	-.024	.077	.752
Percentage of Caucasian/Asian students	.019	.154	.898
Percentage of female students	-.136	.256	.596
Percentage of full-time students	.067	.101	.503
Research I/II institution	-3.985	4.528	.380
Doctoral I/II institution	-3.442	3.644	.346
Liberal Arts I/II institution	-2.277	1.695	.180
Barron's selectivity measure	-.199	.598	.740
Full-time enrolled (FTE) students	.000	.000	.083
Tuition and fees	.000	.001	.914
State dollars allocated per FTE	.150	.535	.780

*Comprehensive I/II institutions excluded by SPSS

When including total dollars per FTE and student/faculty ratio, the model's fit improves almost imperceptibly to .029. State dollars remains the only coefficient larger than .100 (.304), but the standard error increases to .624 and significance remains poor at .627. The changes in total dollars (B=-.141) and student/faculty ratio (B=.024) again appear irrelevant, although the standard error for total dollars is smaller than state dollars (.249) and the significance is also slightly greater at .572. Simply put, none of the statistics returned for the fixed effects model suggest that changes in state dollars lead to substantial changes in retention. The coefficients appear relevant, but they are not statistically significant.

TABLE 17, Fixed Effects Regression, Adding Total Dollars and Student/Faculty Ratio (n=271)

	r-squared: .029 standard error: 7.906		
Independent Variable	B	Standard Error	Significance
Percentage of in-state students	-.026	.078	.735
Percentage of Caucasian/Asian students	.025	.155	.870
Percentage of female students	-.127	.258	.621
Percentage of full-time students	.075	.112	.500
Research I/II institution	-4.004	4.575	.382
Doctoral I/II institution	-3.797	3.713	.307
Liberal Arts I/II institution	-2..278	1.703	.182
Barron's selectivity measure	-.174	.604	.773
Full-time enrolled (FTE) students	.000	.001	.112
Tuition and fees	.000	.001	.829
Total dollars expended per FTE	-.141	.249	.572
Student/faculty ratio	.024	.164	.881
State dollars allocated per FTE	.304	.624	.627

*Comprehensive I/II institutions excluded by SPSS

Summary

When considering cross section data from 1991 and 1996, state dollars per FTE student appear to positively impact student retention. In both years, the regression coefficients were large and statistically significant. However, when employing the fixed effect model with panel data, it would appear that changes in state dollars over time do not lead to substantial changes in freshman to sophomore retention, especially considering the statistical insignificance of the coefficient suggested by the model. The 1991, 1996, and fixed effects model were first computed excluding total dollars expended per FTE student and student/faculty ratio as both were believed to vary with state dollars. Adding them into the original models did not substantially improve their explanatory power, suggesting that their exclusion was appropriate.

Retention Programming and Retention Rates

The final question of interest regards the impact of retention programming on retention rates. While learning centers, summer bridge programs, and freshman seminars all contain elements associated with persistence and individual program studies have shown these programs useful, as noted in the literature review, no research considering these programs across universities has been undertaken. As with the previous question of state allocations and retention rates, I will report the results first as correlations, followed by the two years in question, 1991 and 1996, and concluded by a review of the panel results.

Correlations

Using the sample of 271 institutions that have been studied throughout this research, some interesting correlations emerged. For 1991, only summer bridge programming showed a significant correlation with freshman to sophomore retention, returning a correlation coefficient of .282, significant at .01. Both the learning center coefficient (.111) and the freshman seminar coefficient (.035) were statistically insignificant (Table 9). For 1996, the same pattern was repeated. Summer bridge programming showed a solid correlation with retention (.259, significant at .01), while learning centers (.095) and freshman seminars (-.034) were insignificantly correlated (Table 10).

The panel data, however, returned substantially different results. This data set emerged in preparation for using the fixed effects method and was gathered by subtracting 1991 data values from the 1996 values. What is left is measures in the change in variables from 1991 to 1996. The correlations must be interpreted accordingly. In this case, the change in status of a learning center (.018) or summer bridge program (-.036) showed no significant correlation with a change in retention rate. However, a change in freshman seminar status showed a moderate, correlation with a change in retention of -.137, significant at .05 (Table 11). This correlation suggests that as freshman seminars were discontinued, freshman to sophomore retention actually improved. This result is curious, indeed. Perhaps institutions dropping freshman seminars as their retention rates improved can explain this result. As institutions note an increase in retention, they may look to eliminate programs that contribute to retention,

assuming they are no longer needed. Hence, the cessation of the program is not contributing to improving retention, but retention was already on the upswing, so the programs were closed.

Regression Results: 1991

As with the previous question of state allocations and student retention, the questions arises as to which variables ought to be included in the regression analysis. In this case, I will review regression including all of the variables associated with retention and the three programs in question, but will exclude state dollars allocated per FTE student. This is, in part, due to the potential multicollinearity of state dollars with both total dollars per FTE student and student faculty ratio. These potential relationships (and the correlations that suggest them) were detailed above. In this case, since both total dollars per FTE and student/faculty ratio are noted in the literature as associated with retention, they will be included and state dollars per FTE excluded. In addition, as state dollars may fund the three programs in question, there exists another reason to exclude state dollars from one analysis. A second analysis will be run using state dollars per FTE and excluding student/faculty ratio and total dollars per FTE to compare the differences.

The complete results for the two 1991 regressions can be found in Tables 18 and 19, so I will continue to only report the fit of the model and the coefficients for learning centers, summer bridge programs, and freshman seminars as these are the pertinent pieces of the analysis at this point. The r-squared for the model excluding state dollars was .450. The coefficients for both summer bridge programming and learning centers were large: 1.932 and 1.353, respectively. The freshman seminar coefficient was much smaller

at .195. The model suggests that the operation of a learning centers or summer bridge program on a given campus are each worth 1.9 and 1.3 percentage point improvement in freshman to sophomore retention, respectively.

TABLE 18, Multiple Regression for Three Programs, 1991 (n=271)

Independent Variable	r-squared: .450 standard error: 8.982		Significance
	B	Standard Error	
Freshman seminar	.195	1.149	.865
Summer bridge program	1.932	1.239	.120
Learning center	1.353	1.156	.243
Percentage of in-state students	.003	.053	.941
Percentage of Caucasian/Asian students	.019	.034	.568
Percentage of female students	.005	.082	.949
Percentage of full-time students	.119	.062	.057
Research I/II institution	-4.411	3.042	.148
Doctoral I/II institution	-2.923	1.962	.137
Liberal Arts I/II institution	-2.978	2.633	.259
Barron's selectivity measure	2.672	.468	.000
Full-time enrolled (FTE) students	.000	.000	.005
Tuition and fees	.003	.001	.000
Total dollars expended per FTE	.094	.100	.347
Student/faculty ratio	-.230	.103	.026

*Comprehensive I/II institutions excluded by SPSS

When removing student/faculty ratio and total dollars expended per FTE and adding state dollars to the analysis, the model appears to fit slightly better with r-squared as .467. Summer bridge programming (1.463) and learning centers (.969) retain their large regression coefficients, while the freshman seminar coefficient becomes larger at .537. However, all three coefficients, as with the previous permutation, retain questionable statistical significance.

TABLE 19, Multiple Regression for Three Programs Including State Dollars, 1991 (n=271)

r-squared: .467 standard error: 8.823

Independent Variable	B	Standard Error	Significance
Freshman seminar	.537	1.113	.630
Summer bridge program	1.463	1.227	.234
Learning center	.969	1.120	.388
Percentage of in-state students	-.031	.053	.546
Percentage of Caucasian/Asian students	.034	.033	.301
Percentage of female students	.036	.080	.646
Percentage of full-time students	.207	.045	.000
Research I/II institution	-6.824	2.877	.018
Doctoral I/II institution	-4.283	1.945	.029
Liberal Arts I/II institution	-3.721	2.600	.154
Barron's selectivity measure	2.276	.474	.000
Full-time enrolled (FTE) students	.000	.000	.006
Tuition and fees	.004	.001	.000
State dollars allocated per FTE	1.267	.321	.000

*Comprehensive I/II institutions excluded by SPSS

Regression Results: 1996

The 1996 data reveals similar importance for the three retention programs as the 1991 data. However, summer bridge programming continues to be the only real substantial coefficient (1.229), with a substantial standard error of .988, while learning centers show some promise. The 1996 model without the state dollars per FTE independent variable does have a better fit than its 1991 counterpart, with a r-squared of .506. In the 1996 case, again as with 1991, all three coefficients are positive, but in this case, all three contribute half a percentage point or more to the freshman to sophomore retention rate.

TABLE 20, Multiple Regression for Three Programs, 1996 (n=271)

r-squared: .506 standard error: 7.389

Independent Variable	B	Standard Error	Significance
Freshman seminar	.034	.970	.972
Summer bridge program	1.229	.988	.215
Learning center	.505	.983	.608

Percentage of in-state students	.029	.046	.527
Percentage of Caucasian/Asian students	-.023	.027	.397
Percentage of female students	.093	.073	.197
Percentage of full-time students	.206	.050	.000
Research I/II institution	1.258	2.430	.605
Doctoral I/II institution	-.647	1.713	.706
Liberal Arts I/II institution	-4.691	1.468	.002
Barron's selectivity measure	2.855	.398	.000
Full-time enrolled (FTE) students	.000	.000	.195
Tuition and fees	.002	.001	.000
Total dollars expended per FTE	-.008	.075	.914
Student/faculty ratio	.025	.085	.768

*Comprehensive I/II institutions excluded by SPSS

Here, again, the model appears to fit better than its 1991 equivalent, with a *r*-squared of .522 as compared to .467 for 1991. For the first time a retention program assume a negative coefficient, with freshman seminars returning a value of -.015. However, this coefficient is easily dismissed, as suggested by the .987 value for statistical significance. Summer bridge programming provided a coefficient of 1.086, again displaying surprising effectiveness for programs that are typically the smallest of the three in terms of students served.

TABLE 21, Multiple Regression for Three Programs Including State Dollars, 1996 (n=271)

Independent Variable	r-squared: .522 standard error: 7.254		Significance
	B	Standard Error	
Freshman seminar	-.015	.941	.987
Summer bridge program	1.086	.969	.264
Learning center	.694	.951	.466
Percentage of in-state students	.000	.046	.985
Percentage of Caucasian/Asian students	-.006	.027	.795
Percentage of female students	.102	.071	.152
Percentage of full-time students	.202	.040	.000
Research I/II institution	-2.417	2.286	.291
Doctoral I/II institution	-1.834	1.696	.281
Liberal Arts I/II institution	-4.769	1.441	.001

Barron's selectivity measure	2.520	.401	.000
Full-time enrolled (FTE) students	.000	.000	.067
Tuition and fees	.002	.001	.000
State dollars allocated per FTE	.820	.278	.003

*Comprehensive I/II institutions excluded by SPSS

Fixed Effects Results

To complete gathering evidence on the role of learning centers, summer bridge programs, and freshman seminars in freshman to sophomore retention, the data provided opportunity to look at change over time, using a fixed effects regression with panel data. In this case, I was able to ascertain if the change in a program, in this case whether or not a campus operates the given program, had an impact on the change in student retention from 1991 to 1996. This method could be considered superior to the simple cross sectional approach utilized in the multiple regressions for 1991 and 1996.

The results of this analysis differed substantially from the 1991 and 1996 multiple regressions. The first fixed effects regression, as with the first for 1991 and 1996, used the variables associated with retention and included total dollars expended per FTE and student/faculty ratio while eliminating state dollars for fear of multicollinearity. Summer bridge programming was no longer the critical programming among the three options – freshman seminars now took on a large coefficient that was negative (-2.863). While the model fit went way down compared to 1991 and 1996 (r-squared=.049), this was to be expected due to the method employed. The reversal of program importance, and the negative value for freshman seminars, however, was not. Learning centers were the only programs remaining with a positive coefficient, suggesting that adding summer bridge programming and adding freshman seminars lead to a decrease in student persistence,

particularly with the large freshman seminar coefficient. As was previously suggested, this result could be explained by the subtraction of programming when retention rates are improving and the addition of programming when rates are on the decline. So, perhaps the coefficients for summer bridge programs and freshman seminars suggest the corresponding institutions were enjoying an increase in freshman to sophomore retention and decided to eliminate these programs as a result.

TABLE 22, Fixed Effects Regression for Three Programs, (n=271)

Independent Variable	B	Standard Error	Significance
Freshman seminar	-2.863	1.234	.021
Summer bridge program	-.208	1.819	.909
Learning center	.558	1.621	.731
Percentage of in-state students	-.041	.079	.594
Percentage of Caucasian/Asian students	.010	.157	.944
Percentage of female students	-.171	.257	.506
Percentage of full-time students	.066	.109	.543
Research I/II institution	-2.551	4.680	.586
Doctoral I/II institution	-2.815	3.763	.455
Liberal Arts I/II institution	-2.669	1.733	.125
Barron's selectivity measure	-.079	.600	.895
Full-time enrolled (FTE) students	.000	.001	.212
Tuition and fees	-.000	.001	.852
Total dollars expended per FTE	-.133	.235	.574
Student/faculty ratio	.027	.153	.859

r-squared: .049 standard error: 7.855

*Comprehensive I/II institutions excluded by SPSS

The second fixed effects regression exchanged state dollars allocated per FTE for total dollars expended per FTE and student/faculty ratio. This, however, had little impact on the coefficients of interest. Freshman seminars and summer bridge programs remained negative, and freshman seminars again had a substantially larger coefficient

than the other two programs (-2.749). The model fit was only slightly worse than the first fixed effect model, displaying a r-squared of .047.

TABLE 23, Fixed Effects Regression for Three Programs Including State Dollars, 1996 (n=271)

Independent Variable	r-squared: .047 standard error: 7.845		Significance
	B	Standard Error	
Freshman seminar	-2.749	1.221	.025
Summer bridge program	-.375	1.806	.836
Learning center	.720	1.609	.655
Percentage of in-state students	-.003	.078	.618
Percentage of Caucasian/Asian students	-.002	.155	.988
Percentage of female students	-.171	.257	.507
Percentage of full-time students	.062	.102	.540
Research I/II institution	-2.661	4.666	.569
Doctoral I/II institution	-2.616	3.750	.486
Liberal Arts I/II institution	-2.619	1.730	.131
Barron's selectivity measure	-.147	.599	.806
Full-time enrolled (FTE) students	.000	.001	.129
Tuition and fees	-.000	.001	.891
State dollars allocated per FTE	.092	.539	.864

*Comprehensive I/II institutions excluded by SPSS

Summary

When using a standard multiple regression for both years included in the data, 1991 and 1996, summer bridge programming quickly emerged as the program having the most statistical impact on freshman to sophomore retention. The regression coefficient was consistently large, but the error was sometimes also large and significance never approached the standards of .05. When employing the fixed effects method to take advantage of the data, freshman seminars became the critical form of programming, only in a negative way. As with summer bridge programs, the coefficients for freshman seminars were never close to statistical significance, but they were quite large and

negative. With either method, learning centers were steady with moderate to large, positive coefficients that were less statistically significant than their more dominant counterparts.

Summary

Retention programming, that is, learning centers, summer bridge programs, and freshman seminars, have been growing, both over the last 50 years, and during the 1991 to 1996 time focused on in this work. Institutions employing this programming serve a larger population of students of color, and also display differences in selectivity, and funding collection and expenditure that vary along particular programming lines. State dollars emerged from the 1991 and 1996 multiple regression analyses as important to freshman to sophomore retention. When employing the fixed effect regression, accounting for change between the two years, however, the importance of state dollars disappeared. Similarly, multiple regression for 1991 and 1996 showed summer bridge programming to improve retention rates, but the fixed effects approach indicated that freshman seminars substantially detracted from retention. Chapter Five will allow for further exploration of these results and attempt to attach meaning to them.

CHAPTER FIVE – ANALYSIS AND IMPLICATIONS

After using a variety of techniques to generate statistics for addressing the four research questions, I will use this final chapter to apply the statistics to the questions, as well as consider the implications of the findings for practitioners and researchers. I will begin by tracking the growth of retention programming and then move to the characteristics of institutions using learning centers, summer bridge programs and freshman seminars. Next, I will consider the role of state funding in retention, followed by an analysis of the three retention programs as retention tools. I will conclude by examining some issues not initially identified in this paper, but that have been implied in the statistics. Comments on the implications of the findings for both research and practice will be interjected where appropriate in the analysis, as well as in separate sections at the end of the chapter.

Question One – The growth of retention programming

Question 1:

1) How many public, four-year institutions of higher education utilized learning centers, summer bridge programs, and freshman seminars over the last 50 years?

Did the frequency of learning centers, summer bridge programs, and freshman seminars at public, four-year institutions of higher education change during the 1991 to 1996 time period?

Proposition 1:

1) Public, four year institutions of higher education are increasingly turning to retention programming to improve retention rates. **Proposition confirmed.**

Descriptive statistics collected from the email surveying confirm that retention programming has shown a steady increase in frequency among the 271 public, four-year institutions used from the College Board sample. These trends are displayed in Figures 1 and 2. Growth was relatively slow through the 1950's and 60's, steady in the 70's, and then aggressive in the 80's through the current decade. The beginning of the growth spurt could be attributed to Title III funding that came about in the late sixties. This federal funding was earmarked for underprivileged students and was legislated in 1965 as part of the Higher Education Act of 1965 (Dervarics, 1997). Since learning centers, summer bridge programs, and freshman seminars often have some mode of remediation as part of their program (Boylan, 1999), they may have sprung up as funding was available to support the remediation, or at least as populations thought to require remediation were encouraged to attend higher education.

As for the time frame delineated for this research, 1991 to 1996, the trends were a microcosm of the 50-year period. Learning centers grew by 23 offices, bridge programs by 20 offerings, and seminars by 49 classes from 1991 to 1996 (Table 4). Freshman seminars saw the latest, and most steep growth spurt, relative to the two other programs. The seminal work on seminars, and other freshman programs, was conducted in the late eighties by Upcraft and Gardner (1989), possibly explaining why this program lagged the other two in beginning its substantial growth (Figure 2).

Currently, institutions are leaning more heavily on learning centers and freshman seminars than on bridge programs. There are approximately 10% fewer institutions in the 1996 sample using bridge programming than the other two methods. Bridge programs

are traditionally directed at underprivileged or underrepresented populations (Kezar, 2000), while seminars and centers serve the entire institution. When given money to support retention, institutions may be opting to create programs that reach the widest student audience possible or they may be continuing to neglect populations that are already historically neglected. However, bridge programming has a narrow focus, serving the smallest number of students when considering these three programs. It is possible that institutions choose to invest in programs that reach hundreds (freshman seminars) or thousands (learning centers), instead of the dozens usually aided by summer bridge programs, although they are the interventions with the most significant impact.

Question Two – Characteristics of program users/non-users

Question 2:

2) Among the public, four-year institutions using, or not using, learning centers, summer bridge programs, and freshman seminars, are their common traits in their student populations, their institutional characteristics, or their state revenues?

Proposition 2:

2) No common characteristics exist - institutions of all types, educating all kinds of students, are turning to learning centers, summer bridge programs, and freshman seminars to address retention. **Proposition disconfirmed.**

Users and non-users of learning centers, summer bridge programs, and freshman seminars appear to have two characteristics in common, according to the traits examined in this paper. First, institutions that implement these programs have a higher mean population of students of color. Second, users of learning centers, specifically, have a

higher student/faculty ratio than non-users. When exploring the differences between institutions that use all three programs against those that use none of the three programs, additional differences emerge. Users continue to have higher percentages of students of color in their student body, but also are more selective, enjoy more financial support from the state, and spend more money on their students.

Across both years in question, considering any or all of the three retention programs, institutions using learning centers, summer bridge programs, and freshman seminars had populations composed of higher numbers of students of color. (Tables 6, 7, 8, 9). Two explanations for this relationship exist. Either institutions are creating and offering learning centers, summer bridge programs, and freshman seminars in anticipation of recruiting and retaining higher populations of underrepresented students, or these populations arrived on-campus and institutions had to find ways to support them.

Question 4 addresses the effectiveness of the three programs as retention tools in greater detail, but the basic finding that two of these programs (learning centers and freshman seminars) do not appear to contribute to student retention suggests that these programs may have other purposes. Perhaps the programs are not assisting these students as much as they are attracting them. With a highly selective institution, the challenge becomes finding and enrolling qualified students from underrepresented populations. The competition for this relatively small group of students is fierce. By offering learning centers, summer bridge programs, and freshman seminars, institutions are able to tout their commitment to populations potentially needing additional academic support – perhaps an enticement to students of color. So the higher populations of students of color

coupled with the higher selectivity numbers could be explained by the use of retention programming as more of a marketing tool than as academic skill building or support. The programs put a more attractive face on institutions that are competing to enroll the top students from underrepresented groups.

Question Three – State appropriations and retention

Question 3:

3) Is there a statistically significant relationship between four-year, public institution's freshman to sophomore retention rate and the state appropriations provided to the institution?

Proposition 3:

3) As state revenues decrease, either in real dollars, or as a share of total revenue, freshman to sophomore retention decreases. **Proposition partially confirmed.**

The correlation matrices offer the first hint of this relationship. For both 1991 and 1996, state dollars allocated per FTE is correlated with freshman to sophomore retention at .369, significant at .01 (Tables 9 and 10). The panel data did not have a significant correlation coefficient, a surprising result given the size and strength of the first two coefficients.

Also, for both 1991 and 1996, when considering state dollars in a multiple regression with freshman to sophomore retention as the dependent variable, it was clear that state dollars played a substantial role. Either alone, or combined with student/faculty ratio and total dollars spent per student, both of which were potential dangers of multicollinearity with state dollars per FTE, the state dollars regression coefficient was

significant at no more than .003. The coefficients suggested that anywhere from a \$823 to a \$1678 per FTE increase in state allocations would lead to a 1% increase in freshman to sophomore retention.

However, the fixed effects results, measuring how changes in the independent variables impact changes in the dependent variable, again were not as promising. The coefficients for state dollars per FTE, when using only state dollars per FTE or adding student/faculty ratio and total dollars spent per FTE, remained positive, but became highly statistically insignificant, suggesting that changes in state dollars allocated per student, over time, did not lead to changes in freshman to sophomore retention.

Intuitively, the more money spent on students, the more they will benefit, which should improve persistence. The money can appear in areas already delineated here, such as a lower student/faculty ratio or programming, or in other areas like the condition of the facilities on-campus or other services. What is curious, however, is how cross-section analysis confirms this notion, while the fixed effects analysis does not. The fixed effects model highlights different constructs than the cross section, calling into question the efficacy of the method.

One potential explanation is how the data changed in preparation for the fixed effects regression analysis. The data set was composed by taking the 1996 values for the relevant variables and subtracting from them the 1991 values for the same variables at the same institutions. So, the analysis was performed only in the changes between each variable, for each institution, over the five-year period from 1991 to 1996. The descriptive statistics suggest that there may not have been enough difference between

1991 and 1996 for the key variables to display their impact on retention. Specifically, the difference between the mean freshman to sophomore retention rates from 1991 to 1996 was only .14% and the difference between state allocations was only \$27. Such a small change over time to these two variables would challenge any sort of analysis to define statistically significant coefficients. There simply was not enough change to measure the impact of that change.

What can be said, however, is that the cross section data, analyzed using a standard, multiple regression provided compelling coefficients for the state allocations independent variable. As states look for reasons to cut funds to institutions of higher education, evidence that these cuts will harm outcomes that the state deems worthy (i.e. retention and graduation) will prove useful to advocates for public higher education.

Question Four – Programming and retention

Question 4:

4) Do learning centers, summer bridge programs, and freshman seminars improve freshman to sophomore retention at public, four-year institutions of higher education?

Proposition 4:

4) The presence of learning centers, summer bridge programs, and freshman seminars improves freshman to sophomore retention rates. **Proposition partially confirmed.**

For a third time, I will begin by considering the correlational relationships

between the constructs in question. Summer bridge programming shows the only statistically significant relationship with freshman to sophomore retention, with a correlation coefficient of .282 for the 1991 data and .259 for the 1996 data (Tables 9 and 10), both significant at .01. These numbers suggest that as freshman to sophomore retention increases, so too does the likelihood of a summer bridge program operating on the given campus. By contrast, both learning centers and freshman seminars have statistically insignificant correlations for both data sets.

The fixed effects correlations were mostly unremarkable, perhaps due to the previously noted minor variances in the independent variables measuring change. However, freshman seminars did return a negative coefficient (-.137, significant at .05) that suggests that retention rates actually decreased in the presence of freshman seminars. In fact, the reverse may have been true – as institutions saw a rise in retention rates, they chose to eliminate programs to save cost. Freshman seminars may have been eliminated with retention rates rising, returning results suggesting the absence of the programs were improving retention.

Once an analysis such as this moves beyond the cross section approach and begins to consider events over time, as the fixed effects method does, interpreting the results can become a chicken/egg conundrum. Did retention rates improve, leading to the elimination of programs, or were programs deleted, leading to an improvement in retention? It is difficult to imagine a circumstance where program elimination would benefit retention. Perhaps the demise of a freshman seminar on a given campus freed resources for a more effective program to grow. Or perhaps the seminar was so poorly

executed that it actually inhibited persistence. In any event, an additional year in the panel, in between 1991 and 1996, would have better allowed for interpretation because it would have become clearer if retention rates or the independent variable, in this case, freshman seminars, changed first. For this research, both possibilities require consideration. In fact, the fixed effects approach will always introduce this question.

Moving on to the regression coefficients, the 1991 data yielded regression coefficients of 1.932 and 1.353 for summer bridge programs and learning centers respectively, when excluding state dollars from the analysis. Freshman seminars returned a much smaller coefficient of .195. However, only the summer bridge coefficient appeared to be statistically significant at .120, while the other two coefficients had much higher coefficients (Table 18). While significance levels can be somewhat arbitrary (Rudestam & Newton, 1992), there appears to be general agreement that .05 is an appropriate level with which to declare a result as significant (de Vaus, 2002). That definition of significance will not be adhered to in this work – what is more important is the size of the coefficients for the three programs, relative to one another, and that the significance numbers are not exceedingly high, say above .20. When replacing student/faculty ratio and total dollars expended per FTE with state dollars, the fit of the model improved slightly, but the coefficients for both summer bridge programming and learning centers decreased while they became more statistically insignificant (Table 19).

This pattern nearly replicated itself for the 1996 data. The first regression, using student/faculty ratio and total dollars expended per FTE, returned a large coefficient, of questionable statistical significance, for summer bridge programs (1.229, significant at

.215), and smaller coefficients for both learning centers and freshman seminars of less significance (Table 20). Removing student/faculty ratio and total dollars and adding state dollars allocated per FTE slightly decreased the summer bridge coefficient, slightly increased the learning center coefficient, and left all three coefficients with poor significance numbers (Table 21).

The evidence that summer bridge programs improve retention is compelling, but as previously noted, not congruent with the reality that summer bridge programs reach the smallest number of students among the three offerings. How, then can it have the most effect? Even if these programs could boast 100% retention rates, the 50 or 100 students retained would only influence the institutional retention rate a few tenths of a point. Again, as previously mentioned, the bridge programming may be indicative of a focus on underrepresented students on a given campus. If this focus extends from the bridge program into other programs and services, it becomes easy to imagine how bridge programming may be a proxy for a larger effort towards these students. One example may be that institutions offering bridge programs may have highly developed offices, departments, or even divisions to serve underrepresented students. Bridge programs must emerge from some part of campus, so the existence of a program suggests that there are already other efforts in place to support these historically challenged students.

Ignoring program size for a moment, a different explanation may be one of timing. Summer bridge programs are used by students prior to arrival upon campus for the beginning of the freshman year. Both freshman seminars and learning centers are services to be used after arrival. If most students make their choice to persist or leave in

the first six weeks of their matriculation, as Tinto (1987) suggests, then learning center and freshman seminar interventions may come too late for some students. Bridge programs, on the other hand, arrive early enough to make a difference in persistence decisions, making them more effective in boosting retention rates.

Finally, bridge programs may have emerged as the most effective intervention among the three due to its relationship with state dollars. When reviewing the correlations for 1991 and 1996, only summer bridge programming is significantly correlated with state dollars allocated per FTE (Tables 9 and 10). Both learning centers and freshman seminars show no correlation. Summer bridge programming may be serving as a proxy for state allocations in this analysis, particularly noting that the summer bridge coefficient becomes larger and more statistically significant in the regressions that exclude state dollars per FTE as an independent variable (Tables 18 and 20).

Research opportunities exist for those interested in this particular result. Bridge programs appear to be indicative of several things on their campuses. Since they can't be directly influencing freshman to sophomore retention to the extent these coefficients suggest, they are representing other campus or student body qualities. A study of the campus characteristics of those offering summer bridge programs may help to clarify these results or even confirm a theory or theories suggested above. There is something distinctive to campuses that offer these programs. Practitioners would benefit from understanding what these distinctive features might be.

Between 1991 and 1996, there were more of the three retention programs in operation for the 1996 institutions, making the 1996 data perhaps the correct data to scrutinize more closely. If so, summer bridge programming continues to cement itself as the key program among the three when predicting student persistence. The other two programs, particularly learning centers, may play a role, but it pales in comparison to the role of summer bridge programs. What remains is to test this idea using the panel data with a fixed effect regression.

The panel model, as with the state dollars question, returned different results. As with the 1991 and 1996 data sets, the panel model was run twice – once using state dollars per FTE as an independent variable and once using student/faculty ratio and total dollars spent per FTE, again to avoid multicollinearity. When only using state dollars, freshman seminars took on a very large and negative coefficient of -2.749 , which was also very statistically significant at .025. Summer bridge programming also returned a negative coefficient, but it was exceedingly small and very insignificant. Learning centers maintained a position similar to the standard regression results – a fairly large coefficient (.720), but of questionable significance (.655). These figures can be reviewed in Table 21. The other version of the fixed effects regression, without state dollars, but adding student/faculty ratio and total dollars expended per FTE, mirrored the first – large, negative, and significant freshman seminar coefficient, small, negative, and insignificant summer bridge coefficient, and a solid learning center coefficient that was positive, but not convincingly significant.

The pattern continues that these results are substantially different from the results of the standard multiple regressions already employed. Again, this difference is to be somewhat anticipated as the fixed effects measures how changes in the independent variables influence changes in the dependent variable, as opposed to simply measuring how the independent variables influence the dependent variable. However, it would be desirable for these two approaches to yield complementary, and not contradictory, results. How can the contradiction be explained?

Freshman seminars did show a small, negative, and significant correlation with freshman to sophomore retention when correlating the data in the panel (Table 11). The other two programs did not show any meaningful relationships with retention, although the signs were correct – summer bridge programming and learning centers were both positively correlated. The strong, negative correlation for freshman seminars can be approached in a couple of different ways.

First, since the fixed effects approach measures changes over time, it is the appropriate method for ascertaining the effect of adding or subtracting a program – a subtle, yet crucial interpretation issue. Using the simple linear regressions, the results only suggests if the existence of a program contributes to freshman to sophomore retention, while the fixed effects model allows for analysis of the addition or subtraction of a program impacts changes in retention rates. With this idea, I return to the chicken/egg argument. Did the cessation of freshman seminar operation on some campuses lead to improved student retention, or did improved student retention lead to some campuses deciding that seminars were no longer necessary. Alternately, did

institutions that added the programs truly see a drop in retention rates? These questions can be addressed by considering the institutions fitting these descriptions in the data sets.

Returning to the data sets, only SUNY Plattsburgh and West Chester University fit the description of institutions that ran freshman seminars in 1991 and did not operate them in 1996. SUNY Plattsburgh saw a 1% increase from 1991 to 1996 in freshman to sophomore retention and West Chester saw no change in that period of time. Moreover, SUNY Plattsburgh saw an \$1100 decline in state appropriations, while West Chester again saw no change. So, among the key variables, these two institutions were not outliers in a way that would produce the strong and negative coefficient for freshman seminars. With just two institutions eliminating programs, the suggestion that program elimination would have any statistical impact on this analysis of retention is not supported.

The other possibility for the large and negative result for the freshman seminar coefficient is that institutions that added programs saw a precipitous drop in retention. 51 institutions added freshman seminars from 1991 to 1996. Of these 51, 8 saw double-digit decreases in their retention rates, while only 14 saw retention rate increases. The mean change for all 51 institutions was -2.1% , while the mean change for all 271 institutions in the panel was a small increase of $.1\%$. The 220 institutions with no change in their freshman seminar status or reporting the loss of a seminar had a mean retention rate increase of $.6\%$. Given that the fixed effects method uses changes in variables over time, it is easy to see how the institutions that added the seminars statistically overpowered those that remained constant or lost a seminar. However, it seems foolish to attribute the

drop in retention rates to the seminars themselves, despite what the statistics suggest. Since the fixed effects method generated this result, and many of the curious results throughout this paper, the question may be more one of the appropriateness of the method.

Is Fixed Effects Appropriate For This Analysis?

The wild variation of the fixed effects results from the results for the standard multiple regressions for 1991 and 1996 suggests that either the fixed effects approach was not appropriate for these research questions and data, or that researchers have misidentified the critical constructs in retention over the last 30 years. A review of the results of the fixed effects regression, and consideration of its specific aims and goals, should suggest if the method, data, or some other issue generated the odd results found here.

Data for the same subjects at two different points in time allows for consideration of the effects of change over time, rather than the static, snapshot approach that multiple regression offer of cross-sectional data. However, what is required to take best advantage of change over time is to have significant change over time. For example, as noted in Chapter Three and earlier in this chapter, the mean freshman to sophomore retention rates for the 271 institutions in the sample changed only .19% between 1991 and 1996. This fine a change in the dependent variable puts a great deal of stress on the independent variables to discern such a subtle change. Moreover, other constructs strongly associated with retention showed the same sort of subtle changes that might minimize the opportunity to understand their impact. For example, the mean Barron's selectivity

measure changed only .04 from 1991 to 1996. Selectivity is among the most critical predictors of persistence (Astin, 1993), but such a subtle change did not allow for selectivity to take its usual, significant role. The same logic can be applied to the other variables – given the significance numbers for the variables in the fixed effects regressions, clearly there was simply not enough change among many of them to develop any meaningful relationships. Freshman seminars, as noted above was the lone exception, displaying a large and statistically significant coefficient.

Perhaps freshman seminars, then, are the key to freshman to sophomore retention – eliminate or avoid seminars and retention will improve, according to these results. The data suggest this, but intuition and experience discount this suggestion. More likely, freshman seminars showed enough change from 1991 to 1996 to appear to be influencing retention disproportionately.

Future application of the fixed effects method for this, or any other question, appears to revolve around significant differences in data between time periods. Whether due to the slow moving nature of large institutions, or the laziness of data reporting, providing the same numbers for certain institutional characteristics year after year to the College Board, the key numbers in this data set did not vacillate enough to effectively use the fixed effects model. So, the odd results seem to have emerged from a method that was ill-suited to the data. Truer, and more predictable, relationships emerged from the cross-section analysis of each year.

The Connection Between State Dollars and Retention Programs

At the inception of this research, the primary question was one of the connection between state dollars and student persistence. In developing the analysis, it became important to account for institutional efforts in increasing retention, in addition to the institutional and student characteristics commonly associated with retention. Hence, learning centers, summer bridge programs, and freshman seminars became important elements in this work, and actually became a second focal point. However, state money and retention programming appears to overlap in some meaningful ways.

I have already established that state dollars have some statistical effect on freshman to sophomore retention rate, as have I demonstrated that retention programming, specifically summer bridge programs, and to a lesser extent learning centers, also bear on student persistence. In gathering survey data from the public, four-year colleges and universities, it became clear that state dollars may not only be affecting student retention directly, for lack of a better descriptor, but state dollars filter through these three retention programs into student success, as well.

In dealing with Question 3, the analysis was run without student/faculty ratio because of the potential for multicollinearity with the state dollars per FTE independent variable. State dollars are directed, in large part, to pay faculty salaries (Slaughter & Leslie, 1997), so to include both may distort the effect of either. However, the same potential for multicollinearity exists for state dollars and these three programs – the reason the programs were also not included in Question 3. So, a new question emerges as to the indirect effect of state dollars on student retention.

First, do state dollars support learning centers, summer bridge programs, and freshman seminars? While the response rate for this question, addressed by sending a second email survey to those that responded affirmatively to the first, was low, the results certainly suggest that state dollars do, indeed, support these programs. Bridge programming, apparently the most effective effort of the three, was least reliant of the three on state support. Only 57% of those institutions that responded to the second survey on summer bridge program funding (n=26) were using some state money to support their efforts. This result was not surprising, however. Federal dollars are easier to secure to support programming aimed at underrepresented populations, as summer bridge programs often are (Kezar, 2000). Summer bridge programs often enjoy federal dollars from sources such as the National Science Foundation or the National Institutes of Health (Fraser, 2004; Office of News Services, 2003), so reliance on the state is minimized, although more than half of these programs are still using state money.

Both learning centers and freshman seminars, while apparently somewhat less effective in retaining students, are more dependent on state money. 75% of institutions using learning centers and responding to the second survey (n=50) and 70% of institutions using freshman seminars and responding to the second survey (n=43) reported using some state dollars or total reliance on state contributions for their operation.

The low response rates for the second survey make any definitive statements regarding the relationship between state dollars and retention programming dubious. However, this seems an area ripe for continued research. If institutions are using state

dollars to fund their retention programming, and state money is taking a smaller role in supporting the operation of institutions, it becomes important to understand the potential impact on these programs. Perhaps there is a difference in program effectiveness among institutions relying on state money and those that have found other ways to support their programs. From a practice perspective, again the opportunity arises for more effective lobbying during budget cycles. By connecting state dollars directly to programs that serve students, and potentially improve student performance, it becomes easier to quantify the damage caused by state resistance to subsidizing higher education.

Implications for this work are also interesting. If programming enjoys state support, as suggested here, and programming is effective in supporting retention, also as suggested here, than state dollars matter in student retention in at least two different ways. Statistical evidence exists of a direct relationship, but indirect relationships obviously exist as well. If student/faculty ratios, for example, potentially subject to state allocations, and retention programming, also apparently subject to state allocations, affect retention, what other elements of the institutions are drawing on state money that may improve student persistence? The issue of state dollars and student retention is not as simple as a direct relationship between the two, but there are many “secondary” beneficiaries of state money to be identified and evaluated.

Implications for Research

There are many research questions that emerge from these results, the first of which is program size versus program impact. While summer bridge programming appears to have the largest impact on freshman to sophomore retention, it is also,

typically, the smallest program in terms of the number of participants. How is their disproportionate statistical impact to be explained? Bridge programming, often aimed at underrepresented student populations, may, in fact, be serving as a proxy for a greater interest in and/or ethic of service for these underrepresented groups on the given campus. Such focus would logically lead to a better experience for these students, boosting retention rates. However, a detailed analysis may uncover other explanations.

This work also suggests that future retention research should carefully consider methods of statistical analysis. While the fixed effects regression employed here appeared to be an excellent opportunity to view retention over time instead of the traditional cross section analysis, the data did not support the fixed effects approach since the key variables at many institutions did not change, or had only minor changes, over the five-year period in question. The cross section approach yielded the more meaningful results, at least when considering this data set and these variables.

Lenning, Sauer, and Beal (1980) stated that the “local” situation of each campus made comparison or programming across campuses difficult. However, as retention programs have grown substantially over recent years, research on these programs has not kept pace. The limited, single institution studies available show some promise for learning centers, summer bridge programs, and freshman seminars, as does this work, but research must continue to identify key components of these programs. It appears that institutions have embraced these retention efforts without much evidence of their true effectiveness. While embracing the programs certainly has benefits for the institutions in terms of stature in the community – the programs allow institutions to publicly display

their interest in student success – such an investment of resources should necessitate an understanding of how appropriate the investment is.

Finally, what is observed here is that institutions had more money to spend on students in 1996 than in 1991. Both state allocations per FTE to higher education and total dollars expended by institutions per FTE increased from 1991 to 1996. However, the percentage of state dollars contributed to the entire expenditure per student changed substantially from 1991 to 1996. In 1991, the mean institutional expenditure per student was \$12,829, which increased to \$14,648 in 1996. State dollars only increased from \$5,387 to \$5,414 in 1996 – a very small increase, indeed. As a result, state dollars made up 41.9% of expenditures per FTE in 1991, but only 36.9% of expenditures in 1996. With no real change in mean retention rates over that period of time, this shift in revenue dependence could neither be described as good or bad. However, since retention programming was on the rise during these periods, one would expect an increase in retention that didn't come to fruition. Perhaps, following resource dependency theory, as the institution strays further from state money, by design or force, there is a price to be paid in student persistence. This question will be left to others, but a study of revenue mix and student departure over time seems in order as institutions appear to be only more inclined to seek money from other sources.

Implications for Practice

As already noted, one major implication is a new opportunity to engage the states in dialogue about their role in supporting higher education. This research suggests that state contributions matter – more so, in fact than total dollars expended per FTE, as

displayed by the coefficients for each in Tables 13 and 15. So, while state dollars have diminished as a share of overall revenue for public institutions, these dollars are still critical to supporting student retention. Hard, statistical evidence of that fact should prove useful when state legislatures seek to criticize the performance of institutions of higher education while cutting their funding.

Campuses that are not employing summer bridge programming should find ways to include it in their programming. Of the three programs examined, summer bridge programming distinguished itself as important to freshman to sophomore persistence. However, it is the least used program among the three, by a substantial margin, and it showed the slowest growth from 1991 to 1996. As a research question, it would be interesting to explore the nature of bridge programming as assistance for underrepresented students, contrasted with learning centers and freshman seminars, which could be construed as less specialized efforts. Perhaps this analysis is yet more evidence of institutions lacking sufficient effort or interest in retaining underrepresented students, despite assertions to the contrary. In practice, if money became available to begin some sort of retention effort where one did not exist before, summer bridge programming would appear to be the appropriate place to begin.

Learning centers proved to be the next most effective intervention. Users of these programs appeared to have higher student/faculty ratios in common among them. It can be inferred, then, that institutions were offering learning centers as a way to supplement instruction that may not have been happening due to a higher demand for faculty contact. Somewhat surprisingly, this intervention appears to be appropriate and effective. If

institutions are looking for ways to offset large class sizes, using a learning center seems an appropriate and effective recourse.

When considering all three programs, trends became very pronounced and three appear in conflict with each other. Users of all three programs showed substantially higher populations of non-Caucasian/non-Asian students, but were also more selective, for both 1991 and 1996. Moreover, users of all three programs, with these higher populations of students of color and higher selectivity, also retained students at a higher level – approximately seven percentage points higher for both the 1991 and 1996 data sets. While higher selectivity and higher freshman to sophomore retention rates are certainly congruent, neither of these would necessarily be associated with a higher population of students of color. This outcome can be explained best by surmising that these institutions are admitting more the higher caliber students of color, both boosting the apparent selectivity of the institution and leading to the higher retention rates. The fact that these institutions also happen to employ all three programs suggests that there is an understanding that with larger populations of students of color, support programs need to be in place to cope with their more difficult transition into higher education. In fact, support programs may need to be in place simply to attract these students. Practitioners would be wise to look at the racial demographics of their incoming applicants and classes and implement these programs if they plan to entertain a high number of students of color. The programs appear to work and institutions that are successful in retaining students are employing them. Moreover, it reinforces the rather unfortunate message that offering programs may be more about visibility and a show of good faith than any real

outcomes. It looks good to have the programs, regardless of whether or not they actually work.

Summary

The growth of learning centers and summer bridge programs can likely be attributed to their service to larger numbers of students. Users of the programming are more selective, but have larger populations of students of color. While this result appears contradictory, it implies that users of these programs are more effective at attracting high quality underrepresented students, perhaps due to the offering of retention programming. The cross section data for 1991 and 1996 returned significant coefficients for state dollars and summer bridge programs, but only freshman seminars appeared to matter in the fixed effects regressions. This result was likely due to the small range of the change in the key variables from 1991 to 1996. The fixed effect approach may not have been appropriate for this data set. Future research should focus in issue of revenue share mix and retention rates, while practice can now be informed by a strong statistical relationship between state dollars and retention, bolstering lobbying efforts, and by the importance support programs appear to have in attracting high caliber students of color.

APPENDIX A - First Email Survey

Dear Colleague,

Good morning. My name is Marc Kolb and I am an academic advisor and doctoral student at the University of Arizona. Currently, both my professional and doctoral work is revolving around issues of retention. I am emailing to ask your assistance in gathering some simple information about retention efforts on your campus. I would appreciate it if you took a few minutes to read and respond to the questions below which pertain to retention programming on your campus. Thank you for your time.

- 1) Do you have a Learning Center on your campus? Learning center is defined as a physical location that offers some combination of the following: study skill development, tutoring, remediation, and academic advising.
- 2) What year was this Center opened on your campus?
- 3) Does your campus offer a summer bridge program? Summer bridge programs are defined as pre-freshmen year, residential programs that offer some combination of the following: study skill development, faculty/staff contact, remediation of math and/or English skills, and orientation to campus/college life.
- 4) What year was this program initiated on your campus?
- 5) Does your campus offer a freshmen seminar course? Freshmen seminar is defined as a for-credit, first-year academic experience that offers some combination of the following: academic skill building, campus resource orientation, faculty/staff contact, and major/career exploration.
- 6) What year was the course first offered on your campus?

Again, thank you for your time and willingness to contribute to my research.

Yours,

Marc

APPENDIX A (continued)
Follow-up to First Survey

Dear Colleague,

I am writing to follow-up on the brief survey regarding retention programs and services on your campus. At this time, I have not yet heard back from you and I was hoping this reminder would prompt you to respond. Below are six questions, to be used in my work and research on retention. If you are unable to respond, would you please forward the questions to someone that can or pass on the email address of someone who could help? Again, many thanks for taking the time to help.

- 1) Do you have a Learning Center on your campus? Learning center is defined as a physical location that offers some combination of the following: study skill development, tutoring, remediation, and academic advising.
- 2) What year was this Center opened on your campus?
- 3) Does your campus offer a summer bridge program? Summer bridge programs are defined as pre-freshmen year, residential programs that offer some combination of the following: study skill development, faculty/staff contact, remediation of math and/or English skills, and orientation to campus/college life.
- 4) What year was this program initiated on your campus?
- 5) Does your campus offer a freshmen seminar course? Freshmen seminar is defined as a for-credit, first-year academic experience that offers some combination of the following: academic skill building, campus resource orientation, faculty/staff contact, and major/career exploration.
- 6) What year was the course first offered on your campus?

Regards,

Marc

APPENDIX A (continued)
Second Email Survey

Dear Colleague ,

Greetings. This email is a follow-up to a survey I sent you last spring. You were generous enough to respond to my questions about learning centers, summer bridge programs, and freshman seminars. I am continuing my work on the relationship between state financial allocations and freshman to sophomore retention and I am hoping you are willing to dig a bit further for me.

First, some results from my research. As I have developed my theory, using the information you provided me last year, it has become clear that state allocations to public, four-year institutions are significant in freshman retention. In fact, of all of the independent variables I am using, only the selectivity of an institution is more highly correlated to retention than state funding. As a result, I need more information push forward and further define this relationship.

I have sent this email because your previous response indicated that you have one, two, or all three of the programs I am interested in tracking (learning centers, summer bridge programs, freshman seminars). I now have some questions regarding the financial circumstances of these programs and the populations they serve. I would appreciate any information you can provide regarding the following questions.

An important point is that my interest is focused in the years 1991-1996. Please respond with information pertinent to that time period.

- 1) Was the budget for you learning center increasing or decreasing for the 1991-1996 time period?
- 2) What was the source(s) of the funding for your learning center (fee for service, grants, tuition monies, state monies, etc.) for the 1991-1996 time period?
- 3) Approximately how many students per year were served by your learning center from 1991-1996?
- 4) Was the budget for your summer bridge program increasing or decreasing for the 1991-1996 time period?
- 5) What was the source(s) of the funding for your summer bridge program (fee for service, grants, tuition monies, state monies, etc.) for the 1991-1996 time period?
- 6) Approximately how many students per year were served by your summer bridge program from 1991-1996?

- 7) Was the budget for your freshman seminar increasing or decreasing for the 1991-1996 time period?
- 8) What was the source(s) of the funding for your freshman seminar (fee for service, grants, tuition monies, state monies, etc.) for the 1991-1996 time period?
- 9) Approximately how many students per year were served by your freshman seminar from 1991-1996?

I certainly recognize that these questions are a bit more complex in nature than my last few – they will require more digging to get the answers. However, they are critical to connecting retention, retention programs, and state funding. Your efforts are greatly appreciated. Thank you, in advance. I wish you well in this new year.

Best,

Marc

APPENDIX B - Sample Institutions (n=271)Research I

Arizona State
Colorado State
Florida State
Georgia Tech
Indiana University
Louisiana State
Michigan State
Ohio State
Oregon State
Purdue University
SUNY, Buffalo
University of Alabama
University of Arizona
University of California, Berkeley
University of California, San Diego
University of California, Santa Barbara
University of Colorado
University of Georgia
University of Iowa
University of Kentucky
University of Minnesota
University of Missouri
University of North Carolina
University of Pittsburgh
University of Tennessee
University of Texas
University of Utah
Utah State
Virginia Commonwealth University
Virginia Tech
Wayne State

Research II

Auburn University
Clemson University
Kansas State
Texas Tech
University of Arkansas
University of California, Riverside
University of Idaho
University of Louisville

University of Mississippi
University of Oklahoma
University of South Carolina
University of South Florida
University of Vermont

Doctoral I

Ball State
College of William & Mary
Georgia State
Northern Arizona University
Northern Illinois University
SUNY Binghamton
Texas Woman's University
University of Missouri, Kan City
University of Missouri, Rolla
University of North Carolina, Greensboro
University of Northern Colorado
University of Southern Mississippi
University of Texas, Arlington
University of Toledo

Doctoral II

Cleveland State
Colorado School of Mines
George Mason University
Indiana University-Purdue University, Indianapolis
Middle Tennessee State
Montana State, Bozeman
University of Alabama, Huntsville
University of Central Florida
University of Maine
University of Massachusetts, Lowell
University of Missouri, St. Louis
University of Montana, Missoula
University of Nevada, Reno
University of New Hampshire
University of New Orleans

Comprehensive I

Alabama A&M University
Angelo State
Appalachian State
Arkansas Tech

Armstrong State
Augusta College
Austin Peay State
Boise State
College of Charleston
California Polytechnic State, San Luis
California Polytechnic State, Pomona
California State, Chico
California State, Dominguez
California State, Fresno
California State, Fullerton
California State, Hayward
California State, Long Beach
California State, Los Angeles
California State, Northridge
California State, Sacramento
California State, San Bernardino
California State, Stanislaus
California University of Pennsylvania
Central Connecticut State
Central Michigan University
Central Missouri State
Central Washington University
Chadron State
Chicago State
Columbus College
Coppin State
CUNY Queens College
Delta State
East Carolina University
East Stroudsburg University
Eastern Connecticut State
Eastern Illinois University
Eastern Kentucky University
Eastern Michigan University
Eastern Washington University
Edinboro University
Emporia State
Fayetteville State
Florida A&M University
Fort Hays State
Fort Valley State
Framingham State
Francis Marion University

Frostburg State
Georgia Southern University
Grand Valley State
Henderson State
Humboldt State
Indiana University-Purdue University, Fort Wayne
Indiana University, Northwest
Indiana University, Southeast
Jacksonville State
James Madison University
Keene State
Lamar University, Beaumont
Louisiana State, Shreveport
Mankato State
Marshall University
McNeese State
Midwestern State
Millersville University
Montana State, Billings
Montana State, Northern
Montclair State
Moorhead State
Morehead State
Murray State
New Mexico Highland University
Nicholls State
Norfolk State
North Georgia College
Northeast Louisiana University
Northern Kentucky University
Northern Michigan University
Northern State
Northwest Missouri State
Northwestern State
Oakland University
Pembroke State
Pittsburg State
Plymouth State
Purdue University, Calumet
Radford University
Rhode Island College
Saginaw Valley State
San Jose State
South Dakota State

Southeast Missouri State
Southeastern Louisiana University
Southeastern Oklahoma State
Southern Connecticut State
Southwest Texas State
Southwestern Oklahoma State
St. Cloud State
Stephen F Austin State
Sul Ross State
SUNY College, Buffalo
SUNY College, Fredonia
SUNY College, Oneonta
SUNY College, Plattsburgh
SUNY College, Potsdam
SUNY, Oswego
Tarleton State
The Citadel
Troy State, Montgomery
University of Arkansas, Little Rock
University of Central Arkansas
University of Central Oklahoma
University of Colorado, Colorado Springs
University of Massachusetts, Boston
University of Michigan, Dearborn
University of Minnesota, Duluth
University of Nebraska, Kearney
University of Nevada, Las Vegas
University of North Alabama
University of North Carolina, Charlotte
University of North Florida
University of Northern Iowa
University of Tennessee, Chattanooga
University of Texas, El Paso
University of Texas, Pan American
University of Texas, San Antonio
University of West Florida
University of Wisconsin, Eau Claire
University of Wisconsin, La Crosse
University of Wisconsin, Platteville
University of Wisconsin, River Falls
University of Wisconsin, Stevens Point
University of Wisconsin, Stout
University of Wisconsin, Superior
Valdosta State

Washburn University, Topeka
Wayne State
West Chester University
West Georgia College
West Texas A & M University
Western Carolina University
Western Connecticut State
Western Illinois University
Western Kentucky University
Western New Mexico University
Western Oregon State
Western Washington University
Westfield State
William Paterson College
Winthrop University
Worcester State
Youngstown State

Comprehensive II

Ferris State
Johnson State
Kennesaw State
Lake Superior State
Lander University
Montana Tech
Penn State Erie, Behrend
Southern Utah University
University of Wisconsin, Parkside

Liberal Arts I

Shepherd College
St Mary's College of Maryland
University of Minnesota, Morris
University of North Carolina, Asheville

Liberal Arts II

Black Hills State
Cameron University
Coastal Carolina University
Dickinson State
Elizabeth City State
Glenville State
Lock Haven University
Mayville State

Mesa State
Mississippi University for Women
Missouri Southern State
Missouri Western State
Oklahoma Panhandle State
Peru State
Savannah State
Southwest State
SUNY College, Old Westbury
SUNY, Purchase
University of Maine, Farmington
University of Maine, Fort Kent
University of Maine, Machias
University of Maine, Presque Isle
University of Science/Arts of Oklahoma
University of South Carolina, Aiken
University of South Carolina, Spartanburg
University of Southern Colorado
Valley City State
West Liberty State
West Virginia Tech
Western Montana College
Western State of Colorado
Winston-Salem State

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