To the Graduate Council:

I am submitting herewith a dissertation written by George Allen Finchum, II entitled "Student Mobility to Public Institutions of Higher Education in Tennessee: Implications for Equity and Excellence." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

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Student Mobility to Public Institutions of Higher Education in Tennessee: Implications for Equity and Excellence

A Dissertation

Presented for the

Doctor of Philosophy

Degree

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George Allen Finchum, II

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ABSTRACT

This research was conducted in order to determine if an analytical gravity model for student migration to public institutions of higher education in Tennessee was viable and could provide a basis for determining those areas of the state which were over- and under-represented in terms of college enrollment. The research also provided descriptive and analytic information regarding migration patterns and trends for in-state undergraduate student to the public institutions of higher education in Tennessee.

A Gravity Model based on migration distance and county population was constructed using a Logit Model Simulation in lieu of the Least Squares Regression normally used in building such a model. The use of the Logit Model allowed for a more accurate predictive equation to be constructed, as student migration is a curvalinear rather than a straight line function. The Gravity Model predictions were compared and contrasted to the actual enrollments to determine those counties and regions of Tennessee which were over- and under-represented in college enrollment. These results were also contrasted and correlated with other demographic and socio-economic data for the various counties and regions of the state.

It was found that county representation in college enrollment varies significantly by individual county and region and that various demographic and socio-economic groups

displayed unique migration patterns and trends throughout the study period (Fall, 1980 through Fall, 1990). These included the findings that black students migrated farther than students from other racial groups, that male students migrated farther than female students, and that traditional age students migrated farther than older students. All of these findings were especially true for students attending four-year campuses, although less related significant findings were found for two-year institutions. Additionally, it was found that significant positive relationships existed between both the proportion of urban population and the median income of the home county and the level of enrollment representation from that county in the statewide system of public higher education. Finally, it was found that no relationships existed between students who migrated farther distances and their likelihood to persist or graduate within the higher education system.

TABLE OF CONTENTS

LIST OF TABLES

TABLE PAGE

TABLE PAGE

LIST OF FIGURES

Chapter I

INTRODUCTION

A. GENERAL INTRODUCTION

Overview

Students attend the nation's public colleges and universities for a myriad of reasons. These reasons include such items as the perceived strength of an institution's academic programs, specific academic offerings, the cost of tuition versus that of more expensive private schools, the availability of financial assistance, and the proximity of the campus to the student's home or other desired location. As the needs, desires, and demographic mix of the student body have changed in recent years, the relative importance of these reasons has also changed (Astin, 1977). In addition to the changes in higher education caused by the changing student body, financial pressures have also required states to regulate and control the growth and development of public institutions to match the needs of the state with the funds available (Blumenstyk, 1991).

For these reasons, it has become increasingly important for administrators of public institutions and state systems of higher education to understand more clearly from where their students are and are not drawn. In addition, it is important that administrators comprehend what implications student mobility patterns might have on the quality of service public

institutions offer or need to provide (Fryman, 1988).

Higher Education in Tennessee

The State of Tennessee offered public higher education opportunities through 27 primary colleges and institutes during the study period. These campuses were controlled by two direct boards (The University of Tennessee Board of Trustees, and the Tennessee Board of Regents), and one overseeing body (the Tennessee Higher Education Commission), charged with insuring the equitable and efficient allocation of public resources. This was to be accomplished through insuring that all persons in Tennessee have access to public higher education and that programs are offered in an efficient manner without undue replication of services at multiple institutions.

Public institutions of higher education in Tennessee varied widely -- from large metropolitan universities to mid-sized regional campuses, to small rural state colleges and community colleges in both rural and urban settings. Campuses were located throughout the state, with the intent of allowing the entire population to be within easy commuting distance of at least one of the public institutions. As the population of the state grew and changed in terms of age distribution and educational advancement during the 20 years prior to the study, the nature and function of these institutions changed. Concurrently, the need for administrators and other key decision makers to understand the needs, strengths, and

weaknesses of the state "system" of higher education became more important, as well as more difficult.

The pattern of migration by students in Tennessee seemed to vary widely among the various types of institutions throughout the state. While the role of The University of Tennessee, Knoxville (UTK) was to serve the entire state through both undergraduate and advanced programs, the community colleges and technical institutes were intended to serve populations within the local areas surrounding the campuses themselves. The other universities were to provide service to a broad regional population, as well as to the entire state in certain specialized programs. This montage of intended service areas should have led to a broad spectrum of potential migration patterns among the institutions (McConnell, 1965).

However, there has long been public debate as to the actual versus the intended service areas of many of the four-year institutions. One of the major areas of concern for administrators at public institutions throughout the state was whether their campuses were appropriately serving the intended population and whether persons inadequately served could best be served at another location.

Geographic Research, The Gravity Model, and Student Migration

Since the 1950s, geographers have attempted to gain better quantitative understanding of the potential attraction between various population nodes and surrounding regions.

These complementary researchers have also attempted to improve the knowledge of how such nodes and regions actually interact over the landscape. Since the quantitative revolution that occurred in geographic research in the mid 1950s, several models have been developed to help describe the potential and actual interaction between nodes and/or regions. The various types of models developed for these purposes have been alternatively called potential, gravity, and spatial interaction models (Isard, 1982).

These models allow the researcher to estimate the potential for spatial interaction among nodes and regions based on population, distance, and other factors deemed pertinent to the interaction. For this study, the models have been extended to include utilization of state higher education institutions. The primary factors of the size of the sending population (potential college attenders), the size of the destination (campus), and distance between the origin and destination were weighted based on institution type to obtain an estimate of demand for public higher education services. As the distance between a campus and origin area increases, and intervening opportunities increase, it would seem to be logical that the potential number of students attending the institution would decrease (Isard, 1982).

Under actual circumstances these predictions will not always be accurate. In the case of students migrating to various public institutions of higher learning from the

counties in Tennessee, other factors influenced college choice or the decision to attend college at all. The differences between expected and actual attendance suggested other explanatory factors not initially considered in the model. These included such readily apparent explanatory factors as median origin county income, percentage of the county population that is urban in nature, and the racial makeup of the county in question. Less obvious explanations for over- and under-representation could include the efforts of college recruiters, alumni chapters, and high-school counselors in steering students to or away from certain institutions.

The over- and under-represented counties fell into certain discernible groupings both regionally and demographically. Regional and demographic biases dealing with political, geographic, and social situations influenced college choice. These included the existence of geographic barriers such as mountains or rivers that effectively increase distance, political alliances within or between certain areas, and social or racial attractions of certain institutions.

Summary

As the number, size, and types of institutions has grown, the need for understanding where and why students attend college has increased. By better understanding the migration patterns of students to institutions within an entire state system of higher education, administrators can make more educated decisions regarding recruitment, the allocation of

resources, and even off-campus course offerings. The information provided by the gravity model in analyzing the movement of students to public institutions should allow for more informed decisions and policy development, thereby improving the level of service that public institutions provide to the taxpayers.

Policy and decision-makers will have an ever increasing need to weigh the prospects of providing improved higher education services to various groups and locales throughout Tennessee. These service improvements could include new campuses, off-campus centers, telecommunication media and course offerings, or increased efforts at student recruitment and retention. A better understanding of how and why students move through the state to attend institutions of higher education should assist in any effort to understand the needs of specific groups throughout the state, and the overall needs of the population and business community in Tennessee.

B. THE PROBLEM

Statement of the Problem

Prospective college students in Tennessee have seen the structure and admissions requirements to public four-year institutions of higher education in the state change dramatically. Admissions requirements to the state's public universities rose throughout the study period, and many community colleges had a spectacular rise in enrollment. Public higher education attempted to provide adequate and

equitable service to all populations in the State of Tennessee. The patterns of student migration that developed in Tennessee in the past and the impacts these patterns have on the delivery of higher education to the people of Tennessee were not as well known as is possible.

Purpose

The purpose of the study was fourfold:

1. To identify those areas of the state that are currently being over- or under-served by public institutions of higher education in Tennessee (both two- and four-year).
2. To provide information to policy makers that might allow for the development of activities to increase the service to, and enrollment of, students from currently under-served areas.
3. To develop a model to provide accurate estimates of expected enrollment for each county at each public institution of higher education in Tennessee.
4. To analyze and determine the migration patterns of students and changes in these patterns during the study period. These patterns were studied both for the various demographic groups of students and by the individual institutions and appropriate institutional groups.

Importance of the Study

By determining those counties or regions in Tennessee that were both under-served and over-served by public institutions of higher education in Tennessee, college and

university administrators can better determine where more assistance and efforts need to be directed. If the less affluent areas benefit through efforts to increase enrollment of students from the counties comprising these regions, the ultimate result could be a higher economic standard in these regions as some of the graduates return to their home counties. By better understanding the source of students, and, ultimately, of graduates of the various institutions, administrators will be able to serve the needs of the public, the students, in all areas of the state.

In addition, the study provides administrators insights into the manner in which transfer students migrate between community colleges and universities. This allows policy makers to understand more completely how transfer affects the ability of the community colleges to provide services to their students who wish to attend the state's senior institutions. Knowledge of the movement patterns between the two- and four-year institutions would also allow administrators to negotiate more effective articulation agreements between the schools to further enhance and develop the system of higher education the state has been working toward since the 1960s.

Determining the mobility patterns of undergraduate students, over- and under-represented areas, and the progress of the students will allow for a greater understanding of the effectiveness of the institutions in serving the higher education needs and desires of the public. Those counties and

regions showing an over-representation in enrollment, persistence (maintaining enrollment, with no hiatus from matriculation of more than one year), and graduation will be considered the best served. At the same time, those counties under-represented in all areas will be categorized as the most poorly served. If a specific county or region is under-represented in enrollment while the persistence of students from that county or region is high, then the ultimate service to the county or region could be perceived as higher than the service explained by enrollment alone.

The movement of students between the two-year and four-year institutions will also be analyzed. During the study period (1980-1990), several two-year and four-year institutions in the state agreed to working relationships that allow students to transfer from the two-year to the four-year school receiving full credit toward any courses applicable to a bachelor's degree. These articulation agreements, as they are called, allow a student to attend college for two years at a smaller or less distant community college and then enter the four-year college without losing any credit for courses he/she has already taken. The existence of these programs coincides with the increase in enrollment at the two-year colleges and with the elevated admissions requirements at the state's four-year colleges.

Other facets of enrollment studied will include determining the persistence or continued enrollment of

students based on race and sex. While the proportion of the black population attending college has been dropping throughout the late 1980s in the nation as a whole (Arbeiter, 1987), the mobility and persistence of these students have not been studied in great detail. In addition, the level of mobility of male and female students will be determined in order to determine if gender is a factor related to the likelihood of students to migrate farther and persist to a greater or lesser extent.

As the needs of the population of the state change, the public system of higher education must adapt to meet these needs. This requires that limited public funds be spent effectively to serve persons from throughout the state. During the 1980s, the public system of higher education in Tennessee attempted to adapt to the changing demographic needs of the population by increased efforts of the two-year institutions to provide convenient access to basic higher education and technical training. This effort led to great changes in the admissions and transfer policies used, and the retention efforts made by Tennessee's public institutions of higher education. These elements include policies such as the articulation agreements between the two- and four-year campuses which have been negotiated in the past ten years.

This study analyzed how these policy and demographic changes altered the make-up of the student bodies at these institutions over the period and how well the schools were

serving the state population. The study should also have assisted policy makers in making more informed decisions in the future by providing a unique spatial analysis of the current services the institutions are providing.

Delimitations

1. The study included enrollment figures from public institutions in Tennessee (Appendix A). Private college enrollment and Tennessee students migrating out of state were not included.
2. The study included data for the ten year period from Fall Term 1980 through Fall Term 1990.
3. The study included only enrollment data for students who were native Tennesseans. Non-Tennesseans and foreign students were not considered.
4. The study distinguished persistence and graduation proportions only as defined below. No other definitions for these terms were considered.

Limitations

1. Highly individualistic reasons for students to attend public institutions of higher education, such as dire financial necessity, were not considered in the study.
2. Idiosyncratic reasons not to persist or graduate, such as family emergencies and dire financial hardship, were not considered in the study.
3. Only enrollment in public institutions of higher education in Tennessee was considered for persistence.

Transfer students to institutions outside the Tennessee system were be considered non-persisters.

C. ASSUMPTIONS

The following assumptions were made prior to the study:

1. The county of original residence provided by the student at his/her first enrollment was the most accurate determination of original home residence prior to college enrollment.
2. Enrollment Reporting System (ERS) data provided by the Tennessee Higher Education Commission staff was the most complete and accurate available to measure student mobility to public institutions over an extended period.
3. It was assumed that an increased level of enrollment or enrollment ratio may be equated with an increase in the equity with which all areas of the state are served by public institutions of higher education.
4. It was assumed that a migration or commuting distance of greater than 50 miles would constitute a distance greater than that which could be considered a reasonable local commute.

D. DEFINITION OF TERMS

Academic Inventory System (AIS)

This term refers to the computerized system used by individual public campuses and systems to report graduates to THEC. One record is provided for each student. That record

contains a unique ID Number, campus, major, and vital demographic information.

Carnegie Classification

This term is used to describe the classification of institutions of higher education presented in A Classification of Institutions of Higher Education, 1987 Edition. This well known and documented classification scheme is updated periodically by The Carnegie Foundation for the Advancement of Teaching, and classifies colleges and universities into one of thirteen groups and sub-groups based on enrollment, budget, graduate offerings, and research funding. Public institutions in Tennessee fall into six of these groups.

County of Residence

The county of residence from which a student originally enrolled at an institution is assumed to be the most accurate indication as to where a student came from to attend a particular public institution of higher education. Students who claim residence in a county other than the county of their original enrollment will continue to be classed as residents of their original county in order to analyze migration patterns (See Appendices B1-B4 and Appendix C).

Efficiency of Service

Efficiency of service in higher education is defined as the provision of convenient services of an institution or system of institutions to the largest number of people possible. In attempting to locate institutions or systems of

institutions in this fashion, the primary focus is to minimize the total distance traveled by all students.

Enrollment Ratio (ER)

This term is used to define the ratio between the actual enrollment of students from a county to an institution to the expected enrollment derived for each county to an institution through the use of the gravity model (see page 15).

ER_C = Actual Enrollment-County/Expected Enrollment-County

ER_I = Actual Enrollment-Institution/Expected Enrollment-Institution

Enrollment Reporting System (ERS)/Student Information System (SIS)

These terms are used to identify the computerized system for the individual campuses to report enrollment statistics to THEC. One record is provided for each student, containing ID Number, campus, major, and vital demographic information.

Enrollment Service Model/County Expected Enrollment

This model is used to determine whether or not a specific county is being over- or under-served in relationship to its size and the proportion of the total state population attending any institution during a particular study period. This model is defined as shown below:

CEE = (CP/TP)*TE

where:

CEE = County Enrollment Estimate
CP = County Population
TE = Total Enrollment throughout State
TP = Total State Population

Equity of Service

Equity of service in higher education is defined as the provision of reasonable services from an institution, or state/public system of institutions. An equitably located institution should be located to minimize the maximum distance that the most distant students will have to travel to reach an institution or facility.

Graduation Proportion

The proportion of the incoming undergraduate student body that reaches graduation within six years was chosen arbitrarily from many possible operational definitions to represent a reasonable time frame to complete most undergraduate programs.

Gravity/Potential Models (GP Models)

These terms are used to describe those geographic models that are used to study and predict spatial interactions between areas and/or points. Such models allow the researcher to describe and understand better the interaction between two or more such areas while developing a quantitative measurement based on distance, size, and other important determining factors. The gravity formulation used in this study has been developed using a Logit Model to account for the student's choice of institution based on its perceived utility. This model determines a probability level that any one student from the selected county will choose the selected institution. The development of the GP Model used in this study (equation

numbers 5A and 5B below), is defined by the following steps:

1: School Choice = $f_{(d,size)}$

2: $U_{(i,j)} = (\beta_1 \ln(d_{ij}) + \beta_2 \ln(size))$

3: $$P_{(i,j)} = \frac{e^{Uij}}{\Sigma(e^{Uik})}$$

4: $$P_{(i,j)} = \frac{d_{ij}^{\beta 1} * size_j^{\beta 2}}{\Sigma(d_{ik}^{\beta 1} * size_k^{\beta 2})}$$

5A: $PE_{(i,j)} = ((O_i)*(P_{(i,j)}))$

5B: $PCEE_{(i,j)} = ((CEE_i)*(P_{(i,j)}))$

where:

β_1	=	computed weighting factor for distance
β_2	=	computed weighting factor for school size
CEE	=	County Expected Enrollment as defined by the Enrollment Service Model
d	=	distance between institution and county
e^{Uij}	=	antilog of Utility Function ($U_{(i,j)}$)
f	=	function
i	=	subscript for county
j	=	subscript for school
k	=	subscript for all school choices
$O_{(i)}$	=	total number of students attending college from county (i)
$P_{(i,j)}$	=	probability that any student from county (i) attends any school (j) based on the actual enrollment of students from that county during the study period
$PCEE_{(i,j)}$	=	predicted enrollment from county (i) at school (j) based on the County Expected Enrollment as defined by the Enrollment Service Model
$PE_{(i,j)}$	=	predicted enrollment from county (i) at school (j)
$size_{(j)}$	=	size (total enrollment) of school (j)
$U_{(i,j)}$	=	Utility of school (i) to county (j) based on distance between the two (i,j)

Local Students and Counties

This term is used to describe students or counties within 50 air miles from the campus in question. This distance represents a reasonable distance for the average maximum commute to an institution of higher education and is the maximum average distance any citizen in Tennessee must travel to reach a public college or university in Tennessee.

Non-Local Students and Counties

This term is used to describe students or counties more than 50 air miles from the campus in question.

Non-Traditional Students

These are students over the age of 25, enrolling for the first time in an undergraduate program, during the study period (Fall 1980 through Fall 1990). Those students under age 26 who began a program during or prior to the study period will be classified as Traditional students.

Persistence Proportion

Persistence Proportion is the proportion of the incoming undergraduate students who continue through their degree program without significant delay or interruption. A delay or interruption of more than one year is considered a break in persistence. This period has been chosen arbitrarily from many possible operational definitions of the concept. An interruption of less than one year represents a reasonable period of off-time without detrimentally affecting the completion of most undergraduate programs.

Region

This term is used to define a set of counties within the state of Tennessee that were grouped into a larger area based on some commonality among them. These commonalities can be either geographic or demographic in nature. (See Appendices B2-4)

Rural Counties/Regions

Rural Counties are those counties which are not in Metropolitan Statistical Areas, as defined by the United States Bureau of The Census. Rural Regions are those areas made up primarily of exclusively of Rural Counties. (See Appendix B4)

System of Higher Education or Institutions

This term is used to describe the overall structure of higher education within a state, region, or entire country. The "system" can be described as all institutions operated under the auspices of either governmental authority or a controlling body. This group of institutions is operated in what is believed to be the best interest of the constituents and the campuses themselves. Through these efforts it is hoped that the services of the "system" can be offered as efficiently as possible, without causing a negative impact on the educational endeavor. In Tennessee, all public colleges are chartered, funded, and in part controlled by state government through the Tennessee Higher Education Commission. (See Appendix A)

Tennessee Higher Education Commission Staff (THEC)

THEC is the overseeing body and servicing staff for all higher education institutions in the State of Tennessee. This body has direct responsibility for funding dispersal and program approval. THEC provided direct liaison between the legislature and the two higher education governing bodies, as well as the individual institutions within the state.

Tennessee State Board of Regents (SBR)

Formally known as the "State Board of Regents of the State University and Community College System of Tennessee", this is the governing body and staff of the 23 campus State University System of Tennessee. SBR institutions include all of the public community colleges, vocational/technical institutes, and four-year institutions of higher education except for those operated by The University of Tennessee System. Staff members for this governing body provide overall direction to the individual campuses and liaison with THEC and The University of Tennessee System.

The University of Tennessee University-Wide Administration (UT/UWA)

UT/UWA is the governing body and staff for The University of Tennessee System. UT/UWA institutions include the four primary UT four-year campuses, the Agricultural Experiment Station, the UT College of Veterinary Medicine in Knoxville, and the UT Space Institute in Tullahoma. Staff members for this governing body provide direction to the individual

campuses and liaison with THEC and the State Board of Regents.

Traditional Students

These are students under the age of 26, enrolling for the first time in an undergraduate program, during the study period (Fall 1980 through Fall 1990). Those students over age 25 who began a program during or prior to the study period were classified as Non-Traditional students.

Urban Counties/Regions

Urban Counties are those counties which are in Metropolitan Statistical Areas, as defined by the United States Bureau of The Census. Urban Regions, as used in the study, are the Metropolitan Statistical Areas, or those other areas made up primarily of Urban Counties. (See Appendix B4)

E. RESEARCH QUESTIONS AND HYPOTHESES

The following research questions were analyzed in the study:

1. Which geographic regions/counties of Tennessee were the most under-represented in college enrollment, persistence, and graduation proportion throughout the period? What was unique about these regions/counties?
2. Had the enrollment of local or non-local students changed at the two-year institutions, or had the enrollment patterns of the groups at these campuses remained stable?
3. Had local or non-local enrollment at the lower division levels at senior institutions changed over the ten year period, or had the enrollment of such groups remained stable over the same period?

4. Had transfer movement between two-year and four-year institutions changed over the ten year period in question? Was this movement evident between neighboring campuses or across regional lines?

The following hypotheses were also tested:

1. The county enrollment ratio decreased as the distance from each institution increased.
2. Students from counties and regions more distant from each institution showed a higher persistence and graduation proportion than local students.
3. The enrollment ratio of local counties at two-year institutions was higher than that of local counties at four-year institutions, while the enrollment ratio of non-local counties was higher at four-year schools than two-year schools.
4. Black students migrated longer distances to public institutions than white students.
5. Female students migrated shorter distances to public institutions than male students.
6. Non-traditional age students migrated shorter distances to public institutions than traditional age students.
7. Counties and regions with an over-representation in enrollment were over-represented in persistence and graduation proportions.
8. Urban and high-income counties in Tennessee were over-represented in college enrollment.

F. PROCEDURES

Data Sources

Data for this research were obtained from the Tennessee Higher Education Commission (THEC), the State Board of Regents (SBR), and The University of Tennessee University Wide-Administration (UWA). Other data were obtained from administrative offices at the individual public institutions of higher education in Tennessee. The primary data sources for this research were the THEC Enrollment Reporting System (ERS), the THEC Academic Inventory System (AIS) of graduates, and mission statements for each of the individual campuses, systems, and THEC. The data were obtained directly from the appropriate staff members at each office or institution after proper authorization had been obtained. Although both the ERS and AIS data records contain student identification numbers, no effort was made to identify any student individually. These identification numbers were used only to link the records on a term-by-term basis.

Treatment of Data

Several statistical methods and models were used to analyze the data in this research in order to answer the research questions and test the hypotheses mentioned above. The most important of these methods was the Gravity/Potential Models described earlier and the Pearson's Product Moment Correlation (PPM). No inferential testing was specifically required in this study, as the enrollment data used was the

entire population of students enrolled at public institutions of higher education in Tennessee during the study period. T-tests were used for certain analyses to demonstrate the strength of certain relationships, but not to make any inferential conclusions.

The gravity model was used to analyze the enrollment potential and patterns based on county-by-county and regional breakdowns of the data. These models allowed for the determination of the county's potential for enrollment at each institution, which in turn permitted the determination of over- or under-representation for each county at the respective schools. All or part of the data produced with the gravity/potential models was used in the further analysis of all the research questions and hypotheses.

The PPM Correlation was used to determine if strong relationships existed between enrollment potentials, actual enrollments, persistence and graduation proportions, county median income, and percentage of county urban population. The various combination of these variables were correlated with one another to determine what type of relationship existed between them, and r^2 was computed to provide an estimate of what proportion of the variation in the dependent variable was caused by the associated independent variable. The PPM analysis allowed for the testing of several of the research hypotheses and questions mentioned above. The mean, standard deviation, and variance of various values on categories of

students and/or institutions were used to determine if a meaningful difference between these values was present. These statistical tests were used in order to analyze the research hypotheses discussed in Section V.

For research questions 1-3, the county enrollment ratio was used to determine the answer to the specific question. These questions dealt with the enrollment, persistence, and graduation characteristics of the regions and counties, as well as how far students were willing to migrate to pursue their educational objectives. For Question 1, the simple enrollment ratio allowed for the determination of those counties and regions which were the most over- and under-represented in college enrollment throughout the state of Tennessee. Enrollment ratios were also used to analyze whether local and non-local enrollment at two- and four-year institutions had changed over the ten year period of the study (Questions 2-3). For Question 4, dealing with transfer movement between the two- and four-year campuses, the number and proportion of transfer students moving between the two- and four-year institutions was compared to determine if transfer activity between various types of institutions had changed. This aided in determining which counties had accounted for the majority of any change.

Hypotheses 1 and 2 were tested using the Pearson's Product Moment Correlation (PPM). This allowed for the determination of whether a strong negative correlation existed

between enrollment ratio and distance between the counties and institutions. The same type of examination allowed for the determination of the existence of strong positive correlations between enrollment ratio and both persistence and graduation proportions for Tennessee counties.

The mean values for the average enrollment ratios of local and non-local students at two- and four-year institutions were analyzed (Hypothesis 3). The enrollment ratios for counties which qualified as local migration counties were grouped by type of institution, as were those which qualified as non-local migration counties. These values were compared to determine if any difference existed between the enrollment ratios for non-local and local counties at each type of institution.

The analysis of descriptive statistics was used to determine if differences existed in mean migration distances by race, gender, and student age (Hypotheses 4-6). The migration distance for each group of students (black/white, male/female, and traditional/non-traditional), was averaged using the county of origin migration distances.

For Hypotheses 7 the PPM was used to determine if strong positive relationships existed between county enrollment ratio and both county persistence and graduation proportions. For Hypothesis 8 the PPM allowed for the determination of a positive relationship between enrollment ratio and the proportion of county urban population and county median

income. Each of these analyses and/or tests were conducted using data taken directly from the THEC ERS data for the ten year period from Fall 1980 through Fall 1990, or derived from these data using the GP Models mentioned earlier.

Organization of the Study

The study is organized as follows:

Chapter I	-	Introduction
Chapter II	-	Review of Related Literature
Chapter III	-	Descriptive Data and Answers to Research Questions
Chapter IV	-	Analysis of Data and Hypothesis Testing
Chapter V	-	Summary, Conclusions, and Recommendations
Bibliography	-	Reference Sources
Appendix	-	Detail Data Analyses and Maps

Chapter II contains a review of significant related literature including results of similar research and standard theoretical models associated with institutional location and student mobility. Chapter III contains the basic results and answers to the research questions completed during the study. Chapter IV contains the detailed analyses of the information and data found in the study and reported in Chapter III and the results of the tests performed in relation to the research hypotheses. Finally, Chapter V includes the overall summary, conclusions, and recommendations for further research derived from the analyses described in Chapters III and IV.

Chapter II

REVIEW OF RELATED LITERATURE

A. INTRODUCTION

Educators, geographers, sociologists, and many other individuals concerned with the delivery of educational services have researched the process of student college selection over the past 30 years. This effort has followed the development of research into migration patterns by many social scientists throughout the mid-twentieth century. Most migration research has, however, tended to overlook the annual mass-movement of individuals throughout the United States to attend college, perhaps because of the inherent transient nature this movement represents in most person's lifecycles. Each year the number of college students crossing state lines to attend their chosen institution accounts for approximately 25 percent of the annual inter-state migration in the United States (Fryman, 1985).

The majority of student migration studies have looked at inter-state migration patterns and the impact these movements have on the national and statewide educational delivery systems. A number of these studies have dealt with various state and federal policies that have an influence on inter-state migration, while others provide various insights into the motivations underlying migrational trends of students among states and regions (Johns and Viehland, 1989). There

have also been a small number of studies dealing with the intra-state migration of college students. These intra-state studies have generally dealt with the impact of student migration on one college or university within the state.

A primary reason for the predominance of studies dealing with inter-state migration, is the availability of relatively accurate and manageable data regarding the aggregate enrollment of students from state to state, such as that provided by Johns and Viehland (1989). The data necessary for an accurate study of intra-state migration on a national basis, and to a lesser extent on a single state basis, have often been quite difficult to obtain and even more difficult to analyze. In attempting to use variants of the gravity model as a predictor of student migrations McConnell (1965) and Gossman, Nobbe, Patricelli, Schmid, and Steahr (1968), have shown, however, that the delineation of migration sectors to reasonably sized migration nodes, such as counties, increases the accuracy of the calculations.

B. UNDERSTANDING STUDENT MIGRATION PATTERNS

Meredith (1971) was primarily concerned with the inter-state migration of student and its effects on higher education in the state of Mississippi. His research provided insights into long-term changes in student migration and enrollment differences between public and private institutions between 1949 and 1968. His research project had two primary goals: to identify the changes in migration patterns on a nationwide

basis over the study period and to develop a migration model for analyzing student movement using detailed information from Mississippi.

Two of the major findings of the Meredith study were that the percentage of students remaining in their home state for undergraduate study was over 80 percent throughout the period and that students attending private institutions were much more likely to migrate out of state than those attending public institutions. The most valuable finding of this study was that over the entire 20 year period only eight states substantially altered their migration status (i.e., from being either a net in-migration state to out-migration state, or vice-versa) (Meredith, 1971). This finding shows that even with the extensive growth in public higher education during the period, inter-state student migration patterns changed drastically.

At the same time, Steahr and Schmid (1972) reinforced one of Meredith's major conclusions. In analyzing the total number of inter-state migrants to public and private institutions over a similar study period, they examined the percentage of the total enrollment migrating between states rather than the actual count. Analyzing data in this fashion took into consideration the growth in college enrollment represented in the data collected between 1949 and 1968. They found that out-of-state migration declined by 16 percent over the period (Steahr and Schmid, 1972, pp. 444-445).

During the 1960s and early 1970s, other major research projects involving inter-state student migration patterns were also undertaken with the support of the United States Office of Education. These projects led to several reports and articles dealing with student migration patterns. During this period, the overall number and enrollment of two-year community or junior colleges was began to increase rapidly. Students at these institutions were much less likely to cross state lines to attend a specific college than those attending four-year public or private institutions (Calvert, Drews, and Wade, 1971). Calvert et al. (1971), and Gossman et al. (1968) observed that during this period, colleges began to shift from encouraging geographical diversity in their student bodies to attempting to assemble student bodies with cultural, racial, and socio-economic diversity. Additionally, as the number and size of community colleges increased in the 1970s and 1980s, fewer students migrated to institutions outside their state, choosing instead to pursue their education at a college nearer to their home (Calvert, et al., 1971). All of these actions played a role in the overall reduction in the proportion of the national aggregate student body that migrates between states and colleges.

James F. Fryman conducted extensive research into the inter-state migration of students in Iowa and the upper midwestern region throughout the 1980s. A primary focus in his research was the reasons or factors that led a student to

migrate out-of-state. He found that the majority of students from Iowa who migrated to other states remained "within fifty miles of the Iowa border" (Fryman, 1988, pp. 238-239). Movement was often to attend an institution that was closer to the student's home than one of the three four-year public universities in Iowa.

Fryman also found that students usually migrate to out-of-state public four-year institutions only when it is financially feasible. In the upper midwest, several states offer reciprocal tuition agreements which allow students from any member state to attend any public institution in another member state at in-state tuition rates. Also, the range of increase between in-state and out-of-state tuition varies widely among states, with those offering lower out-of-state rates often receiving a much larger ratio of out-of-state migration (Fryman, 1988).

C. MODELS AND MEASUREMENT OF MIGRATION RATES

As colleges and universities increased in number and size over the past thirty years, efforts were made to regionalize many aspects of their administration. States developed statewide coordinating boards, regional accrediting agencies grew more powerful in their influence on higher education, and the federal government regionalized much of its data on enrollment patterns and trends for comparative purposes. As an outgrowth of this movement, Slater (1976) developed a measurement for better defining these regions using the inter-

state migrational patterns of students to institutions of higher education. This research investigated the migration patterns of students among states to determine if those regions defined by the United States Department of Education were valid or were simply arbitrary in their make-up.

Using his migration threshold model, Slater determined meaningful regional combinations of states based on actual migration patterns of students within and between the various states. His model allows for differing levels of migratory movement between states before determining the number and size of higher education regions desired (Slater, 1976). Again, as in many other inter-state migration studies, tuition rates, agreements between states, and distance between population centers and institutions accounted for a large amount of the migration of students among states.

The development of measurements and prediction models for student migration in higher education led researchers to investigate the relationships between migration rates and institutional characteristics. Garcia (1983) completed a step-wise regression analysis between 22 such characteristics and inter-state migration rates to individual institutions and found that three of these characteristics accounted for approximately 31 percent of the variability of student migration rates. Auxiliary services for students was the most highly correlated positive factor in inter-state migration to an institution, while the percentage of graduate and

professional students and public control of an institution had the highest negative correlations (Garcia, 1983). The aspect of public versus private control substantiates much of the research conducted by other researchers.

D. TUITION RATES AND STUDENT MIGRATION

Several studies attempted to demonstrate the possible link between the inter-state migration of college students and tuition rates at various institutions and within state systems. While most students attending public colleges and universities choose to stay within their own state to avoid premium tuition rates charged to non-residents, it is a logical conclusion that a higher number of students are likely to migrate to an institution or state with lower tuition rates than to campuses or states with higher fees for educational services. Other factors of student in-migration that often play a more significant role than non-resident tuition rates are "general attractiveness to in-migrants and states with favorable economic and environmental conditions" (Morgan, 1983, p. 183). Also, states that are most likely to increase non-resident tuition rates are those that are "strong net importers of college students" (Morgan, 1983, p. 192). These states would be least likely to suffer significant adverse effects by such actions.

In the past, many felt that tuition rates played a major role in the migration of students to public institutions among states, Viehland (1989), however, found that the actual effect

could only be considered moderate. According to his research, "non-resident tuition increases in the public sector will cause relatively small declines in enrollment and will be accompanied by increased tuition revenue" (Viehland, 1989, p. 110). The limited affect of tuition changes and specific tuition policies on inter-state migration and enrollment can conceivably be compensated for in other areas, such as institutional reputation, program availability, available scholarship monies, and other financial aid programs.

While these results seem to indicate that students who are willing or choose to pay non-resident tuition are only slightly affected by tuition differences, students who can benefit from inter-state tuition reciprocity agreements undoubtedly are more likely to cross state lines in search of higher education opportunities. Wisconsin and Minnesota have an extensive reciprocity agreement, allowing students from each state to attend a public institution in either state for in-state or resident tuition rates. This agreement directly contributes to the fact that over 10,000 students from Minnesota attend public institutions in Wisconsin, while only 4,300 students from Illinois migrate to Wisconsin, and no other state sends more than 1,200 students (University of Wisconsin, 1991). When students are able to cross state lines to a neighboring state without major financial barriers, inter-state migration increases.

Tuition rates certainly do play a role in the migration

patterns of college students. However, major differences in tuition rates must be perceived before significant shifts in student migration become evident. Shifts in non-resident rates will not greatly affect the migration habits of those students who are willing to pay these rates, but reciprocity agreements completely eliminating such surcharges on tuition at public institutions will have a significant effect on inter-state student enrollment.

In Tennessee, tuition rates at public four-year campuses differ only slightly. So too, rates at two-year colleges in Tennessee vary little. There is,however, a rate difference between two- and four-year institutions, and some migrational differences may be noticeable between these campus categories.

E. THE CLASSIC GRAVITY MODEL

The classic gravity model used by researchers in geography and other social sciences for over forty years was first defined and described by sociologist George Zipf in 1946, and "social physicist" John Stewart in 1947. The model is based on the premise that two places, or nodes, "interact with one another in proportion to the product of their masses and inversely according to some function of the distance between them" (Abler, 1971, p. 221). This model has been used by geographers and other researchers to explain transportation and migration patterns among places, gross economic interaction among towns and cities, and communication levels among nodes in a complex communication network (Isard, 1982).

Normally the gravity model assumes that the effect of distance is a smooth and continuous function. However, political boundaries and other geographic entities may create barriers to migration and/or interaction between places. This would certainly be the case in the college student migration situations described above. Most students, if all other factors were equal, would choose not to pay the higher tuition rates to attend out-of-state public colleges and universities. When such barriers to interaction or migration are present, factors increasing the frictional effect of distance over such boundaries must be added to the model (Abler, 1971). Alternatively, a predictive equation allowing for non-linearity in the gravity model must replace the classic general linear model (i.e., regression formula). Such a non-linear equation that has proved effective in such cases is the Logit Model. The justification and specific background of the Logit Model formulation of the Gravity Model used in this study will be discussed further in the following sections.

The classic gravity model is defined below (Isard, 1982):

$$F = G*(P_iP_j/d_{ij}^2)$$

where:

F	=	Demographic Force between Points i and j
G	=	Computed Gravitational Constant
P_i	=	Population of Node i
P_j	=	Population of Node j
d_{ij}	=	Distance between Nodes i and j

This model is the conceptual basis for the vast majority of gravity models developed in the past 40 years, whether the model is based on an OLS regression or a Logit Model simulation.

F. THE GRAVITY MODEL IN PAST STUDENT MIGRATION RESEARCH

The most comprehensive student migration study undertaken prior to the 1980s was completed in 1968 with the support of the United States Office of Education (Gossman et al., 1968). This study combined the efforts of numerous researchers in building a research method for understanding both "the description and prediction of human migration" (Gossman et al., 1968, p. 3). In analyzing student migration, the study provided a complete description of the in- and out-migration of students among the states. The study also described the differences in inter-state movement patterns for students at both public and private institutions of higher education.

The most enlightening aspect of the Gossman et al. study was the attempt to develop predictive models for student migration patterns. This effort centered mainly on the development of a gravity model for aggregate inter-state student migration (Gossman et al., 1968, pp. 153-174). The gravity model developed by Gossman et al. (1968) was based on the classic formulation constructed by Zipf (1946) and as expanded and elaborated upon by Isard (1982). This formulation is solved as a linear regression model, with independent variables for the out-migration of a state, the in-migration of a state, and the distance separating the two states. The dependent variable was the expected/predicted migration volume between the states, with the formula taking the form (Gossman et al., 1968, p. 154):

$$M_{ij} = k((O_i * I_j)/D_{ij})$$

where:

M_{ij} = Migration Volume between States i and j
k = Predetermined/Computed Constant
O_i = Out-migration from State i
I_j = In-migration to State j
D_{ij} = Distance between States i and j

McConnell (1965) developed a gravity model to analyze the enrollment patterns of students at one public institution for each county within the home state, thereby focusing exclusively on intra-state migration. In this research, McConnell developed five gravity models similar to the one developed by Gossman et al. (1968). The variations in the models were in the use of either population or aggregate income as the primary weighting factor in the numerator portion of the independent variable and either distance or intervening educational opportunities as the denominator of the independent variable calculation.

G. THE LOGIT MODEL AS PART OF A GRAVITY MODEL: AN IMPROVED COMBINATION

While the basic gravity model has served researchers well since its initial development in the 1950s and 1960s, more advanced techniques for predicting interaction have been developed in the past fifteen years. The Logit Model has provided researchers with an improved method of predicting the probability that a specific choice will be made, especially when the nature of the interaction proves to be a non-linear function of distance and other relevant explanatory values. The basic gravity model has always been based on the

assumption that the function of node sizes and distance was linear or log-linear in nature, thereby allowing an ordinary least squares (OLS) regression to be used in developing the variables for the prediction equation. The Logit Model allows for a non-linear (i.e, curvalinear), function to be simulated accurately by analyzing possible choices based on a maximum likelihood calculation rather than an OLS regression calculation.

When OLS regression is applied to a function that does not meet the linearity assumption, several errors in the calculations can occur. These errors include the development of "estimates which (1) have no known distributional properties, (2) are sensitive to the range of data, (3) may grossly understate the magnitude of the true effects, (4) systematically yield probability predictions outside the range of 0 to 1, and (5) get worse as standard statistical procedures for improving estimates are employed" (Aldrich and Nelson, 1984, p. 30).

The concept behind the Logit Model is that choices are made based on utilities and the likelihood that an individual will make a specific choice within the group of choices available. Students will choose an institution based on the "utility" of that institution, as they perceive it. This allows for the varying degrees of interest that certain individuals have in specific characteristics of institutions, such as size, program offerings, distance from home, costs,

and reputation. The Logit Model allows for the development of the utility function in comparison to the aggregate utility of the full set of discrete educational choices. The utility of the complete set of choices is the basis for the probability that any individual within the group will make a specific choice with the set of available selections (Ben-Akiva and Lerman, 1985).

By combining the non-linear estimating capabilities of the Logit Model with the concepts inherent in the classic Gravity Model, it is possible to improve the estimation calculations of migration and enrollment potentials at public institutions of higher education. Past research in student migration has led to many valuable conclusions regarding the reasons students migrate between their homes and their chosen institution, including costs, distance, institutional characteristics, and the student's personal traits. By combining the non-contentious results of all past research and model development in student migration, with the non-linear estimating properties of the Logit Model, a more concise and accurate composite model of student migration and enrollment potential will be developed.

This use of the Logit Model instead of the regression equation in the formulation of the model used in this study creates a gravity model formula that differs somewhat in a mathematical sense from formulation of the model to be used in prior research. However, this model, and all gravity models

developed since the 1940s are conceptually derived from the type of formula developed by Zipf (1946) and Stewart (1947), as discussed earlier.

Chapter III

DESCRIPTIVE DATA AND ANSWERS TO RESEARCH QUESTIONS

A. PROCEDURES

Basic Data Compilation

The data for this study were obtained from the archived data files of the Tennessee Higher Education Commission (THEC). These files included records from the Student Information System (SIS) and the Academic Inventory System (AIS), used by the THEC staff to count and analyze student enrollment at public institutions throughout the state. These data are normally used as input to the THEC funding formula for state appropriations, to determine enrollment in specific programs and/or departments, and to analyze persistence and graduation tendencies of students at all campuses in the state system of higher education.

The data were obtained via computer datasets for each year and term for which this study was completed (i.e. Fall 1980 through Fall 1990). The SIS contains one or more records per student and enrollment location. Each record contains information on campus, demographic and biographic information on the student (race, gender, age, major, home county, student level), and the student's enrollment status. The individual identity (name and address) of the student was unknown to THEC or the researcher and is irrelevant in the research conducted here or by the THEC Staff. A student identification number is

included in the record to allow connection of all records for a student, but identifying an individual student without contacting the campus records office would have been difficult or impossible. The AIS contains similar information to the SIS, except that information related to degrees awarded by campus, year, term, and student major.

The individual data files for each term were compiled into two large datasets from which two research files for this study were constructed. The first of these files contained one record per Tennessee county and institution, with the overall enrollment, and enrollment by gender, race, and age groups from the county to the respective institution for each term in the study period. This file was used to construct the gravity model equations and to analyze the actual enrollments at the campuses in relation to the predictions the model produced. The county file was also used to analyze the migration patterns and trends of the various groupings of undergraduate, in-state students, as defined in the research questions and hypotheses.

The second major research file constructed from the THEC data files was used to analyze the persistence and graduation proportions for the counties, regions, and institutions. This file contained one record per student enrolled at any time during the study period. Each record contains the demographic and biographic information on that student, as well as information on all terms and institutions at which the student

enrolled. The combined record allowed for the analysis of overall enrollment persistence by term and graduation persistence. The latter was possible to calculate because the file contained an indicator for the specific campus from which a student graduated.

After the compilation of these files was completed, each was then processed using the appropriate research methods discussed in Chapter I to analyze the questions and hypotheses necessary for the completion of this study. The data used for the study represent the entire known population of undergraduate in-state students at public institutions of higher education in Tennessee, making the use of advanced inferential statistical methods unnecessary. The analyses reported in this chapter and in Chapter IV will refer to statistical significance only in the hypothetical sense. That is, might the analyzed data have shown statistical significance if the results had been drawn from a sample of the entire population? Statistical significance is reported merely to emphasize the strength of the relationships analyzed.

Treatment of Descriptive Data

Data compiled to answer the research questions proposed in Chapter I were analyzed in several ways. These methods included the compilation of the predicted enrollment and enrollment ratios for the various counties and regions of the state and the determination as if to whether these geographic

areas were under- or over-represented in enrollment at any individual campus or throughout the entire state system. Other methods of analysis used to answer the research questions included: 1) the assembling of transfer patterns among the various regions of the state and the individual institutions; and, 2) the compilation of enrollment percentages for the local and non-local students at each institution. These data compilations are presented in the subsequent tables and in the appendices.

B. PRESENTATION OF DESCRIPTIVE DATA

Average Migration Distances

Tables 1 and 2 show the average migration distances for all students to each institution and from each county, respectively. These tables display the basic migratory influence of students from each county or to each institution. As can be noted, the four-year institutions have a much higher average migration distance for their student body than do the two-year campuses. Normally, a lower percentage of the students at four-year institutions are considered local migrants. This information provides a useful basis for better understanding the patterns of migration of the various student groups to be discussed in the following sections.

Other information in Table 1 and 2 of particular interest are the extreme values of average, minimum, and maximum migration distances, and the proportion of local enrollment for each campus and county. UT-Chattanooga had the shortest

TABLE 1

Average Migration Distances* of In-State Students to Tennessee Public Higher Education Institutions by Campus Fall Terms 1984-1990

	Average	Minimum	Maximum	%Local**
All Schools/Counties	41.14	5.81	472.73	82.04
Four-Year	52.13	6.72	467.38	71.40
Austin Peay State	40.60	17.26	312.12	84.42
East Tennessee State	33.24	**6.72**	438.51	79.81
Memphis State	34.21	**19.88**	**467.38**	**89.46**
Middle Tennessee St	45.60	12.92	**259.50**	74.75
Tennessee State	52.37	11.15	282.38	73.02
Tennessee Tech	62.74	9.72	262.57	**44.43**
UT Chattanooga	**32.08**	12.92	264.75	88.15
UT Knoxville	81.04	10.63	347.00	57.50
UT Martin	60.29	9.02	398.04	50.53
UT Memphis	**103.84**	17.68	463.67	49.79
Two-Year	20.73	5.81	472.73	96.11
Chattanooga State	18.96	14.61	268.48	97.57
Cleveland State	20.95	15.25	288.36	97.60
Columbia State	**25.03**	15.23	283.13	96.67
Dyersburg State	22.52	13.08	399.47	96.46
Jackson State	24.97	13.68	379.04	94.68
Motlow State	17.59	6.71	**230.94**	96.26
Northeast State	**14.44**	8.13	439.15	98.10
Pellissippi State	14.59	**5.81**	333.76	95.96
Roane State	20.74	6.80	313.48	96.01
Shelby State	23.52	**21.26**	**472.73**	**98.34**
State Tech-Memphis	20.19	17.32	463.23	98.11
State Tech-Nashville	22.98	10.75	283.41	**91.87**
Volunteer State	20.12	10.51	243.92	93.02
Walters State	22.38	9.28	387.29	94.68

* Distance measured as straight line distance from county population center to campus location.

** %Local: Percentage of students from counties within 50 miles of institution

Highlighted figures represent minimum and maximum migration distances within each category.

TABLE 2

Average Migration Distances* of In-State Students to Tennessee Public Higher Education Institutions by County Fall Terms 1984-90

County	Average	Minimum	Maximum	%Local**
All Schools/Counties	41.14	5.81	472.73	82.04
Four-Year	52.13	6.72	467.38	71.40
Two-Year	20.73	5.81	472.73	96.11
Anderson	39.29	8.22	336.84	73.70
Bedford	38.00	16.11	238.09	82.23
Benton	85.56	**47.66**	325.59	37.30
Bledsoe	47.50	33.87	266.78	84.68
Blount	35.07	15.03	341.09	79.24
Bradley	32.60	15.25	293.06	82.35
Campbell	53.15	31.07	340.37	69.77
Cannon	27.62	18.27	225.00	**91.71**
Carroll	61.13	32.28	346.54	71.14
Carter	23.09	9.50	446.15	90.24
Cheatham	41.92	15.48	266.59	83.67
Chester	55.26	19.34	359.50	60.64
Claiborne	48.99	27.75	296.97	72.97
Clay	44.83	25.44	266.24	64.85
Cocke	41.86	19.23	387.91	74.17
Coffee	40.14	6.71	222.07	73.95
Crockett	62.70	19.90	385.35	70.87
Cumberland	46.33	27.43	284.50	66.71
Davidson	42.01	10.75	249.74	79.82
Decatur	71.57	40.79	329.69	48.85
Dekalb	40.41	22.63	245.05	84.29
Dickson	65.14	28.73	282.94	54.60
Dyer	46.88	13.80	397.41	81.31
Fayette	68.91	24.68	407.93	68.73
Fentress	49.82	35.83	292.79	71.17
Franklin	47.35	14.24	225.32	75.19
Gibson	63.53	21.02	371.36	68.09
Giles	80.73	30.40	274.75	30.64
Grainger	30.89	13.12	379.64	86.28
Greene	43.70	24.82	408.96	75.29
Grundy	46.62	28.45	239.57	46.06
Hamblen	31.10	9.28	384.51	79.81
Hamilton	28.44	12.92	271.37	84.93
Hancock	38.08	20.75	397.04	70.72
Hardeman	80.29	31.33	383.59	42.10
Hardin	**102.23**	46.75	340.37	**20.90**
Hawkins	45.62	27.04	415.33	77.00

TABLE 2 (cont)

Average Migration Distances* of In-State Students to Tennessee Public Higher Education Institutions by County Fall Terms 1984-90

County	Average	Minimum	Maximum	%Local**
All Schools/Counties	41.14	5.81	472.73	82.04
Four-Year	52.13	6.72	467.38	71.40
Two-Year	20.73	5.81	472.73	96.11
Haywood	81.37	27.04	394.38	61.13
Henderson	62.91	24.58	345.13	53.48
Henry	77.37	31.28	337.49	58.38
Hickman	55.34	21.89	288.23	57.21
Houston	54.82	24.81	301.56	68.48
Humphreys	89.68	40.49	307.66	21.86
Jackson	25.44	13.75	262.02	84.55
Jefferson	34.67	13.87	373.52	81.62
Johnson	49.99	31.06	**472.73**	84.38
Knox	23.60	**5.81**	350.73	89.16
Lake	68.36	20.87	402.71	70.39
Lauderdale	64.32	19.52	408.15	68.29
Lawrence	68.59	31.01	293.27	49.50
Lewis	48.88	24.31	206.36	65.28
Lincoln	64.59	25.55	251.43	39.61
Loudon	39.07	14.73	322.49	77.91
McMinn	45.17	22.63	304.08	62.30
McNairy	91.42	36.99	359.32	32.30
Macon	77.36	37.95	300.99	23.10
Madison	62.26	13.68	368.23	56.67
Marion	36.96	18.27	244.85	77.51
Marshall	49.49	21.54	257.02	80.45
Maury	40.12	15.23	270.92	83.36
Meigs	43.81	22.32	292.36	71.10
Monroe	56.87	31.95	316.85	72.37
Montgomery	42.34	17.26	284.05	80.69
Moore	30.60	9.49	**203.51**	86.87
Morgan	28.03	9.62	310.68	77.91
Obion	48.52	12.76	381.03	79.29
Overton	32.55	16.96	271.72	77.37
Perry	70.07	41.61	223.34	45.10
Pickett	42.66	34.82	213.22	88.26
Polk	39.20	21.57	307.24	84.89
Putnam	**22.69**	9.72	266.51	84.12
Rhea	47.12	25.55	289.75	70.93
Roane	31.09	6.80	310.81	77.86
Robertson	55.29	21.88	254.67	56.41

TABLE 2 (cont)

Average Migration Distances* of In-State Students to Tennessee Public Higher Education Institutions by County Fall Terms 1984-90

County	Average	Minimum	Maximum	%Local**
All Schools/Counties	41.14	5.81	472.73	82.04
Four-Year	52.13	6.72	467.38	71.40
Two-Year	20.73	5.81	472.73	96.11
Rutherford	25.19	12.92	231.75	90.49
Scott	57.93	33.37	321.27	62.75
Sequatchie	36.83	20.66	257.63	79.13
Sevier	43.28	22.73	364.33	79.32
Shelby	44.39	17.32	439.15	88.71
Smith	42.62	25.00	238.69	84.13
Stewart	47.65	24.82	307.49	70.20
Sullivan	44.65	8.12	444.34	73.60
Sumner	43.76	10.51	235.49	75.74
Tipton	61.56	24.50	369.16	72.84
Trousdale	43.17	19.98	231.67	86.51
Unicoi	31.16	11.62	432.81	87.41
Union	39.33	20.95	318.92	80.48
Van Buren	44.10	31.15	256.70	76.47
Warren	50.17	35.79	242.16	83.01
Washington	23.04	6.72	439.44	87.17
Wayne	85.74	45.47	315.65	35.14
Weakley	26.40	9.02	363.01	90.37
White	30.55	17.32	263.66	77.31
Williamson	71.07	15.20	257.43	62.49
Wilson	45.42	14.86	225.10	82.68

* Distance measured as straight line distance from county population center to campus location.

** %Local: Percentage of students from counties within 50 miles of institution

Highlighted figures represent minimum and maximum migration distances within each category.

average migration distance of all four-year institutions with 32.08 miles traveled, while UT-Memphis and UT-Knoxville had the longest migration distances with 103.84 and 81.04 mile averages, respectively. These figures, combined with the local percentages of 88.15 for UT-Chattanooga, 49.79 for UT-Memphis, and 57.50 for UT-Knoxville, demonstrate the variations in service among these campuses. UT-Chattanooga is made up primarily of students from Chattanooga and the surrounding area, while UT-Knoxville and UT-Memphis attract numerous students from counties throughout the state. Among the two-year campuses the difference between the shortest and longest average migration distances was much less (14.44 for Northeast State and 25.03 for Columbia State), and was a direct reflection of the area surrounding each campus. Northeast State is very near to the Virginia and North Carolina borders with Tennessee, thus limiting its zone of service to in-state students originating from he north and east of its location. Columbia State is, on the other hand, near the geographic center of Tennessee, allowing it to draw students from the rural counties surrounding the campus in all directions. Since the two-year campuses draw well over 90 percent of their students from the local counties, geographic impediments to in-state student movement such as these were a major factor in how far students could and did migrate to the institutions.

The minimum and maximum migration distances for each

county reflect the geographic size of the "home" county of the institution (minimum), and the distance of the "home" county from the most distant county in the state. Institutions in Middle Tennessee have much shorter maximum migration distances that those in either East or West Tennessee. Therefore, while these figures provide an interesting base for understanding the general migration patterns of students to the institution, the usefulness of these figures in comparing campus migration patterns is limited.

At the county level (Table 2), the extreme values provide some further insights into the migration patterns and requirements of students from throughout the state. Three counties in south-central Tennessee (Benton, Hardin, and Wayne Counties) have minimum migration distances of over 45 miles to the nearest public institution of higher education. These counties, along with others having higher minimum migration distances also tend to be among those counties with the highest average migration distance and the lowest percentages of local enrollment by their students. Those counties with relatively low minimum distances are also the counties with the highest local enrollments and the shortest average migration distances, as would be expected. As with the campus information, the maximum distance traveled is merely a reflection of the geographic location of the county in respect to the most distance institution.

Enrollment Analysis/Ratios by Region and County

The question of under- and over-representation in college enrollment by state region and counties has been posed in Research Question 1. This question asked, "Which geographic regions/counties of Tennessee were the most under-represented in college enrollment, persistence, and graduation proportion throughout the period?" Table 3 shows the analysis of the Enrollment Ratios for each of the Grand Divisions of Tennessee. The Enrollment Ratio for each county or region was defined as the ratio of actual enrollment to the predicted enrollment provided by the gravity model used in this study. As can be noted, the only regional/institutional level variation is an under-representation for Middle Tennessee at two-year institutions. The combination of the large number of counties represented in each of these regions definitely masks the under- and over-representations of the various individual counties, in that several counties in Middle Tennessee displayed an over-representation of enrollment at all institutional levels (i.e. Davidson and Williamson Counties), but the overall trend for this region was a low Enrollment Ratio.

Table 4 presents similar information compiled for each of the Educational Developmental Districts (as shown in Figure 1). As can be noted from the table, only Region 6 was over-represented at all types of campuses and overall, and no district was under-represented at all types of campuses and

TABLE 3

Average Enrollment Ratios of Actual Student Enrollment
to Predicted Student Enrollment
By Grand State Divisions, Tennessee
Fall Terms 1984-1990

Tennessee Grand Division	Overall Ratio	2 Year Campuses Only	4 Year Campuses Only
East	1.05219	1.07887	1.03776
Middle	0.87952	0.79759 **L**	0.92385
West	1.07697	1.14123	1.04222

Overall Ratio:
H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.00290 (i.e., < 0.80232, > 1.20348). See Appendix D1 for detailed information.

2-Year Campuses Only:
H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.00590 (i.e., < 0.80472, > 1.20708). See Appendix D2 for detailed information.

4-Year Campuses Only:
H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.00127 (i.e., < 0.80102, > 1.20153). See Appendix D3 for detailed information.

TABLE 4

Average Enrollment Ratios of Student Enrollment to Predicted student Enrollment
By Educational Developmental Districts
Fall Terms 1984-1990

Developmental District (County Types or MSA)	Overall Ratio	2 Year Campuses Only	4 Year Campuses Only
1 (Tri-Cities)	1.14242	0.66935 **L**	1.39832 **H**
2 (Rural)	0.73428 **L**	0.95785	0.61335 **L**
3 (Knoxville)	1.10622	0.67286 **L**	1.34063 **H**
4 (Suburban)	0.81899	0.91006	0.76973
5 (Rural/Suburban)	1.07673	1.95704 **H**	0.60054 **L**
6 (Chattanooga/Sub)	1.32654 **H**	1.68177 **H**	1.13439 **H**
7 (Rural/Suburban)	0.95972	0.73393 **L**	1.08186
8 (Rural)	0.92891	0.93685	0.92462
9 (Rural/Suburban)	0.83240	1.04330	0.71832 **L**
10 (Nashville/Sub)	0.84084	0.68006 **L**	0.92781
11 (Rural)	0.76777 **L**	0.91653	0.68730 **L**
12 (Memphis/Sub)	1.24215 **H**	1.22896	1.24929 **H**
13 (Rural)	0.91768	1.22344	0.75229

Overall Ratio:

H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 0.97651 (i.e., < 0.78121, > 1.17181). See Appendix E1 for detailed information.

2-Year Campuses Only:

H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.04708 (i.e., < 0.83766, > 1.25649). See Appendix E2 for detailed information.

4-Year Campuses Only:

H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 0.93834 (i.e., < 0.75067, > 1.12601). See Appendix E3 for detailed information.

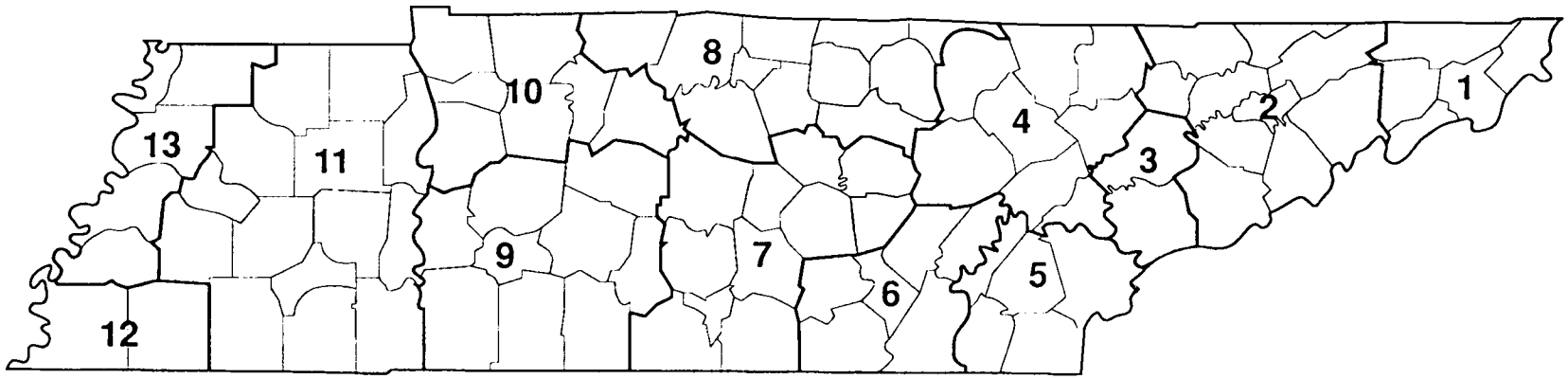

Figure 1: Map of Tennessee Educational Developmental Districts

overall. The variations in the overall ratios for the other districts were due to under- or over-representation at either the two- or four-year campuses for students migrating from the counties in that district. Finally, Table 5 displays a similar set of information compiled for the counties of each Metropolitan Statistical Area (MSA) and for the entire group of rural counties. Similar variations in the Enrollment Ratios for these county groupings also appear throughout this table as those seen in the previous tables. Enrollment Ratio tables for each of the individual counties can be found in Appendices F1-F3.

Discussion. As can be seen from the tables discussed in this section, counties in the rural areas of the state tend to show under-representations in the overall and four-year institutional Enrollment Ratio measurements, while the various urban areas differ in enrollment ratio level representation. The developmental districts and MSA regions containing significant areas that were suburban in nature tend to show over-representation in more than one Enrollment Ratio (Tables 4 and 5), while the counties in the larger MSAs vary according to institutional availability. The geographic dispersion of the various campuses and campus types can be seen in the enrollment ratio indicator analyses. Those counties and county groupings more distant from any two-year institution tended to show under-representations at this institutional level, while those counties containing campuses of either

TABLE 5

Average Enrollment Ratios of Student Enrollment to
Predicted student Enrollment
By Metropolitan and Rural Areas
Fall Terms 1984-1990

Metro/ Rural Area	Overall Ratio	2 Year Campuses Only	4 Year Campuses Only
Chattanooga	1.41569 **H**	1.78655 **H**	1.21508
Clarksville	0.82138 **L**	0.11371 **L**	1.20418
Jackson	1.01549	1.73282 **H**	0.62747 **L**
Knoxville	1.00343	0.69893 **L**	1.16814
Memphis	1.23378	1.22037 **H**	1.24104
Nashville	0.90558	0.82129	0.95117
Tri-Cities	1.10953	0.70544 **L**	1.32811 **H**
Rural Areas	0.83282 **L**	1.02857	0.72692 **L**

Overall Ratio:
H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.04221 (i.e., < 0.83377, > 1.25065). See Appendix G1 for detailed information.

2-Year Campuses Only:
H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.01346 (i.e., < 0.81077, > 1.21615). See Appendix G2 for detailed information.

4-Year Campuses Only:
H(igh)/**L**(ow) indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.05776 (i.e., < 0.84621, > 1.26932). See Appendix G3 for detailed information.

level demonstrated an over-representation at that campus type.

Persistence and Graduation Analysis by Region and County

The persistence and graduation tendencies of students from the various counties and regions defined for this study varied widely. As can be seen in Tables 6 and 7, the counties that compose the East Tennessee Grand Division consistently had the highest persistence and graduation proportions, while West Tennessee showed the lowest proportions except for two-year persistence and graduation. While these tables provide some insight into the overall performance of students from the various large regions, the aggregation of information provided in these tables masks the characteristics of various counties and county combinations.

Tables 8 and 9 provide information similar to that provided in Tables 6 and 7, except they employ the more finely grained (N=13) Educational Developmental Districts, while Tables 10 and 11 on persistence and graduation provide the information broken down by Metropolitan Statistical Area (MSA) and Rural Counties. As can be noted, the urban areas in East Tennessee tended to be among the higher ranking areas throughout all of the table entries. The Knoxville and Tri-Cities MSAs tended to rank relatively high in persistence and relatively high in the graduation proportions, with the Chattanooga MSA following closely behind. The Educational Developmental Districts made up primarily of rural counties tended to be near the overall averages, while the urban areas

TABLE 6

Two-Year, Four-Year, and Overall Student
Persistence Proportions by Grand State Divisions
1980-1990

Division	Overall Persistence Proportion	2 Year Persistence Proportion	4 Year Persistence Proportion
East	41.52	28.02	53.68
Middle	37.97	24.12	48.92
West	35.28	25.31	46.08
Statewide Proportion	38.51	26.06	49.91

TABLE 7

Two-Year, Four-Year, and Overall Student
Graduation Proportions by Grand State Division
1980-1990

Division	2 Year Graduation Proportion	4 Year Graduation Proportion
East	6.40	30.28
Middle	6.22	24.85
West	6.29	22.38
Statewide Proportion	6.31	26.20

TABLE 8

Two-Year, Four-Year, and Overall Student Persistence Proportions by Educational Developmental Districts 1980-1990

District	Overall Persistence Proportion	2 Year Persistence Proportion	4 Year Persistence Proportion
1	47.86	25.37	53.04
2	36.98	27.90	57.60
3	44.65	25.17	51.09
4	42.28	32.61	56.35
5	34.64	29.28	63.15
6	39.54	28.72	52.96
7	44.59	27.73	53.99
8	40.08	24.94	56.73
9	39.59	29.09	59.02
10	33.43	19.78	41.38
11	37.80	29.34	50.43
12	34.66	23.87	44.65
13	35.10	27.69	49.99
Statewide Proportion	38.51	26.06	49.91

TABLE 9

Two-Year, Four-Year, and Overall Student Graduation Proportions by Educational Developmental District 1980-1990

Division	2 Year Graduation Proportion	4 Year Graduation Proportion
1	8.70	26.69
2	6.00	31.86
3	4.21	30.90
4	6.35	34.27
5	8.71	36.58
6	6.32	28.90
7	7.85	28.57
8	5.49	28.51
9	8.87	31.25
10	4.71	20.32
11	8.11	24.90
12	5.78	21.66
13	6.08	23.46
Statewide Proportion	6.31	26.20

TABLE 10

Two-Year, Four-Year, and Overall Student
Persistence Proportions by Metropolitan & Rural Areas
1980-1990

District	Overall Persistence Proportion	2 Year Persistence Proportion	4 Year Persistence Proportion
Chattanooga	39.28	28.47	52.56
Clarksville	38.46	9.87	38.85
Jackson	35.10	30.40	57.92
Knoxville	42.80	26.05	51.67
Memphis	34.68	23.98	44.74
Nashville	35.55	21.68	46.95
Tri-Cities	48.20	26.38	53.27
Rural Areas	39.44	29.64	55.37
Statewide Proportion	38.51	26.06	49.91

TABLE 11

Two-Year, Four-Year, and Overall Student
Graduation Proportions by Metropolitan and Rural Areas
1980-1990

Division	2 Year Graduation Proportion	4 Year Graduation Proportion
Chattanooga	6.24	28.81
Clarksville	3.29	17.32
Jackson	9.85	31.83
Knoxville	4.52	31.30
Memphis	5.79	21.69
Nashville	4.87	23.27
Tri-Cities	8.84	26.75
Rural Areas	7.79	29.74
Statewide Proportion	6.31	26.20

in Middle and West Tennessee tended to exhibit lower than average proportions in most of the categories.

Discussion. The lower persistence and graduation proportions for students from the urban areas in Middle and West Tennessee could be a function of the differing demographic and racial make-up of these areas in relation to those in East Tennessee, as well as the number of campuses available to these students and the distance they are required to travel to attend certain institution types. Basically, the East Tennessee region and the urban areas in that region tended to display the highest the persistence and graduation proportions when compared to the statewide average and the performance of the other areas.

Local and Non-Local Students

The issue of enrollment changes for local and non-local students at two-year institutions was addressed in Research Question 2. This question asked, "Had the enrollment of local or non-local students changed at the two-year institutions, or had the patterns of such groups at these campuses remained stable?" Tables 12 and 13 show the patterns of local versus non-local enrollment at each of the institution types. It can be noted that the enrollment of local students at two-year institutions dropped through 1987, and then began to rise thereafter.

A similar approach was taken in Question 3, in addressing the enrollment trends of students at the four-year campuses.

TABLE 12

Local vs. Non-Local Undergraduate Student Enrollment
at Tennessee Two-Year Public Higher Education Institutions
Fall Terms 1984-1990

Year	Local	Non-Local	Total
1984	36,471/96.46%	1,339/ 3.54%	37,810
1985	34,179/96.33%	1,301/ 3.67%	35,480
1986	35,586/96.30%	1,366/ 3.70%	36,952
1987	35,059/95.70%	1,574/ 4.30%	36,633
1988	36,202/95.87%	1,559/ 4.13%	37,761
1989	40,020/95.98%	1,676/ 4.02%	41,696
1990	43,974/96.12%	1,774/ 3.88%	45,748

TABLE 13

Local Undergraduate Student Enrollment
at Tennessee Public Higher Education Institutions
Counts and Percentages
Fall Terms 1984-90

Year	2-Year	4-Year	Total Local	Total
1984	36,471	52,247	88,718	110,078
	41.11%	58.89%	80.60%	
1985	34,179	50,537	84,716	106,117
	40.35%	59.65%	79.83%	
1986	35,586	49,472	85,058	106,288
	41.84%	58.16%	80.03%	
1987	35,059	50,430	85,489	107,557
	41.01%	58.99%	79.48%	
1988	36,202	51,142	87,344	109,849
	41.45%	58.55%	79.51%	
1989	40,020	52,977	92,997	115,906
	43.03%	56.97%	80.23%	
1990	43,974	53,998	97,972	121,595
	44.88%	55.12%	80.57%	

The question asked, "Had local or non-local enrollment at the lower division levels at senior institutions changed over the ten year period, or had the enrollment of such groups remained stable over the same period?" Table 14 displays analytical data that show that the pattern of local enrollment for lower division students at four-year campuses dropped or fluctuated over the entire study period. Additionally, the proportion of all local students enrolling at two-year campuses increased throughout the study period, while the proportion of these students enrolling at four-year campuses dropped at a reciprocal rate (see Table 13).

Discussion. The changes in enrollment patterns of local students at two- and four-year campuses may have been related to the raising of admissions standards at all of the four-year campuses throughout the state system. After 1987, the actual number of local students enrolled at two-year campuses

TABLE 14

Local vs. Non-Local Lower-Division Student Enrollment at Tennessee Four-Year Public Higher Education Institutions Fall Terms 1984-1990

Year	Local	Non-Local	Total
1984	27,168/71.54%	10,808/28.46%	37,976
1985	25,840/70.27%	10,934/29.73%	36,774
1986	25,244/69.49%	11,083/30.51%	36,327
1987	25,658/69.10%	11,476/30.90%	37,134
1988	26,869/69.01%	12,066/30.99%	38,935
1989	27,848/69.44%	12,255/30.56%	40,103
1990	27,544/69.37%	12,162/30.63%	39,706

increased to an all time high, while the proportion of such students approached a similar level. The changes in the enrollment patterns at four-year institutions is also evidence that the enrollment of local students at two-year campuses was increasing as an overall proportion of the state-wide enrollment. The enrollment of such students at four-year campuses, however, continued to fall.

Transfer Movement of Students Between Institution Types

The issue of transfer movement between two-year and four-year institutions was raised in Research Question 4. The question asked, "Had transfer movement between two-year and four-year institutions changed over the ten-year period in question?" The question also asked "Was the movement evident between neighboring campuses or across regional lines?" To address these questions the transfer information for the various institution types, regions, and specific institution pairings was studied. Table 15 shows that total transfer movement was highest in 1981, dropped from 1982 through 1987, and began to rise between 1988 and 1990. This increase in transfer movements coincides with the movement by four-year institutions throughout the state to raise admissions standards for incoming freshmen. This increase in admissions standards was also evident in the enrollment patterns of local students at two- and four-year campuses.

Table 16 displays the inter- and intra-regional transfer movement of students from two-year campuses to four-year

TABLE 15

Total Transfer Movements of In-State Undergraduate On-Campus Students Between Public Higher Education Institutions in Tennessee
Fall 1980 - Fall 1990

Year	Total Enrollments	Total Transfers	Transfer Percentage
1981	202,835	8,515	**4.20%**
1982	178,417	6,654	3.72%
1983	184,159	6,656	3.61%
1984	178,357	6,100	3.42%
1985	171,501	5,494	3.20%
1986	168,740	5,286	3.13%
1987	172,178	5,368	**3.12%**
1988	177,045	5,900	3.33%
1989	179,825	6,047	3.36%
1990	188,057	7,086	3.77%
Total	1,801,114	63,106	3.50%

1981 Includes Fall 1980 - All other years represent individual calendar years.

campuses located in the respective regions. East Tennessee had the largest number of transfer movements both to and from the various campus types and regions. The largest inter-regional movements were also shown to be between East and Middle Tennessee. Tables 17 and 18 display the movement between various pairings of two- and four-year campuses. Table 17 shows the two-year campuses that are the major "senders" to each four-year campus. Table 18 displays the major recipient four-year campuses of transfer students from each two-year campus.

TABLE 16

Transfer Movements of In-State Undergraduate On-Campus Students Between Public Higher Education Institutions in Tennessee by Campus/Grand Division Fall 1980 - Fall 1990

From 2-Year Campus Division	To 4-Year Campus Division			
	East	Middle	West	Total
East				
Number	21,924	4,704	284	26,912
Percentage	34.78%	7.46%	0.45%	42.70%
Row Pct	81.47%	17.48%	1.06%	
Col Pct	83.36%	24.11%	1.65%	39.76%
Middle				
Number	2,677	13,030	1,163	16,870
Percentage	4.25%	20.67%	1.85%	26.76%
Row Pct	15.87%	77.24%	6.89%	
Col Pct	10.18%	66.79%	6.75%	30.12%
West				
Number	1,700	1,775	15,744	19,249
Percentage	2.70%	2.82%	25.03%	30.54%
Row Pct	8.83%	9.22%	81.95%	
Col Pct	6.46%	9.10%	91.60%	30.13%
Total	26,301	19,509	17,221	63,031
	41.73%	30.95%	27.32%	100.00%

NB: The categories for 75 known transfer students could not be determined.

TABLE 17

Transfer Movements of In-State Undergraduate On-Campus Students Between Public Higher Education Institutions in Tennessee by 4-Year Campus and Top Feeder 2-Year Campuses Fall 1980 - Fall 1990

To 4-Year Campus	From 2-Year Campus 1	From 2-Year Campus 2
Austin Peay	Volunteer State	State Tech-Nash
Number	445	306
Pct To	31.76%	21.84%
Pct From	7.29%	8.76%
East Tennessee	Walters State	Northeast State
Number	1,932	1,218
Pct To	46.41%	29.26%
Pct From	37.71%	88.71%
Memphis State	Shelby State	State Tech-Memphis
Number	5,376	3,630
Pct To	48.05%	32.44%
Pct From	68.55%	88.43%
Middle Tenn St	Volunteer State	State Tech-Nash
Number	1,799	1,142
Pct To	21.42%	13.60%
Pct From	29.49%	32.70%
Tennessee St	State Tech-Nash	Volunteer State
Number	1,291	1,191
Pct To	38.00%	35.06%
Pct From	36.97%	19.52%
Tennessee Tech	Roane State	Volunteer State
Number	1,711	1,238
Pct To	27.11%	19.62%
Pct From	24.27%	20.29%
UT Chattanooga	Chattanooga State	Cleveland State
Number	4,680	1,614
Pct To	68.77%	23.72%
Pct From	69.90%	43.34%
UT Knoxville	Roane State	Walters State
Number	4,216	2,617
Pct To	27.50%	17.07%
Pct From	59.79%	51.08%

TABLE 17 (cont)

Transfer Movements of In-State Undergraduate
On-Campus Students Between Public Higher Education
Institutions in Tennessee by
4-Year Campus and Top Feeder 2-Year Campuses
Fall 1980 - Fall 1990

To 4-Year Campus	From 2-Year Campus 1	From 2-Year Campus 2
UT Martin	Jackson State	Dyersburg State
Number	2,123	1,433
Pct To	36.55%	24.67%
Pct From	42.33%	62.69%
UT Memphis	Shelby State	Jackson State
Number	101	54
Pct To	45.29%	24.22%
Pct From	1.29%	1.08%

TABLE 18

Transfer Movements of In-State Undergraduate
On-Campus Students Between Public Higher Education
Institutions in Tennessee by
2-Year Campus and Top Receiving 4-Year Campuses
Fall 1980 - Fall 1990

From 2-Year Campus	To 4-Year Campus 1	To 4-Year Campus 2
Chattanooga St	UT Chattanooga	UT Knoxville
Number	4,680	924
Pct To	68.77%	6.03%
Pct From	69.90%	13.80%
Cleveland St	UT Chattanooga	UT Knoxville
Number	1,614	1,046
Pct To	23.72%	6.82%
Pct From	43.34%	28.09%
Columbia State	Middle Tennessee	UT Knoxville
Number	1,477	465
Pct To	17.58%	3.03%
Pct From	45.94%	14.46%
Dyersburg St	UT Martin	Memphis State
Number	1,433	452
Pct To	24.67%	4.04%
Pct From	62.69%	19.77%
Jackson State	UT Martin	Memphis State
Number	2,123	1,207
Pct To	36.55%	10.79%
Pct From	42.33%	24.07%
Motlow State	Middle Tennessee	Tennessee Tech
Number	2,055	942
Pct To	24.46%	14.93%
Pct From	50.59%	23.19%
Northeast St	East Tennessee	UT Knoxville
Number	1,218	87
Pct To	29.26%	0.57%
Pct From	88.71%	6.34%
Pellissippi St	UT Knoxville	East Tennessee
Number	2,414	217
Pct To	15.74%	5.21%
Pct From	81.94%	7.37%

TABLE 18 (cont)

Transfer Movements of In-State Undergraduate
On-Campus Students Between Public Higher Education
Institutions in Tennessee by
2-Year Campus and Top Receiving 4-Year Campuses
Fall 1980 - Fall 1990

From 2-Year Campus	To 4-Year Campus 1	To 4-Year Campus 2
Roane State	UT Knoxville	Tennessee Tech
Number	4,216	1,711
Pct To	27.50%	27.11%
Pct From	59.79%	24.27%
Shelby State	Memphis State	UT Martin
Number	5,376	1,119
Pct To	48.05%	19.26%
Pct From	68.55%	14.27%
State Tech-Mem	Memphis State	UT Martin
Number	3,630	254
Pct To	32.44%	4.37%
Pct From	88.43%	6.19%
St Tech-Nash	Tennessee State	Middle Tennessee
Number	1,291	1,142
Pct To	38.00%	13.60%
Pct From	36.97%	32.70%
Volunteer St	Middle Tennessee	Tennessee Tech
Number	1,799	1,238
Pct To	21.42%	19.62%
Pct From	29.49%	20.29%
Walters State	UT Knoxville	East Tennessee
Number	2,617	1,932
Pct To	17.07%	46.41%
Pct From	51.08%	37.71%

Discussion. The major sending two-year campuses are almost entirely made up of the two-year campuses most closely located to each four-year campus. The closest four-year campuses always functioned as the leading "receiver" of transfer students, but UT-Knoxville functioned as the second most important "receiver" for two-year campuses even though there may have been more proximate four-year institutions. This could be attributed to the statewide "flagship" mission of UT-Knoxville, as well as the many unique majors offered by that institution.

C. SUMMARY OF DESCRIPTIVE DATA ANALYSIS

There are a large number of predictable relationships in evidence among the descriptive data described above. This does not reduce the importance of analyzing such information nor does it decrease the relevance of the analysis itself or of the unusual and unexpected details found in the analyses. As can be seen, the four-year institutions exercise a great deal more power in attracting students from more distant counties. The size, mission, and nature of the four-year campus is also a major factor in the migratory patterns of students to any specific campus. The two-year campuses function as local enrollment poles for the statewide system of higher education. These institutions almost exclusively enroll students from the counties and areas immediately surrounding each campus.

Chapter IV

ANALYSIS OF DATA AND HYPOTHESIS TESTING

A. DATA COMPILATION FOR HYPOTHESIS TESTING

As with the descriptive analyses described in Chapter III, the data for the hypothesis testing portion of this study were also obtained from the archived data files of the Tennessee Higher Education Commission (THEC). The same basic data compilation required for the analysis of the research questions was used to create the data necessary to test the research hypotheses. The compilation of the Enrollment Ratio and the determination of local and non-local enrollment, as described in Chapter I, created the necessary information to test the hypotheses dealing with enrollment ratios versus migration distance and those dealing with the income and urban make-up of the students' home county (i.e., Hypotheses 1, 3, and 8). The compilation of the basic distance, persistence, and graduation information for each student, combined with the basic enrollment ratio data for each student county, and/or campus provided the necessary information to test those hypotheses dealing with region, race, gender, student age, and enrollment ratios versus the persistence and graduation proportions (i.e., Hypotheses 2, 4, 5, 6, and 7). By testing these hypotheses, it was possible to gain a more complete understanding of the basic migratory patterns of in-state students to public institutions of higher education in Tennessee.

As population data were the basis of all testing in this study, the use of inferential methods was not necessary. For clarity, however, the results of basic significance tests are shown. These values will demonstrate the strength of any relationships observed in the population data analyses. This will allow for more precise and meaningful statements regarding the relationships or differences found during the analyses and testing of the hypotheses proposed and undertaken in this study.

B. RESULTS OF HYPOTHESIS TESTING

Enrollment Ratio and Migration Distance

In order to test the accuracy and validity of the Gravity Model developed to estimate the expected enrollment for each county and institution, Hypothesis 1 was tested. The hypothesis stated: "The county enrollment ratio decreased as the distance from each institution increased." The basic implication of this statement is centered in the concept that if the model inaccurately predicted the enrollment of students by county and institution, the enrollment ratio would change as factors unaccounted for in the model played a greater role in student migration decisions than did distance, campus enrollment, and county population.

In Tables 19 and 20, the results of the Pearson's Product Moment Correlations between the enrollment ratio and distance of a county from the institution are shown. All of the calculated correlation values are low, especially for the

TABLE 19

Product-Moment Correlations Between
County Enrollment Ratios and Distance to Institution for
Two-Year Public Higher Education Institutions in Tennessee
Fall Terms 1984-1990

	Distance to Institution
Enrollment Ratio of Actual Enrollment to Predicted Actual Enrollment	r = +0.161 r^2 = 0.026
Enrollment Ratio of Actual Enrollment to Predicted Proportional Enrollment	r = +0.141 r^2 = 0.020

n=1330

TABLE 20

Product-Moment Correlations Between
County Enrollment Ratios and Distance to Institution for
Four-Year Public Higher Education Institutions in Tennessee
Fall Terms 1984-1990

	Distance to Institution
Enrollment Ratio of Actual Enrollment to Predicted Actual Enrollment	r = +0.018 r^2 = 0.000
Enrollment Ratio of Actual Enrollment to Predicted Proportional Enrollment	r = +0.037 r^2 = 0.001

n=855

four-year campuses, with no r^2 value for these correlations exceeding 0.26. Additionally, these weak relationships were positive in nature, the opposite of the relationship expected. Therefore, these findings did not support the statement made in Hypothesis 1. These findings provide evidence that the factor of migration distance was an excellent predictor of student enrollment. These results are further supported by the information displayed in Tables 21 and 22, dealing with the explanatory strength of the gravity model using the Logit formulation applied in this study. The strength, shown by the Pearson's Product-Moment Correlations and strength/fit coefficients (r^2) presented in Tables 21 and 22 allow for the conclusion that the gravity model used in this study shows that distance and county size explain between 47.7 and 55.2 percent of the variation between actual enrollment and potential enrollment at two-year institutions versus 47.3 percent for a least squares regression. For four-year campuses, between 90.4 and 95.3 percent of the variation is explained using the logit formulation gravity model, whereas, a linear least squares regression as the basis of the gravity model produced r^2 explanatory values of only 62.7 percent for these institutions. The very modest improvement for two-year campuses in the strength/fit coefficient is explained in the fact that well over 90 percent of all students at these institutions come from the surrounding counties, and the ability to measure the distance traveled per student or

TABLE 21

Product-Moment Correlations Between Actual Enrollment and Predicted Enrollments for Two-Year Public Institutions of Higher Education in Tennessee Fall 1980 - Fall 1990

	Actual Enrollment
Logit Model of Predicted Actual Enrollment	r = +0.743 r^2 = 0.552
Logit Model of Predicted Proportional Enrollment	r = +0.691 r^2 = 0.477
LS Regression Model of Predicted Enrollment	r = +0.688 r^2 = 0.473

n = 1330

TABLE 22

Product-Moment Correlations Between Actual Enrollment and Predicted Enrollments for Four-Year Public Institutions of Higher Education in Tennessee Fall 1980 - Fall 1990

	Actual Enrollment
Logit Model of Predicted Actual Enrollment	r = +0.976 r^2 = 0.953
Logit Model of Predicted Proportional Enrollment	r = +0.951 r^2 = 0.904
LS Regression Model of Predicted Actual Enrollment	r = +0.792 r^2 = 0.627

n = 855

student group at these micro-spatial levels is simply not fine enough at the county-wide level to allow for an entirely accurate model for measuring the migration habits of these students. Since the students at four-year campuses come from a much broader range of counties, the effect of the micro-spatial migrations for the local students on the overall prediction strength of either model is reduced. A comparative example of the specific enrollment predictions by county for two institutions is shown in Appendix H.

Discussion. Since the gravity model provided fairly accurate enrollment projections from the various counties throughout the state, the enrollment ratio was not skewed by any unforeseen factors influencing student migration habits. This allowed the Enrollment Ratio to remain consistent for county and institution pairing, regardless of the migration distance between the students and the campus. Therefore, it can be stated that Hypothesis 1 is false, and the Gravity Model developed for use in this study for analyzing student migration is an accurate predictor of the migration habits and patterns of college students in Tennessee. The strength of the model is especially evident for four-year campuses, while the model for two-year campuses does need further refinement.

Persistence, Graduation, and Migration Distance

Hypothesis 2 addressed the relationship between migration distance and the persistence and graduation tendencies of the college students represented in the study. The hypothesis

stated: "Students from counties and regions more distant from each institution showed a higher persistence and graduation proportion than local students." The rationale for this hypothesis is more intuitive than substantive, in that the desire to continue may be related to willingness to migrate.

Tables 23 and 24 display the results of the Pearson's Product Moment Correlations between the various persistence and graduation proportions and migration distances. All of the calculated correlation values are extremely low (-0.025 to +0.096), and only two of the five tests displayed the expected positive correlations. Additionally, the strength of the r^2 values showed that less than one percent of the variation in the independent variable was explained by the dependent variable. Therefore, Hypothesis 2 is not supported.

Discussion. Initial migration distance seemed to have little or no effect on persistence or graduation rates of students once they made the effort to reach the institution. As can be noted from the correlation coefficients, both minimal positive and negative associations exist between various persistence and graduation proportions and distance migrated. Other factors affecting student retention must take over after the student makes the initial migration effort to reach his/her chosen college or university.

Enrollment Ratios by Institution and Student Migration Type

Hypothesis 3 stated that a meaningful difference existed between the Enrollment Ratios of local and non-local students

TABLE 23

Product-Moment Correlations Between County Student Persistence Proportions and Distance to Institution for Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

	Distance to Institution
Two-Year Institution Persistence Proportion	$r = -0.086$ $r^2 = 0.007$
Four-Year Institution Persistence Proportion	$r = +0.096$ $r^2 = 0.009$
Overall Institution Persistence Proportion	$r = -0.020$ $r^2 = 0.000$

n=1956

TABLE 24

Product-Moment Correlations Between County Student Graduation Proportions and Distance to Institution for Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

	Distance to Institution
Two-Year Institution Graduation Proportion	$r = -0.025$ $r^2 = 0.001$
Four-Year Institution Graduation Proportion	$r = +0.071$ $r^2 = 0.005$

n=1956

at each institution type. The rationale for this hypothesis is that local students at two-year campuses are more apt to be over-represented, while at four-year institutions non-local students would more likely be over-represented. The hypothesis stated: "The enrollment ratio of local counties at two-year institutions was higher than that of local counties at four-year institutions, while the enrollment ratio of non-local counties was higher at four-year schools than two-year schools." Two-year schools are intended primarily to serve the local population, while the four-year campuses are intended to provide educational services within a broad region or throughout the entire state.

In Tables 25 and 26, the average enrollment ratios for each group are shown, and the results of a simple t-test between these average values are presented. Table 25 demonstrates that the Enrollment Ratio for local counties at two-year campuses was indeed higher than that for four-year institutions. However, the Enrollment Ratio for non-local counties at two-year campuses was considerably higher than that for four-year universities.

Discussion. The unexpected occurrence of high enrollment ratios for non-local students at two-year institutions may be attributed to the fact that predicted enrollment for two-year campuses from the more distant non-local counties is often a very small fractional value. Therefore, if more than a handful of students attend a two-year campus from one of these

TABLE 25

t-Test Between Mean Values for
County Enrollment Ratios of Local Counties
and Public Higher Education Institution Types in Tennessee
Fall Terms 1984-1990

Enrollment Ratio of
Actual Enrollment to Predicted Actual Enrollment

Institution Type	Mean	Standard Deviation	N	t
Two-Year	2.620	4.948	173	4.2437*
Four-Year	1.009	0.537	109	

* $p < .05$ Critical t Value = 1.96

Enrollment Ratio of
Actual Enrollment to Predicted Proportional Enrollment

Institution Type	Mean	Standard Deviation	N	t
Two-Year	2.408	4.944	173	4.2256*
Four-Year	0.806	0.522	109	

* $p < .05$ Critical t Value = 1.96

TABLE 26

t-Test Between Mean Values for
County Enrollment Ratios of Non-Local Counties
and Public Higher Education Institution Types in Tennessee
Fall Terms 1984-1990

Enrollment Ratio of
Actual Enrollment to Predicted Actual Enrollment

Institution Type	Mean	Standard Deviation	N	t
Two-Year	26.273	201.319	1157	4.264*
Four-Year	1.036	1.581	746	

* $p < .05$ Critical t Value = 1.96

Enrollment Ratio of
Actual Enrollment to Predicted Proportional Enrollment

Institution Type	Mean	Standard Deviation	N	t
Two-Year	26.040	197.051	1157	4.353*
Four-Year	0.823	1.588	746	

* $p < .05$ Critical t Value = 1.96

counties, the Enrollment Ratio for that county is very high. Basically, the Enrollment Ratios for the four-year campus model maintain a consistent level, while those for the two-year campus become skewed outside of the local migration distance of 50 miles. This makes the gravity model forecasts for the four-year campuses useful for counties from throughout the state. The predictions for non-local enrollment at two-year campuses are, however, suspect. These spurious predictions are due in part to the problem of small enrollment potentials for these institution and county combinations.

Average Migration Distances by Race

Tables 27 and 28 show the average migration distances for all students to each institution by racial group and the number of students represented in each grouping. Hypothesis 4 stated: "Black students migrated longer distances to public institutions than white students." The only racial groups described on the database were "Black" and "Other". Because black and Caucasian students made up over 98 percent of all students enrolled in colleges and universities in Tennessee, there is little inaccuracy in dividing the races into only two groups. Blacks made up the single largest minority group in Tennessee. Tables 27 and 28 provide a basic understanding of the migratory patterns of students to each institution.

The average overall migration distance for black students was almost seven miles farther than that for all other students and over 14 miles farther for students at four-year

TABLE 27

Migration Distances of In-State Undergraduate Students to Tennessee Public Higher Education Institutions by Race
Fall Terms 1984-1990

Group	BLACK	OTHER[a]	Difference	
All Schools/Counties	47.03	40.21	6.82	*
Four-Year	64.79	50.32	14.47	*
Austin Peay State	67.78	35.93	31.85	*
East Tennessee State	69.53	32.43	37.10	*
Memphis State	**34.20**	34.21	**-0.01**	
Middle Tennessee State	62.72	44.04	18.68	*
Tennessee State	60.94	**27.07**	33.87	*
Tennessee Tech	96.29	61.98	34.31	*
UT Chattanooga	85.08	25.84	59.24	*
UT Knoxville	**166.16**	77.34	**88.82**	*
UT Martin	81.64	56.29	25.35	*
UT Memphis	39.19	**110.54**	-71.35	$
Two-Year	21.06	20.67	0.39	*
Chattanooga State	19.00	18.96	**0.04**	
Cleveland State	27.75	20.68	7.07	*
Columbia State	21.52	**25.32**	-3.80	$
Dyersburg State	25.22	22.20	3.02	*
Jackson State	22.69	25.34	-2.65	$
Motlow State	26.19	17.03	9.16	*
Northeast State	14.97	**14.44**	0.53	
Pellissippi State	**14.89**	14.58	0.31	
Roane State	**31.95**	20.44	**11.51**	*
Shelby State	22.84	25.18	-2.34	$
State Tech-Memphis	19.28	20.60	-1.32	$
State Tech-Nashville	17.64	23.87	-6.23	$
Volunteer State	20.75	20.09	0.66	
Walters State	27.63	22.20	5.43	*

t-Test Significance Level: $p < .05$

[a]Other - All Racial Groups other than Black/African American

* Black Migration Distance Statistically Greater than 'Other'
$ Black Migration Distance Statistically Less than 'Other'

Highlighted Values indicate Maximum and Minimum Migration Distances for each category.

TABLE 28

Total In-State Undergraduate Students at
Tennessee Public Higher Education Institutions
by Race
Fall Terms 1984-1990

Group	TOTAL	BLACK	OTHER[a]
All Schools/Counties	777,390	106,189/14%	671,201/86%
Four-Year	505,310	63,050/12%	442,260/88%
Austin Peay State	18,808	2,762/15%	16,046/85%
East Tennessee State	51,153	1,111/ 2%	50,042/98%
Memphis State	104,092	20,206/19%	83,886/81%
Middle Tennessee State	74,604	6,233/ 8%	68,371/92%
Tennessee State	24,356	18,190/75%	6,166/25%
Tennessee Tech	43,982	967/ 2%	42,961/98%
UT Chattanooga	38,155	4,021/11%	34,134/89%
UT Knoxville	120,471	5,013/ 4%	115,458/96%
UT Martin	27,411	4,328/16%	23,083/84%
UT Memphis	2,332	219/ 9%	2,113/91%
Two-Year	272,080	43,139/16%	228,941/84%
Chattanooga State	32,721	3,816/12%	28,905/88%
Cleveland State	19,379	733/ 4%	18,646/96%
Columbia State	13,605	1,036/ 8%	12,569/92%
Dyersburg State	8,893	951/11%	7,942/89%
Jackson State	17,390	2,448/14%	14,942/86%
Motlow State	12,456	767/ 6%	11,689/94%
Northeast State	12,294	137/ 1%	12,157/99%
Pellissippi State	15,705	768/ 5%	14,937/95%
Roane State	13,242	353/ 3%	12,889/97%
Shelby State	19,934	14,102/71%	5,832/29%
State Tech-Memphis	39,757	12,428/31%	27,329/69%
State Tech-Nashville	29,180	4,174/14%	25,006/86%
Volunteer State	19,532	822/ 4%	18,710/96%
Walters State	17,992	604/ 3%	17,388/97%

[a]OTHER - All Racial Groups other than Black/African American

campuses, with much smaller differences at all but one two-year campus. While migration distances for black students to each of the four-year institutions were higher at most institutions, the migration of these students to the Memphis campuses was either equal or less.

While migration distances for black students to four-year institutions were much higher than those for other students, two-year campuses demonstrated a much closer migration distance differential. Less than one-half mile difference between migration distances by racial group was evident for two-year campuses. Several of the individual two-year institutions located in counties with large black populations had higher migration distances for the non-black student populations during the study period. The small, but significant, overall difference for two-year campuses did show that black students did migrate slightly farther than non-black students. The results of this analysis supports the premise of the statement made in Hypothesis 4 that black students travel longer distances to attend public colleges in Tennessee, especially the four-year institutions.

Discussion. The lack of a significant difference in average migration distances to the four-year campuses in the Memphis area may be attributed to the fact that Shelby County has the largest concentration of black population in the state, and many of these students remained close to home to attend either Memphis State or UT-Memphis. The same issues

could also have affected the migration distances observed at several of the two-year campuses. Two-year campuses tended to attract over 90 percent of their students from the local area, a fact which remained consistent regardless of student race.

Another factor influencing the longer migration distances for black students was the availability of special financial aid for these students and the recruiting efforts by colleges and universities to secure qualified minority students. The higher education institutions in the State of Tennessee were under a court order throughout the study period to initiate and continue desegregation efforts and to increase the enrollment of black students (Gruetzemacher, 1991). This led many of these institutions to initiate substantial efforts to recruit and continue to enroll minority students from areas throughout the state, especially from those areas with a large black population.

Average Migration Distances by Gender

Tables 29 and 30 show the average migration distances for all students to each institution by gender and the number of students represented in each group. Hypothesis 5 stated: "Female students migrated shorter distances to public institutions than male students." The average overall migration distance for female students was 5.90 miles less than that for male students and over seven miles less for male students at four-year campuses. At only two two-year campuses -- Dyersburg State and Volunteer State -- did female students

TABLE 29

Migration Distances of In-State Undergraduate Students to Tennessee Public Higher Education Institutions by Gender
Fall Terms 1984-1990

Group	Female	Male	Difference	
All Schools/Counties	38.51	44.41	-5.90	$
Four-Year	48.80	55.85	-7.05	$
Austin Peay State	40.36	40.97	**-0.61**	
East Tennessee State	32.97	33.60	-0.63	
Memphis State	**32.43**	36.28	-3.85	$
Middle Tennessee State	44.71	46.62	-1.91	$
Tennessee State	51.39	53.84	-2.45	$
Tennessee Tech	53.17	70.32	-17.15	$
UT Chattanooga	33.97	**29.84**	4.13	*
UT Knoxville	75.21	86.60	-11.39	$
UT Martin	59.74	60.94	-1.20	
UT Memphis	**101.16**	**121.36**	**-20.20**	$
Two-Year	20.14	21.48	-1.34	$
Chattanooga State	18.67	19.37	-0.70	$
Cleveland State	20.28	21.95	-1.67	$
Columbia State	24.55	25.91	-0.36	$
Dyersburg State	22.55	22.49	**0.06**	
Jackson State	**24.73**	25.36	-0.63	
Motlow State	16.56	19.36	-2.80	$
Northeast State	**13.65**	**14.97**	-1.32	$
Pellissippi State	13.66	15.43	-1.77	$
Roane State	19.40	22.77	-3.37	$
Shelby State	23.23	24.24	-1.01	$
State Tech-Memphis	19.78	20.52	-0.74	$
State Tech-Nashville	18.89	**26.62**	**-7.73**	$
Volunteer State	20.17	20.04	0.13	
Walters State	21.89	23.16	-1.27	$

t-Test Significance Level: $p < .05$

* Female Migration Distance Statistically Greater than Male
$ Female Migration Distance Statistically Less than Male

Highlighted Values indicate Maximum and Minimum Migration Distances for each category.

TABLE 30

Total In-State Undergraduate Students at
Tennessee Public Higher Education Institutions
by Gender
Fall Terms 1984-1990

Group	TOTAL	FEMALE	MALE
All Schools/Counties	777,390	419,201/54%	357,459/46%
Four-Year	505,310	266,827/53%	238,483/47%
Austin Peay State	18,808	11,328/60%	7,480/40%
East Tennessee State	51,153	29,376/57%	21,777/43%
Memphis State	104,092	55,921/54%	48,171/46%
Middle Tennessee State	74,604	39,665/53%	34,939/47%
Tennessee State	24,356	14,646/60%	9,710/40%
Tennessee Tech	43,982	19,413/44%	24,515/56%
UT Chattanooga	38,155	20,735/54%	17,420/46%
UT Knoxville	120,471	58,836/49%	61,635/51%
UT Martin	27,411	14,884/54%	12,527/46%
UT Memphis	2,332	2,023/87%	309/13%
Two-Year	272,080	153,104/56%	118,976/44%
Chattanooga State	32,721	19,157/59%	13,524/41%
Cleveland State	19,379	11,557/60%	7,822/40%
Columbia State	13,605	8,827/65%	4,778/35%
Dyersburg State	8,893	5,339/60%	3,554/40%
Jackson State	17,390	10,882/63%	6,508/37%
Motlow State	12,456	7,861/63%	4,595/37%
Northeast State	12,294	4,937/40%	7,357/60%
Pellissippi State	15,705	7,460/48%	8,345/52%
Roane State	13,242	7,954/60%	5,288/40%
Shelby State	19,934	14,168/71%	5,766/29%
State Tech-Memphis	39,757	17,906/45%	21,851/55%
State Tech-Nashville	29,180	13,738/47%	15,442/53%
Volunteer State	19,532	12,322/63%	7,210/37%
Walters State	17,992	10,956/61%	7,036/39%

travel farther than their male counterparts, and these differences were by only fractional values. The results of these analyses would support the premise of the statement made in Hypothesis 5 that female students do travel shorter distances to attend public colleges in Tennessee.

Discussion. The shorter migration distances for female students may be partially explained by the fact that the same campuses have higher male enrollment proportions, higher overall migration distances, and the greatest gender migration differences. Since the students attending these campuses are migrating the farthest average distances, and a large number of them are male, the affect on the overall state averages by gender could be altered. Tennessee Tech, UT-Knoxville, and State Tech-Nashville display some of the highest migration distances overall, the highest distances for males, and the greatest differences in migration distance by gender. As stated earlier, these campuses had some of the highest male enrollment proportions of any campuses within the state system of public higher education. This combination of high male enrollment and high overall migration distances and gender differences could lead to the notable skewing of the overall average migration distances by gender (Tables 29 and 30).

Average Migration Distances by Age Grouping

Tables 31 and 32 show the average migration distances for all students to each institution by age grouping and the number of students represented in each group. Hypothesis 6

TABLE 31

Migration Distances of In-State Undergraduate Students to Tennessee Public Higher Education Institutions by Traditional Student/Age Groups
Fall Terms 1984-1990

Group	NONTRAD[a]	TRAD[b]	Difference	
All Schools/Counties	24.05	47.87	-23.02	$
Four-Year	28.35	57.94	-29.59	$
Austin Peay State	28.42	43.91	-15.49	$
East Tennessee State	21.91	36.28	-14.37	$
Memphis State	26.47	37.16	-10.69	$
Middle Tennessee State	34.33	48.02	-13.69	$
Tennessee State	24.92	62.73	-37.81	$
Tennessee Tech	35.79	66.03	-30.24	$
UT Chattanooga	20.69	**35.83**	-15.14	$
UT Knoxville	33.14	89.48	-56.34	$
UT Martin	27.72	64.49	-36.77	$
UT Memphis	**67.16**	**114.39**	**-47.23**	$
Two-Year	20.51	20.90	-0.39	$
Chattanooga State	18.93	18.98	-0.05	
Cleveland State	20.42	21.38	-0.96	$
Columbia State	23.72	25.94	-1.67	$
Dyersburg State	21.48	23.47	-1.99	$
Jackson State	**24.73**	25.36	-0.63	
Motlow State	16.58	18.38	-1.80	$
Northeast State	**14.31**	**14.52**	-0.21	
Pellissippi State	14.52	14.63	-0.11	
Roane State	19.40	22.77	-3.37	$
Shelby State	19.31	21.44	-2.31	$
State Tech-Memphis	20.12	20.25	-0.13	
State Tech-Nashville	22.89	**23.10**	**-0.21**	
Volunteer State	19.28	20.71	-1.43	$
Walters State	23.53	21.62	1.91	*

t-Test Significance Level: $p < .05$

* Non-Trad Migration Distance Statistically Greater than Trad
$ Non-Trad Migration Distance Statistically Less than Trad
[a]NONTRAD - Non-Traditional Student (Began UG Program > age 25)
[b]TRAD - Traditional Student (Began UG Program < age 26)

Highlighted Values indicate Maximum and Minimum Migration Distances for each category.

TABLE 32

Total In-State Undergraduate Students at
Tennessee Public Higher Education Institutions
by Traditional Student/Age Groups
Fall Terms 1984-1990

Group	TOTAL	NONTRAD[a]	TRAD[b]
All Schools/Counties	777,390	219,712/28%	557,678/72%
Four-Year	505,310	99,305/20%	406,005/80%
Austin Peay State	18,808	4,016/21%	14,792/79%
East Tennessee State	51,153	10,810/21%	40,343/79%
Memphis State	104,092	28,740/28%	75,352/72%
Middle Tennessee State	74,604	13,155/18%	61,449/82%
Tennessee State	24,356	6,674/27%	17,682/73%
Tennessee Tech	43,982	4,778/11%	39,150/89%
UT Chattanooga	38,155	9,437/25%	28,718/75%
UT Knoxville	120,471	18,042/15%	102,429/85%
UT Martin	27,411	3,132/11%	24,279/89%
UT Memphis	2,332	521/22%	1,811/78%
Two-Year	272,080	120,407/44%	151,673/56%
Chattanooga State	32,721	13,965/43%	18,756/57%
Cleveland State	19,379	8,595/44%	10,784/56%
Columbia State	13,605	5,606/41%	7,999/59%
Dyersburg State	8,893	4,230/48%	4,663/52%
Jackson State	17,390	7,227/42%	10,163/58%
Motlow State	12,456	5,418/43%	7,038/57%
Northeast State	12,294	4,651/38%	7,643/62%
Pellissippi State	15,705	6,127/39%	9,578/61%
Roane State	13,242	4,314/33%	8,928/67%
Shelby State	19,934	8,554/43%	11,380/57%
State Tech-Memphis	39,757	20,071/51%	19,686/49%
State Tech-Nashville	29,180	16,365/56%	12,815/44%
Volunteer State	19,532	8,104/42%	11,428/58%
Walters State	17,992	7,180/40%	10,812/60%

[a]NONTRAD - Non-Traditional Student (Began UG Program > age 25)
[b]TRAD - Traditional Student (Began UG Program < age 26)

stated: "Non-Traditional age students migrated shorter distances to public institutions than traditional age students." The average overall migration distance for non-traditional aged students was 23.02 miles less than that for traditional aged counterparts and 29.59 miles less than that for traditional aged students at four-year campuses. At two-year campuses non-traditional aged students migrated a small, but significant, distance less than their traditional aged counterparts, and at only one campus (Walters State) did non-traditional age students migrate farther than other students. The results of these analyses support Hypothesis 6 that non-traditional students do travel shorter distances to attend public colleges in Tennessee than traditional aged students.

Discussion. The basis for the wide discrepancy between the migration distances of traditional and non-traditional aged students may be that older students were more likely to be attending college on a part-time basis while working at a permanent job. Additionally, these students were more likely to have family obligations that would keep them from migrating a significant distance to attend college. The lack of larger differences between the migration distances for traditional and non-traditional students at two-year campuses is based, in part, on the fact that few students in either group migrate farther than 50 miles to reach their respective campuses. The impact of the large professional, technical, and engineering programs at Tennessee Tech, UT-Memphis, and UT-Knoxville were

noticeable in the very large differences between distances travelled by the two age groups at these campuses.

Enrollment Ratios, Persistence, and Graduation Proportions

Hypothesis 7 dealt with the relationship between the Enrollment Ratios of the various counties and the persistence and graduation tendencies exhibited by students from those counties. If a county is over-represented in enrollment, it may be argued that students from that county or region will also display higher persistence and/or graduation proportions. The hypothesis stated: "Counties and regions with an over-representation in enrollment were over-represented in persistence and graduation proportions."

In Tables 33 and 34, the results of the Pearson's Product Moment Correlations between the enrollment ratios and the persistence proportions are shown, and in Tables 35 and 36 the results of the Pearson's Product Moment Correlations between the enrollment ratios and the graduation proportions are shown. All of the calculated correlation values are low, with some displaying negative relationships rather than the expected positive correlations. This is especially true for the two-year campuses. For two-year campuses the hypothesis is not supported, while for four-year campuses only a weak relationship existed between over-representation in enrollment and increased persistence and graduation of students from each county. The explanatory level (r^2) of the relationships varied from zero to 6.4 percent, advocating and verifying the

TABLE 33

Product-Moment Correlations Between County Enrollment Ratios and Student Persistence Proportions for Two-Year Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

Enrollment Ratio	Overall Persistence Proportion	Two-Year Persistence Proportion	Four-Year Persistence Proportion
Actual Enrollment to Predicted Actual Enrollment	$r = +0.004$ $r^2 = 0.000$	$r = -0.027$ $r^2 = 0.001$	$r = +0.013$ $r^2 = 0.000$
Actual Enrollment to Predicted Proportional Enrollment	$r = +0.032$ $r^2 = 0.001$	$r = +0.021$ $r^2 = 0.000$	$r = +0.036$ $r^2 = 0.001$

n=1113

TABLE 34

Product-Moment Correlations Between County Enrollment Ratios and Student Persistence Proportions for Four-Year Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

Enrollment Ratio	Overall Persistence Proportion	Two-Year Persistence Proportion	Four-Year Persistence Proportion
Actual Enrollment to Predicted Actual Enrollment	$r = +0.253$ $r^2 = 0.064$	$r = +0.029$ $r^2 = 0.001$	$r = +0.253$ $r^2 = 0.064$
Actual Enrollment to Predicted Proportional Enrollment	$r = +0.224$ $r^2 = 0.050$	$r = -0.062$ $r^2 = 0.004$	$r = +0.224$ $r^2 = 0.050$

n=843

TABLE 35

Product-Moment Correlations Between County Enrollment Ratios and Student Graduation Proportions for Two-Year Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

Enrollment Ratio	Two-Year Graduation Proportion	Four-Year Graduation Proportion
Actual Enrollment to Predicted Actual Enrollment	$r = +0.028$ $r^2 = 0.001$	$r = +0.033$ $r^2 = 0.001$
Actual Enrollment to Predicted Proportional Enrollment	$r = +0.034$ $r^2 = 0.001$	$r = +0.065$ $r^2 = 0.004$

n=1113

TABLE 36

Product-Moment Correlations Between County Enrollment Ratios and Student Graduation Proportions for Four-Year Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

Enrollment Ratio	Two-Year Graduation Proportion	Four-Year Graduation Proportion
Actual Enrollment to Predicted Actual Enrollment	$r = -0.061$ $r^2 = 0.004$	$r = +0.239$ $r^2 = 0.057$
Actual Enrollment to Predicted Proportional Enrollment	$r = -0.095$ $r^2 = 0.009$	$r = +0.199$ $r^2 = 0.040$

n=843

lack of support for Hypothesis 7.

Discussion. The lack of any significant or meaningful relationship between enrollment ratio and either persistence or graduation proportions at two-year campuses may be attributable to the overall low rates of persistence and graduation demonstrated at these campuses. Additionally, since the large majority of the enrollment at each of these institutions came from local counties, the relationships between enrollment ratios and these proportions for non-local students is highly suspect due to the "small n problem." The weak relationships displayed between enrollment ratio and the persistence and graduation proportions at four-year campuses may demonstrate that once the initial effort to reach an institution is made, factors other than the distance the students had to migrate to reach the campus played a greater role in their continuing attendance or graduation.

Enrollment Ratios, County Income, and Urban Populations

Hypothesis 8 addressed relationships between the Enrollment Ratios of the various counties and the median income of the county and the proportion of the county population determined to be residing in urban areas. It has been observed and documented that there are normally positive relationships between urbanity and family income with the likelihood that a student will attend college (Garcia, 1983 and Viehland, 1989). If these income and urbanity factors positively affect the initial enrollment tendencies of

students, they may also alter the effect of distance used to calculate the enrollment predictions made in this study. Hypothesis 8 stated that "Urban and high-income counties in Tennessee were over-represented in college enrollment."

Tables 37 and 38 present the results of the Pearson's Product Moment Correlations between the enrollment ratios and the proportion of the county population defined as urban. Tables 39 and 40 show the results of the Pearson's Product Moment Correlations between the enrollment ratios and median county income. Weak relationships existed between the Enrollment Ratio and either county income or urbanity levels at two-year institutions. Corresponding weak relationships were also present between the Enrollment Ratios and both income and urbanity levels at four-year campuses. While these positive relationships were not exceptionally strong, the size of the population studied and the explanatory levels of the correlations for four-year campuses (1.5 - 7.0 for urban population proportion, 4.3 - 7.6 percent for median county income) support to a limited degree the assertions made in Hypotheses 8 for these institutions.

Discussion. The lack of any exceptionally strong relationships between urbanity or income level of the county and the enrollment ratio demonstrate the overall strength of the gravity model in predicting the enrollment potential throughout the state. As was demonstrated in Hypothesis 1, the effects of factors other than distance did not seem to

TABLE 37

Product-Moment Correlations Between County Enrollment Ratios and Percentage of County Urban Population for Two-Year Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

Enrollment Ratio	Percentage of Urban Population
Actual Enrollment to Predicted Actual Enrollment	r = +0.122 r^2 = 0.015
Actual Enrollment to Predicted Proportional Enrollment	r = +0.127 r^2 = 0.016

n=1330

TABLE 38

Product-Moment Correlations Between County Enrollment Ratios and Percentage of County Urban Population for Four-Year Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

Enrollment Ratio	Percentage of Urban Population
Actual Enrollment to Predicted Actual Enrollment	r = +0.167 r^2 = 0.028
Actual Enrollment to Predicted Proportional Enrollment	r = +0.264 r^2 = 0.070

n=855

TABLE 39

Product-Moment Correlations Between County Enrollment Ratios and County Median Income for Two-Year Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

Enrollment Ratio	Median Family Income
Actual Enrollment to Predicted Actual Enrollment	r = +0.059 r^2 = 0.003
Actual Enrollment to Predicted Proportional Enrollment	r = +0.076 r^2 = 0.006

n=1330

TABLE 40

Product-Moment Correlations Between County Enrollment Ratios and County Median Income for Four-Year Public Higher Education Institutions in Tennessee Fall 1980 - Fall 1990

Enrollment Ratio	Median Family Income
Actual Enrollment to Predicted Actual Enrollment	r = +0.207 r^2 = 0.043
Actual Enrollment to Predicted Proportional Enrollment	r = +0.271 r^2 = 0.073

n=855

have a strong influence on the potential of students to migrate from any county to any institution. While only moderate relationships existed between the enrollment ratio and both urbanity and county income, the overall strength of these correlations could only be considered weak to moderate, and of minor consequence in the overall migration potential of any county/school combinations.

C. SUMMARY OF HYPOTHESES TESTING

Supported Hypotheses

Hypotheses 3, 4, 5, and 6 shown below, were supported:

H3. The enrollment ratio of local counties at two-year institutions was higher than that of local counties at four-year institutions, while the enrollment ratio of non-local counties was higher at four-year schools than two-year schools.

H4. Black students migrated longer distances to public institutions than white students.

H5. Female students migrated shorter distances to public institutions than male students.

H6. Non-traditional age students migrated shorter distances than traditional students.

Non-Supported Hypotheses

Hypotheses 1 and 2, shown below, were not supported:

H1. The county enrollment ratio would decrease as the distance from each institution increased.

H2. Students from counties and regions more distant

from an institution would show a higher persistence and graduation proportion than local students.

Partially Supported Hypotheses

Hypotheses 7 and 8 were not supported when dealing with two-year institutions, but moderate relationships were found in examining the correlations for four-year campuses.

H7. Counties and regions with an over-representation in enrollment were over-represented in persistence and graduation proportions.

H8. Urban and high-income counties in Tennessee were slightly over-represented in college enrollment at four-year campuses, but not at two-year campuses.

Summary

Overall, the results of the study show that the gravity model developed to predict student migration potential provides accurate projections of enrollment on a statewide basis. The ability of the model to provide useful predictions for analyzing the migration habits of public college students in Tennessee was especially evident in studying enrollment patterns at four-year institutions. It was observed that various student groups did display substantial differences in their migration habits. While these variations in migration behavior were predicted, the verification of these hypotheses provide useful information in analyzing student attendance characteristics at public institutions of higher education in the State of Tennessee. The results of the study also provide

a strong foundation for further analysis into the migration characteristics of certain demographic groups or individual students, as well as information useful to admissions and retention officers dealing with diverse student populations.

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. INTRODUCTION

The overriding objectives of this study were to develop an analytical model for examining student migration to public institutions of higher education in the State of Tennessee, and to identify those areas of the state which were being over- or under-served by the existing public system of higher education during the study period. This research brought to the forefront valuable information regarding the attendance and migration habits of in-state students attending the public higher education institutions in Tennessee. Policy and decision makers in the public higher education community of Tennessee may find this information useful in determining future student recruiting and retention strategies.

Special large databases were compiled for the study using existing data files available from the Tennessee Higher Education Commission (THEC). The initial data files consisted of over six million attendance and graduation records from the THEC Student Information and Academic Inventory Systems for the period beginning with the Fall Term of 1980 (August) through the Fall Term of 1990 (December). These records provided information on the campus, year, and term of the student's attendance; the student's race, gender, and age; the home county of the student; and information regarding any

degree a student might have received during the study period. The individual records were then compiled into analytical records by county and school, and into composite records by student. These completed data files and records allowed for further analysis of the migration, persistence, and graduation trends of the aggregate student populations.

B. SUMMARY OF THE FINDINGS

Descriptive Research Questions

The rural counties in Tennessee tended to be under-represented in student enrollment at the public institutions of higher education in the state. The suburban counties tended to display an over-representation during the same study period, while the urban counties displayed differing levels of representation throughout the state. In terms of persistence and graduation, very different spatial differences were apparent. The East Tennessee region, and most notably the urban areas in this region (Tri-Cities, Chattanooga, and Knoxville), tended to show the highest persistence and graduation proportions within the statewide higher education system.

The enrollment of local students, or those students migrating less than 50 miles to a campus, demonstrated several interesting changes through the study period. Early in the study period (1980-1986), the pattern of enrollment for these students was changing to one of a lower proportion of local students attending two-year campuses, and an increasing

proportion attending four-year campuses. Beginning in 1987 this trend reversed itself. The actual enrollment and proportion of enrollment composed of local students attending two-year institutions rose to consistently through the last four years of the study period. The enrollment proportions of non-local students at four-year campuses often showed direct relationships to the changes in the enrollment of local students at two-year campuses, rising throughout the period.

An analysis of the transfer movements of students among institutions in the state system of public higher education provided results that were fairly predictable. The major feeder two-year campuses for transfers to the four-year campuses were the closest two-year schools to each university. Each two-year campus most often sent the largest number of its transfers to the closest four-year university. However, in several instances, The University of Tennessee, Knoxville functioned as the second leading receiver of transfers for two-year institutions which were much closer to other four-year universities.

Hypothesis Testing

The relationships and differences between various aspects of student migration, persistence, and graduation proportions were analyzed using either correlations or t-tests. The data used in this study represented the entire population, thereby making the use of any inferential techniques unnecessary. However, the results of these tests allowed for a greater

understanding of the strength of relationships among the various items and population groups analyzed in the study. The following significant relationships or differences were found during the study:

1. Local students were more likely to be over-represented at two-year campuses than at four-your campuses.
2. Non-local students were more likely to be over-represented at two-year campuses than at four-year campuses. However, this was most likely due to the very small expected enrollments of non-local students at two-year institutions combined with the enrollment of a small, but significant, number of students from a few distant counties at each two-year institution.
3. Undergraduate in-state black students migrated farther to public institutions of higher education in Tennessee than did other students, especially to the four-year campuses.
4. Undergraduate in-state male students migrated farther to public institutions of higher education in Tennessee than did female students, especially to the four-year campuses.
5. Traditional age (i.e., those less than age 25), undergraduate in-state students migrated farther to public institutions of higher education in

Tennessee than did older students. This was especially so for the four-year campuses.

6. A positive relationship existed between the Enrollment Ratio and the persistence proportion for the home county at the four-year institutions.
7. A positive relationship existed between the Enrollment Ratio and the graduation proportion for the home county at the four-year institutions.

The following items were found to have weaker relationships during the study period. The overall lack of strength of these relationships led to either a partial support or the failure of the associated research hypotheses:

1. A weak positive relationship existed between the percentage of urban population in each county and the enrollment ratio for students from that county at the four-year campuses.
2. A weak positive relationship existed between the county median income and the enrollment ratio for that county at the four-year campuses.
3. A weak positive relationship exited between the Enrollment Ratio and the distance between the students' home county and the attended campus.

Finally, the following variable were found to have no meaningful relationships:

1. No relationship existed between the persistence proportions and the distances between the home

counties and the campuses.

2. No relationship existed between the graduation proportion and the distance between the home county and the campus for two-year institutions.
3. No relationship existed between the Enrollment Ratio and the persistence proportion for the home county at the two-year institutions.
4. No relationship existed between the Enrollment Ratio and the graduation proportion for the home county at the two-year institutions.

C. CONCLUSIONS

The results of the analysis and tests performed during this study lead to the following conclusions:

1. The lack of strong relationships between the Enrollment Ratios and those factors other than distance, county population, or campus size validates the use of the Logit formulation of the Gravity Model in analyzing and predicting student enrollment by county and institution in Tennessee.
2. The lack of precise migration distances for local students inhibited the construction of the gravity model for enrollment prediction at two-year campuses. This lack of finely detailed migration distance estimates also caused problems in analyzing data for local students at four-year campuses with larger local enrollment proportions.

3. With the proportion of local students attending two-year campuses (those migrating less than 50 miles to attend a public college in Tennessee), increasing throughout the latter half of the study period, it is assumed to that these institutions were continuing to increase their role in providing convenient higher education opportunities to the populations of the local areas which they were intended to serve.

4. Campus administrators can make no assumptions regarding the relationship between the proportion of local or non-local students represented in the student body of their institution and the potential of these students to persist or graduate.

5. The gravity model developed and used in the study is more applicable for use in analyzing student migration habits and patterns at four-year public colleges and universities, than two-year colleges.

D. RECOMMENDATIONS

Based on the findings and conclusions of the study, the following recommendations are made:

1. Further refinements and applications of the gravity model used for analysis in this study should be completed in order to produce a predictive version of the model for use in enrollment modeling and prediction studies. The refinements could include

the addition of factors such as county income, urban proportion of the county population, the racial mix of the county, the size of the college age student cohort from each county rather than the overall county population, and the use of a weighted distance factor to allow for traveling difficulty due to road conditions or other factors.

2. The gravity model used in this study should also be used in performing analytical studies of student migration habits in other states, or between states. This would provide further validation of the model and the findings of this study, and aid in the development of a predictive version of the model as mentioned above.

3. College and university admissions and recruiting officers should use the knowledge of under- and over-representation in student enrollment by county at their respective institutions in planning for future recruiting efforts. Those counties demonstrating an under-representation should be targeted for additional recruiting efforts. Recruiting strategies for those counties exhibiting an over-representation could or should either remain stable or be decreased.

4. Further analysis into the differences in migration habits for various student groups should center on

combining the effects of race, gender, and age, as well as on such factors as family income and college attendance history of parents and siblings.

5. The construction of a gravity model using more finely detailed spatial measurements for two-year campus students, especially those from within 50 miles of the campus, should be undertaken. As these individuals make up the vast majority of the student population at these institutions, having a more finely detailed estimate of their migration distances would allow for a more accurate analysis and prediction model to be constructed. One example of a more finely grained set of migration zones for local students at each campus would be to use the high school districts in the surrounding counties. This would allow administrators to better comprehend the over- and under-representation of student enrollment from the nearby high schools and neighborhoods.

6. The gravity model developed in this study should be used in analyzing student migration to public four-year colleges and universities. The use of the model in studying migration to two-year campuses should be undertaken if a finely grained set of migration distance estimates is available.

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APPENDICES

APPENDIX A1

Tennessee Public Institutions of Higher Education
Included in Study with Enrollments

Institution/Location (as needed)	1990 Enrollment
All Schools	166,448
Four-Year Schools	107,188
Two-Year Schools	59,260
Tennessee Board of Regents Schools	127,026
University of Tennessee System	39,422
Four-Year Schools	
Austin Peay State University / Clarksville	6,292
East Tennessee State University / Johnson City	11,185
Memphis State University	20,728
Middle Tennessee State University / Murfreesboro	14,136
Tennessee State University / Nashville	7,362
Tennessee Technological University / Cookeville	8,063
The University of Tennessee at Chattanooga	7,564
The University of Tennessee at Knoxville	25,016
The University of Tennessee at Martin	5,095
The University of Tennessee at Memphis	1,747
Two-Year Schools	
Chattanooga State Technical Community College	7,412
Cleveland State Community College	3,098
Columbia State Community College	3,053
Dyersburg State Community College	1,870
Jackson State Community College	3,010
Motlow State Community College / Tullahoma	2,544
Northeast State Technical Community College / Blountville	2,647
Pellissippi State Technical Community College / Knoxville	4,702
Roane State Community College / Harriman	4,320
Shelby State Community College / Memphis	4,216
State Technical Institute at Memphis	8,852
State Technical Institute at Nashville	5,646
Volunteer State Community College / Gallatin	3,670
Walters State Community College / Morristown	4,220

1990 Enrollment - HEP 1991 Higher Education Directory.

See Figure 2 (Appendix I) for Map of Campus Locations.

APPENDIX B1

Counties of Tennessee with 1990 Population

County	Population	County	Population
Anderson	68,072	Jefferson	32,954
Bedford	30,101	Johnson	13,736
Benton	14,379	Knox	328,643
Bledsoe	9,653	Lake	6,692
Blount	85,706	Lauderdale	23,341
Bradley	73,157	Lawrence	35,026
Campbell	35,014	Lewis	9,219
Cannon	10,444	Lincoln	28,060
Carroll	27,442	Loudon	31,189
Carter	51,240	McMinn	42,292
Cheatham	26,784	McNairy	22,378
Chester	12,807	Macon	15,745
Claiborne	26,054	Madison	77,031
Clay	12,807	Marion	24,429
Cocke	29,005	Marshall	21,456
Coffee	40,249	Maury	54,222
Crockett	13,300	Meigs	7,941
Cumberland	34,416	Monroe	30,470
Davidson	504,988	Montgomery	91,906
Decatur	10,438	Moore	4,705
DeKalb	14,312	Morgan	17,229
Dickson	34,876	Obion	31,597
Dyer	34,513	Overton	17,598
Fayette	25,431	Perry	6,576
Fentress	14,620	**Pickett**	**4,508**
Franklin	34,576	Polk	13,549
Gibson	46,154	Putnam	51,233
Giles	25,733	Rhea	23,933
Grainger	17,074	Roane	47,058
Greene	55,640	Robertson	41,201
Grundy	13,222	Rutherford	117,652
Hamblen	50,229	Scott	18,305
Hamilton	281,989	Sequatchie	8,826
Hancock	6,727	Sevier	50,898
Hardeman	23,240	**Shelby**	**815,161**
Hardin	22,457	Smith	14,094
Hawkins	44,431	Stewart	9,362
Haywood	18,888	Sullivan	142,686
Henderson	21,770	Sumner	101,587
Henry	27,796	Tipton	37,281
Hickman	16,698	Trousdale	5,895
Houston	6,988	Unicoi	16,507
Humphreys	15,503	Union	13,657
Jackson	9,186	Van Buren	4,837

APPENDIX B1 (cont)

Counties of Tennessee with 1990 Population

County	Population
Warren	32,818
Washington	91,277
Wayne	13,863
Weakley	31,754
White	20,001
Williamson	79,840
Wilson	67,086
Total	4,827,464

Population from the 1990 United States Census of Population.

See Figure 3 (Appendix I) for Map of Tennessee Counties.

APPENDIX B2

Grand Divisions of Tennessee as Used in Study by County

East (34)	Middle (39)	West (22)
Anderson	Bedford	Benton
Bledsoe	Cannon	Carroll
Blount	Cheatham	Chester
Bradley	Clay	Crockett
Campbell	Coffee	Decatur
Carter	Davidson	Dyer
Claiborne	DeKalb	Fayette
Cocke	Dickson	Gibson
Cumberland	Fentress	Hardeman
Grainger	Franklin	Hardin
Greene	Giles	Haywood
Hamblen	Grundy	Henderson
Hamilton	Hickman	Henry
Hancock	Houston	Lake
Hawkins	Humphreys	Lauderdale
Jefferson	Jackson	McNairy
Johnson	Lawrence	Madison
Knox	Lewis	Obion
Loudon	Lincoln	Perry
McMinn	Macon	Shelby
Marion	Marshall	Tipton
Meigs	Maury	Weakley
Monroe	Montgomery	
Morgan	Moore	
Polk	Overton	
Rhea	Pickett	
Roane	Putnam	
Scott	Robertson	
Sequatchie	Rutherford	
Sevier	Smith	
Sullivan	Stewart	
Unicoi	Sumner	
Union	Trousdale	
Washington	Van Buren	
	Warren	
	Wayne	
	White	
	Williamson	
	Wilson	

Divisions defined by the United States Bureau of the Census.

See Figure 4 (Appendix I) for Map of Grand Divisions.

APPENDIX B3

Tennessee Educational Developmental Districts by County

District 1 (5)	District 6 (6)	District 10 (7)
Carter	Bledsoe	Cheatham
Johnson	Grundy	Davidson
Sullivan	Hamilton	Dickson
Unicoi	Marion	Houston
Washington	Rhea	Humphreys
	Sequatchie	Montgomery
District 2 (10)		Stewart
Claiborne	District 7 (11)	
Cocke	Bedford	District 11 (14)
Grainger	Cannon	Benton
Greene	Coffee	Carroll
Hamblen	DeKalb	Chester
Hancock	Franklin	Crockett
Hawkins	Lincoln	Decatur
Jefferson	Moore	Gibson
Sevier	Rutherford	Hardeman
Union	Van Buren	Hardin
	Warren	Haywood
District 3 (2)	White	Henderson
Blount		Henry
Knox	District 8 (11)	Madison
	Clay	McNairy
District 4 (8)	Jackson	Weakley
Anderson	Macon	
Campbell	Overton	District 12 (2)
Cumberland	Pickett	Fayette
Fentress	Putnam	Shelby
Loudon	Robertson	
Morgan	Smith	District 13 (5)
Roane	Sumner	Dyer
Scott	Trousdale	Lake
	Wilson	Lauderdale
District 5 (5)		Obion
Bradley	District 9 (9)	Tipton
McMinn	Giles	
Meigs	Hickman	
Monroe	Lawrence	
Polk	Lewis	
	Marshall	
	Maury	
	Perry	
	Wayne	
	Williamson	

See Figure 1 (page 55) for Map of Tennessee Educational Developmental Districts.

APPENDIX B4

Metropolitan Areas and Rural Counties as Used in Study

MSA (7)/Counties (26)	Rural Counties (69)	
Chattanooga (3)	Bedford	Lewis
Hamilton	Benton	Lincoln
Marion	Bledsoe	Loudon
Sequatchie	Bradley	McMinn
	Campbell	McNairy
Clarksville (1)	Cannon	Macon
Montgomery	Carroll	Marshall
	Chester	Maury
Jackson (1)	Claiborne	Meigs
Madison	Clay	Monroe
	Cocke	Moore
Knoxville (7)	Coffee	Morgan
Anderson	Crockett	Obion
Blount	Cumberland	Overton
Grainger	Decatur	Perry
Jefferson	DeKalb	Pickett
Knox	Dyer	Polk
Sevier	Fayette	Putnam
Union	Fentress	Rhea
	Franklin	Roane
Nashville (8)	Gibson	Scott
Cheatham	Giles	Smith
Davidson	Greene	Stewart
Dickson	Grundy	Trousdale
Robertson	Hamblen	Unicoi
Rutherford	Hancock	Van Buren
Sumner	Hardeman	Warren
Williamson	Hardin	Wayne
Wilson	Haywood	Weakley
	Henderson	White
Memphis (2)	Henry	
Shelby	Hickman	
Tipton	Houston	
	Humphreys	
Tri-Cities (4)	Jackson	
Carter	Johnson	
Hawkins	Lake	
Sullivan	Lauderdale	
Washington	Lawrence	

Metropolitan Statistical Areas (MSA) and Rural Counties defined by the United States Bureau of the Census.

See Figure 5 (Appendix I) for Map of Metropolitan Statistical Areas and Rural Counties.

APPENDIX C

Least Distant Two and Four-Year Public Institutions of Higher Education in Tennessee by Tennessee County

County	Two-Year	Four-Year
Anderson	Pellissippi State	UT Knoxville
Bedford	Motlow State	Middle Tennessee State
Benton	Jackson State	UT Martin
Bledsoe	Cleveland State	UT Chattanooga
Blount	Pellissippi State	UT Knoxville
Bradley	Cleveland State	UT Chattanooga
Campbell	Pellissippi State	UT Knoxville
Cannon	Motlow State	Middle Tennessee State
Carroll	Jackson State	UT Martin
Carter	Northeast State	East Tennessee State
Cheatham	State Tech-Nash	Tennessee State
Chester	Jackson State	UT Martin
Claiborne	Walters State	UT Knoxville
Clay	Volunteer State	Tennessee Tech
Cocke	Walters State	UT Knoxville
Coffee	Motlow State	Middle Tennessee State
Crockett	Dyersburg State	UT Martin
Cumberland	Roane State	Tennessee Tech
Davidson	State Tech-Nash	Tennessee State
Decatur	Jackson State	UT Martin
Dekalb	Volunteer State	Tennessee Tech
Dickson	State Tech-Nash	Austin Peay State
Dyer	Dyersburg State	UT Martin
Fayette	Shelby State	Memphis State
Fentress	Roane State	Tennessee Tech
Franklin	Motlow State	UT Chattanooga
Gibson	Jackson State	UT Martin
Giles	Columbia State	Middle Tennessee State
Grainger	Walters State	UT Knoxville
Greene	Walters State	East Tennessee State
Grundy	Motlow State	UT Chattanooga
Hamblen	Walters State	UT Knoxville
Hamilton	Chattanooga State	UT Chattanooga
Hancock	Walters State	East Tennessee State
Hardeman	Jackson State	Memphis State
Hardin	Jackson State	UT Martin
Hawkins	Walters State	East Tennessee State
Haywood	Jackson State	Memphis State
Henderson	Jackson State	UT Martin
Henry	Jackson State	UT Martin
Hickman	Columbia State	Tennessee State
Houston	State Tech-Nash	Austin Peay State
Humphreys	Columbia State	Austin Peay State

APPENDIX C (cont)

Least Distant Two and Four-Year Public Institutions of Higher Education in Tennessee by Tennessee County

County	Two-Year	Four-Year
Jackson	Volunteer State	Tennessee Tech
Jefferson	Walters State	UT Knoxville
Johnson	Northeast State	East Tennessee State
Knox	Pellissippi State	UT Knoxville
Lake	Dyersburg State	UT Martin
Lauderdale	Dyersburg State	Memphis State
Lawrence	Columbia State	Middle Tennessee State
Lewis	Columbia State	Tennessee State
Lincoln	Motlow State	Middle Tennessee State
Loudon	Roane State	UT Knoxville
McMinn	Cleveland State	UT Chattanooga
McNairy	Jackson State	UT Martin
Macon	Roane State	Tennessee Tech
Madison	Jackson State	UT Martin
Marion	Chattanooga State	UT Chattanooga
Marshall	Columbia State	Middle Tennessee State
Maury	Columbia State	Middle Tennessee State
Meigs	Cleveland State	UT Chattanooga
Monroe	Roane State	UT Knoxville
Montgomery	State Tech-Nash	Austin Peay State
Moore	Motlow State	Middle Tennessee State
Morgan	Roane State	UT Knoxville
Obion	Dyersburg State	UT Martin
Overton	Roane State	Tennessee Tech
Perry	Columbia State	Austin Peay State
Pickett	Roane State	Tennessee Tech
Polk	Cleveland State	UT Chattanooga
Putnam	Roane State	Tennessee Tech
Rhea	Cleveland State	UT Chattanooga
Roane	Roane State	UT Knoxville
Robertson	State Tech-Nash	Tennessee State
Rutherford	State Tech-Nash	Middle Tennessee State
Scott	Roane State	UT Knoxville
Sequatchie	Chattanooga State	UT Chattanooga
Sevier	Pellissippi State	UT Knoxville
Shelby	Shelby State	Memphis State
Smith	Volunteer State	Tennessee Tech
Stewart	State Tech-Nash	Austin Peay State
Sullivan	Northeast State	East Tennessee State
Sumner	Volunteer State	Tennessee State
Tipton	Shelby State	Memphis State
Trousdale	Volunteer State	Tennessee State
Unicoi	Northeast State	East Tennessee State

APPENDIX C (cont)

Least Distant Two and Four-Year Public Institutions of Higher Education in Tennessee by Tennessee County

County	Two-Year	Four-Year
Union	Pellissippi State	UT Knoxville
Van Buren	Chattanooga State	Tennessee Tech
Warren	Motlow State	Tennessee Tech
Washington	Northeast State	East Tennessee State
Wayne	Columbia State	Tennessee State
Weakley	Dyersburg State	UT Martin
White	Roane State	Tennessee Tech
Williamson	State Tech-Nash	Tennessee State
Wilson	Volunteer State	Middle Tennessee State

APPENDIX D1

Actual Enrollments, Predicted Enrollments, Enrollment Ratios, and Representation Indicators for All Public Institutions of Higher Education in Tennessee by Grand State Division Fall Terms 1984-1990

Division	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
East	308,135	292,851	1.05219	
Middle	233,418	265,391	0.87952	
West	233,501	216,812	1.07697	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.00290 (0.80232, 1.20348).

APPENDIX D2

Actual Enrollments, Predicted Enrollments, Enrollment Ratios, and Representation Indicators for Two-Year Public Institutions of Higher Education in Tennessee by Grand State Division Fall Terms 1984-1990

Division	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
East	110,911	102,803	1.07887	
Middle	74,306	93,163	0.79759	LOW
West	86,859	76,110	1.14123	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.00590 (0.80472, 1.20708).

APPENDIX D3

Actual Enrollments, Predicted Enrollments, Enrollment Ratios, and Representation Indicators for Four-Year Public Institutions of Higher Education in Tennessee by Grand State Division Fall Terms 1984-1990

Division	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
East	197,224	190,048	1.03776	
Middle	159,112	172,228	0.92385	
West	146,642	140,702	1.04222	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.00127 (0.80102, 1.20153).

APPENDIX E1

Actual Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for All Public Institutions of Higher Education in
by Educational Development District
Fall Terms 1984-1990

Dev. District	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
1	57,858	50,645	1.14242	
2	38,511	52,447	0.73428	LOW
3	73,590	66,524	1.10622	
4	34,970	42,699	0.81899	
5	28,940	26,878	1.07673	
6	77,109	58,128	1.32654	HI
7	52,043	54,227	0.95972	
8	50,847	54,738	0.92891	
9	35,099	42,166	0.83240	
10	93,203	110,846	0.84084	
11	45,588	59,377	0.76777	LOW
12	167,638	134,958	1.24215	HI
13	19,658	21,421	0.91768	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 0.97651 (0.78121, 1.17181).

APPENDIX E2

Actual Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for Two-Year Public Institutions of Higher Education in
by Educational Development District
Fall Terms 1984-1990

Dev. District	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
1	11,900	17,779	0.66935	LOW
2	17,635	18,411	0.95785	
3	15,713	23,353	0.67286	LOW
4	13,641	14,989	0.91006	
5	18,465	9,435	1.95704	HI
6	34,317	20,405	1.68177	HI
7	13,971	19,036	0.73393	LOW
8	18,002	19,215	0.93685	
9	15,443	14,802	1.04330	
10	26,462	38,911	0.68006	LOW
11	19,104	20,844	0.91653	
12	58,223	47,376	1.22896	
13	9,200	7,520	1.22344	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.04708 (0.83766, 1.25649).

APPENDIX E3

Actual Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for Four-Year Public Institutions of Higher Education in
by Educational Development District
Fall Terms 1984-1990

Dev. District	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
1	45,958	32,867	1.39832	HI
2	20,876	34,036	0.61335	LOW
3	57,877	43,171	1.34063	HI
4	21,329	27,710	0.76973	
5	10,475	17,443	0.60054	LOW
6	42,792	37,723	1.13439	HI
7	38,072	35,191	1.08186	
8	32,845	35,523	0.92462	
9	19,656	27,364	0.71832	LOW
10	66,741	71,934	0.92781	
11	26,484	38,533	0.68730	LOW
12	109,415	87,582	1.24929	HI
13	10,458	12,902	0.75229	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 0.938341 (0.75067, 1.12601).

APPENDIX F1

County Enrollments, Predicted Enrollments, Enrollment Ratios, and Representation Indicators for All Public Institutions of Higher Education in Tennessee by County
Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Anderson	10,788	10,929	0.98710	HI
Bedford	4,754	4,832	0.98371	HI
Benton	1,222	2,309	0.52933	LOW
Bledsoe	1,024	1,550	0.66073	
Blount	10,881	13,760	0.79076	
Bradley	17,697	11,745	1.50671	HI
Campbell	1,839	5,622	0.32714	LOW
Cannon	1,273	1,677	0.75911	
Carroll	2,728	4,405	0.61918	LOW
Carter	7,799	8,227	0.94802	HI
Cheatham	2,725	4,300	0.63369	
Chester	1,017	2,056	0.49461	LOW
Claiborne	1,628	4,183	0.38919	LOW
Clay	713	2,056	0.34676	LOW
Cocke	3,290	4,657	0.70650	
Coffee	9,582	6,462	1.48282	HI
Crockett	1,728	2,135	0.80924	
Cumberland	3,312	5,534	0.59853	LOW
Davidson	70,488	81,076	0.86940	
Decatur	1,164	1,676	0.69458	
DeKalb	1,638	2,298	0.71285	
Dickson	4,035	5,599	0.72062	
Dyer	7,211	5,541	1.30137	HI
Fayette	2,368	4,083	0.57997	LOW
Fentress	1,653	2,347	0.70423	
Franklin	5,554	5,551	1.00050	HI
Gibson	6,496	7,410	0.87664	
Giles	2,124	4,131	0.51410	LOW
Grainger	1,545	2,741	0.56361	LOW
Greene	6,791	8,933	0.76021	
Grundy	1,190	2,123	0.56058	LOW
Hamblen	9,445	8,064	1.17121	HI
Hamilton	67,523	45,274	1.49144	HI
Hancock	502	1,080	0.46480	LOW
Hardeman	2,800	3,731	0.75043	
Hardin	1,617	3,605	0.44848	LOW
Hawkins	5,055	7,133	0.70863	
Haywood	2,320	3,032	0.76505	

APPENDIX F1 (cont)

County Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for All Public Institutions of Higher Education in
Tennessee by County
Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Henderson	2,557	3,495	0.73158	
Henry	2,113	4,462	0.47348	LOW
Hickman	1,716	2,681	0.64009	
Houston	840	1,122	0.74871	
Humphreys	2,092	2,489	0.84049	
Jackson	887	1,474	0.60143	LOW
Jefferson	4,356	5,290	0.82332	
Johnson	1,253	2,205	0.56817	LOW
Knox	62,709	52,764	1.18848	HI
Lake	847	1,074	0.78834	
Lauderdale	2,967	3,747	0.79174	
Lawrence	3,215	5,623	0.57171	LOW
Lewis	1,054	1,480	0.71210	
Lincoln	3,230	4,505	0.71697	
Loudon	4,291	5,007	0.85693	
McMinn	5,820	6,790	0.85714	
McNairy	2,183	3,593	0.60760	LOW
Macon	1,406	2,528	0.55620	LOW
Madison	12,559	12,367	1.01549	HI
Marion	3,168	3,922	0.80773	
Marshall	2,900	3,445	0.84185	
Maury	10,602	8,705	1.21787	HI
Meigs	903	1,275	0.70827	
Monroe	2,570	4,892	0.52535	LOW
Montgomery	12,120	14,756	0.82138	
Moore	1,055	755	1.39663	HI
Morgan	1,829	2,766	0.66121	
Obion	5,047	5,073	0.99489	HI
Overton	1,998	2,825	0.70716	
Perry	617	1,056	0.58440	LOW
Pickett	477	724	0.65905	
Polk	1,950	2,175	0.89643	
Putnam	9,550	8,226	1.16102	HI
Rhea	3,243	3,842	0.84399	
Roane	9,765	7,555	1.29249	HI
Robertson	4,454	6,615	0.67333	
Rutherford	18,879	18,889	0.99946	HI
Scott	1,493	2,939	0.50802	LOW

APPENDIX F1 (cont)

County Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for All Public Institutions of Higher Education in
Tennessee by County
Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Sequatchie	961	1,417	0.67818	
Sevier	5,074	8,172	0.62092	LOW
Shelby	165,270	130,875	1.26281	HI
Smith	1,654	2,263	0.73095	
Stewart	903	1,503	0.60077	LOW
Sullivan	27,776	22,908	1.21248	HI
Sumner	20,197	16,310	1.23833	HI
Tipton	3,586	5,986	0.59911	LOW
Trousdale	644	946	0.68044	
Unicoi	2,669	2,650	1.00709	HI
Union	825	2,193	0.37626	LOW
Van Buren	340	777	0.43781	LOW
Warren	3,438	5,269	0.65250	
Washington	18,361	14,655	1.25292	HI
Wayne	903	2,226	0.40571	LOW
Weakley	5,084	5,098	0.99723	HI
White	2,300	3,211	0.71625	
Williamson	11,968	12,818	0.93366	
Wilson	8,867	10,771	0.82325	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 0.78788 (0.63031, 0.94546).

APPENDIX F2

County Enrollments, Predicted Enrollments, Enrollment Ratios, and Representation Indicators for Two-Year Public Institutions of Higher Education in Tennessee by County
Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Anderson	2,930	3,837	0.76371	
Bedford	1,805	1,696	1.06396	HI
Benton	260	810	0.32083	LOW
Bledsoe	376	544	0.69112	
Blount	1,912	4,830	0.39358	LOW
Bradley	12,300	4,123	2.98317	HI
Campbell	289	1,973	0.14645	LOW
Cannon	114	589	0.19365	LOW
Carroll	994	1,547	0.64269	LOW
Carter	1,084	2,888	0.37536	LOW
Cheatham	988	1,510	0.65450	LOW
Chester	643	722	0.89082	
Claiborne	637	1,468	0.43380	LOW
Clay	77	722	0.10668	LOW
Cocke	1,894	1,635	1.15861	HI
Coffee	4,742	2,268	2.09043	HI
Crockett	968	750	1.29138	HI
Cumberland	773	1,943	0.39794	LOW
Davidson	23,508	28,461	0.82597	
Decatur	636	588	1.08111	HI
DeKalb	167	807	0.20704	LOW
Dickson	936	1,966	0.47619	LOW
Dyer	5,026	1,945	2.58386	HI
Fayette	931	1,433	0.64955	LOW
Fentress	293	824	0.35559	LOW
Franklin	2,936	1,949	1.50664	HI
Gibson	2,685	2,601	1.03220	HI
Giles	694	1,450	0.47852	LOW
Grainger	997	962	1.03607	HI
Greene	1,930	3,136	0.61546	LOW
Grundy	467	745	0.62668	LOW
Hamblen	5,878	2,831	2.07637	HI
Hamilton	29,741	15,893	1.87134	HI
Hancock	364	379	0.96008	
Hardeman	1,225	1,310	0.93525	
Hardin	408	1,266	0.32236	LOW
Hawkins	2,058	2,504	0.82184	
Haywood	988	1,065	0.92811	

APPENDIX F2 (cont)

County Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for Two-Year Public Institutions of Higher Education in
Tennessee by County
Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Henderson	1,497	1,227	1.22009	HI
Henry	223	1,567	0.14235	LOW
Hickman	827	941	0.87876	
Houston	77	394	0.19551	LOW
Humphreys	306	874	0.35021	LOW
Jackson	39	518	0.07533	LOW
Jefferson	2,331	1,857	1.25506	HI
Johnson	196	774	0.25318	LOW
Knox	13,801	18,522	0.74510	
Lake	436	377	1.15600	HI
Lauderdale	1,443	1,316	1.09692	HI
Lawrence	1,699	1,974	0.86066	
Lewis	734	520	1.41267	HI
Lincoln	1,324	1,581	0.83720	
Loudon	1,650	1,758	0.93867	
McMinn	3,251	2,384	1.36392	HI
McNairy	784	1,261	0.62162	LOW
Macon	720	887	0.81137	
Madison	7,523	4,341	1.73282	HI
Marion	1,529	1,377	1.11053	HI
Marshall	1,342	1,209	1.10977	HI
Maury	7,038	3,056	2.30305	HI
Meigs	529	448	1.18198	HI
Monroe	1,016	1,717	0.59163	LOW
Montgomery	589	5,180	0.11371	LOW
Moore	723	265	2.72651	HI
Morgan	1,219	971	1.25537	HI
Obion	956	1,781	0.53684	LOW
Overton	106	992	0.10687	LOW
Perry	332	371	0.89579	
Pickett	14	254	0.05510	LOW
Polk	1,369	764	1.79277	HI
Putnam	405	2,887	0.14026	LOW
Rhea	1,732	1,349	1.28404	HI
Roane	5,893	2,652	2.22194	HI
Robertson	1,385	2,322	0.59645	LOW
Rutherford	1,443	6,631	0.21762	LOW
Scott	594	1,032	0.57577	LOW

APPENDIX F2 (cont)

County Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for Two-Year Public Institutions of Higher Education in
Tennessee by County
Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Sequatchie	472	497	0.94887	
Sevier	1,282	2,869	0.44691	LOW
Shelby	57,292	45,943	1.24704	HI
Smith	475	794	0.59798	LOW
Stewart	58	527	0.10992	LOW
Sullivan	6,939	8,042	0.86287	
Sumner	11,761	5,725	2.05416	HI
Tipton	1,339	2,101	0.63727	LOW
Trousdale	389	332	1.17083	HI
Unicoi	504	930	0.54174	LOW
Union	264	770	0.34299	LOW
Van Buren	45	273	0.16507	LOW
Warren	569	1,850	0.30763	LOW
Washington	3,177	5,144	0.61757	LOW
Wayne	344	781	0.44028	LOW
Weakley	270	1,790	0.15087	HI
White	103	1,127	0.09137	LOW
Williamson	2,433	4,450	0.54069	LOW
Wilson	2,631	3,781	0.69585	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 0.84973 (0.67979, 1.01968).

APPENDIX F3

County Enrollments, Predicted Enrollments, Enrollment Ratios, and Representation Indicators for Four-Year Public Institutions of Higher Education in Tennessee by County Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Anderson	7,858	7,092	1.10793	HI
Bedford	2,949	3,136	0.94029	HI
Benton	962	1,498	0.64212	
Bledsoe	648	1,006	0.64429	
Blount	8,969	8,930	1.00439	HI
Bradley	5,397	7,622	0.70805	
Campbell	1,550	3,648	0.42487	LOW
Cannon	1,159	1,088	1.06499	HI
Carroll	1,734	2,859	0.60646	
Carter	6,715	5,339	1.25779	HI
Cheatham	1,737	2,791	0.62244	
Chester	374	1,334	0.28028	LOW
Claiborne	991	2,715	0.36506	LOW
Clay	636	1,334	0.47663	LOW
Cocke	1,396	3,022	0.46194	LOW
Coffee	4,840	4,194	1.15414	HI
Crockett	760	1,386	0.54844	LOW
Cumberland	2,539	3,591	0.70704	
Davidson	46,980	52,615	0.89290	
Decatur	528	1,088	0.48550	LOW
DeKalb	1,471	1,491	0.98647	HI
Dickson	3,099	3,634	0.85283	
Dyer	2,185	3,596	0.60763	
Fayette	1,437	2,650	0.54233	LOW
Fentress	1,360	1,523	0.89282	
Franklin	2,618	3,603	0.72672	
Gibson	3,811	4,809	0.79250	
Giles	1,430	2,681	0.53335	LOW
Grainger	548	1,779	0.30805	LOW
Greene	4,861	5,797	0.83851	
Grundy	723	1,378	0.52482	LOW
Hamblen	3,567	5,233	0.68158	
Hamilton	37,782	29,381	1.28595	HI
Hancock	138	701	0.19689	LOW
Hardeman	1,575	2,421	0.65045	
Hardin	1,209	2,340	0.51671	LOW
Hawkins	2,997	4,629	0.64740	
Haywood	1,332	1,968	0.67684	

APPENDIX F3 (cont)

County Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for Four-Year Public Institutions of Higher Education in
Tennessee by County
Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Henderson	1,060	2,268	0.46732	LOW
Henry	1,890	2,896	0.65260	
Hickman	889	1,740	0.51098	LOW
Houston	763	728	1.04795	HI
Humphreys	1,786	1,615	1.10570	HI
Jackson	848	957	0.88601	
Jefferson	2,025	3,434	0.58978	LOW
Johnson	1,057	1,431	0.73856	
Knox	48,908	34,242	1.42832	HI
Lake	411	697	0.58946	LOW
Lauderdale	1,524	2,432	0.62667	
Lawrence	1,516	3,649	0.41541	LOW
Lewis	320	961	0.33315	LOW
Lincoln	1,906	2,924	0.65194	
Loudon	2,641	3,250	0.81271	
McMinn	2,569	4,406	0.58301	LOW
McNairy	1,399	2,332	0.60002	LOW
Macon	686	1,640	0.41817	LOW
Madison	5,036	8,026	0.62747	
Marion	1,639	2,545	0.64394	
Marshall	1,558	2,236	0.69693	
Maury	3,564	5,649	0.63086	
Meigs	374	827	0.45203	LOW
Monroe	1,554	3,175	0.48950	LOW
Montgomery	11,531	9,576	1.20418	HI
Moore	332	490	0.67725	
Morgan	610	1,795	0.33981	LOW
Obion	4,091	3,292	1.24266	HI
Overton	1,892	1,833	1.03188	HI
Perry	285	685	0.41596	LOW
Pickett	463	470	0.98575	HI
Polk	581	1,411	0.41157	LOW
Putnam	9,145	5,338	1.71318	HI
Rhea	1,511	2,494	0.60595	
Roane	3,872	4,903	0.78972	
Robertson	3,069	4,293	0.71492	
Rutherford	17,436	12,258	1.42239	HI
Scott	899	1,907	0.47137	LOW

APPENDIX F3 (cont)

County Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for Four-Year Public Institutions of Higher Education in
Tennessee by County
Fall Terms 1984-1990

County	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Sequatchie	489	920	0.53176	LOW
Sevier	3,792	5,303	0.71505	
Shelby	107,978	84,932	1.27134	HI
Smith	1,179	1,468	0.80288	
Stewart	845	975	0.86628	
Sullivan	20,837	14,867	1.40160	HI
Sumner	8,436	10,584	0.79702	
Tipton	2,247	3,884	0.57848	LOW
Trousdale	255	614	0.41517	LOW
Unicoi	2,165	1,720	1.25881	HI
Union	561	1,423	0.39426	LOW
Van Buren	295	504	0.58535	LOW
Warren	2,869	3,419	0.83905	
Washington	15,184	9,510	1.59660	HI
Wayne	559	1,444	0.38701	LOW
Weakley	4,814	3,308	1.45505	HI
White	2,197	2,084	1.05426	HI
Williamson	9,535	8,319	1.14623	HI
Wilson	6,236	6,990	0.89216	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 0.75443 (0.60354, 0.90532).

APPENDIX G1

Actual Enrollments, Predicted Enrollments, Enrollment Ratios, and Representation Indicators for All Public Institutions of Higher Education in Tennessee by Metro and Rural Area Counties Fall Terms 1984-1990

Metro/ Rural Area	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Chattanooga	71,652	50,613	1.41569	HI
Clarksville	12,120	14,756	0.82138	LO
Jackson	12,559	12,367	1.01549	
Knoxville	96,178	95,850	1.00343	
Memphis	168,856	136,860	1.23378	
Nashville	141,613	156,379	0.90558	
Tri-Cities	61,660	55,573	1.10953	
Rural Areas	210,416	252,656	0.83282	LOW

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.04221 (0.83371, 1.25065).

APPENDIX G2

Actual Enrollments, Predicted Enrollments, Enrollment Ratios, and Representation Indicators for Two-Year Public Institutions of Higher Education in Tennessee by Metro and Rural Area Counties Fall Terms 1984-1990

Metro/ Rural Area	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Chattanooga	31,742	17,767	1.78655	HI
Clarksville	589	5,180	0.11371	LO
Jackson	7,523	4,341	1.73282	HI
Knoxville	23,517	33,647	0.69893	LOW
Memphis	58,631	48,044	1.22037	HI
Nashville	45,085	54,895	0.82129	
Tri-Cities	13,762	19,509	0.70544	LOW
Rural Areas	91,227	88,693	1.02857	

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.01346 (0.81077, 1.21615).

APPENDIX G3

Actual Enrollments, Predicted Enrollments,
Enrollment Ratios, and Representation Indicators
for Four-Year Public Institutions of Higher Education in
Tennessee by Metro and Rural Area Counties
Fall Terms 1984-1990

Metro/ Rural Area	Actual Enrollment	Hypothetical Predicted Enrollment	Enrollment Ratio	HI/ LOW
Chattanooga	39,910	32,846	1.21508	
Clarksville	11,531	9,576	1.20418	
Jackson	5,036	8,026	0.62747	LOW
Knoxville	72,661	62,202	1.16814	
Memphis	110,225	88,817	1.24104	
Nashville	96,528	101,483	0.95117	
Tri-Cities	47,898	36,065	1.32811	HI
Rural Areas	119,189	163,963	0.72692	LOW

HI/LOW indicates when Enrollment Ratio is more than 20 percent different from mean value of 1.05776 (0.84621, 1.26932).

APPENDIX H1

Total County Enrollment Predictions for Pellissippi State for Logit and Least Squares Regression Formulations of Gravity Model
Fall 1980 - Fall 1990

County	Actual Enrollment	Predicted Enrollment Logit Model	Predicted Enrollment LSR Model
Anderson	1,352	2,460.49	225.02
Bedford	7	5.08	7.95
Benton	1	2.01	0.53
Bledsoe	0	49.28	4.33
Blount	1,346	1,392.52	146.32
Bradley	35	717.26	42.59
Campbell	180	111.73	43.81
Cannon	0	3.95	1.72
Carroll	2	2.87	2.37
Carter	9	3.46	18.17
Cheatham	2	7.59	4.71
Chester	0	0.83	0.15
Claiborne	25	160.33	22.31
Clay	1	14.73	3.85
Cocke	33	200.44	20.84
Coffee	13	1.63	13.57
Crockett	1	0.24	0.10
Cumberland	18	140.93	28.93
Davidson	56	103.33	110.99
Decatur	1	4.12	0.08
DeKalb	1	12.60	4.24
Dickson	1	8.17	6.26
Dyer	5	0.26	2.59
Fayette	0	1.82	1.21
Fentress	2	74.08	10.46
Franklin	3	7.45	10.79
Gibson	5	1.39	5.24
Giles	2	4.48	4.24
Grainger	19	29.68	15.15
Greene	25	79.95	29.19
Grundy	0	12.85	3.48
Hamblen	53	126.68	37.30
Hamilton	68	1,265.11	107.80
Hancock	1	26.48	1.91
Hardeman	4	2.99	1.19
Hardin	2	3.98	1.65
Hawkins	16	63.22	22.49
Haywood	0	0.49	0.55
Henderson	1	3.80	1.46

APPENDIX H1 (cont)

Total County Enrollment Predictions for Pellissippi State for Logit and Least Squares Regression Formulations of Gravity Model

Fall 1980 - Fall 1990

County	Actual Enrollment	Predicted Enrollment Logit Model	Predicted Enrollment LSR Model
Henry	5	1.40	2.62
Hickman	0	1.78	1.46
Houston	1	1.10	0.00
Humphreys	1	3.65	0.89
Jackson	1	5.76	1.96
Jefferson	85	266.67	31.80
Johnson	0	3.33	1.86
Knox	10,572	13,464.61	995.12
Lake	4	0.07	0.00
Lauderdale	0	0.19	0.93
Lawrence	2	10.03	5.93
Lewis	3	2.19	0.11
Lincoln	1	10.10	6.15
Loudon	595	917.48	75.15
McMinn	21	874.31	38.24
McNairy	1	3.60	1.36
Macon	1	197.00	9.32
Madison	9	3.20	11.15
Marion	3	61.33	8.74
Marshall	0	4.66	3.76
Maury	1	8.03	12.76
Meigs	3	95.05	5.14
Monroe	65	433.78	37.74
Montgomery	5	13.20	20.13
Moore	0	0.46	0.00
Morgan	71	97.10	27.12
Obion	1	0.63	2.38
Overton	0	29.86	8.99
Perry	0	2.47	0.00
Pickett	0	2.79	0.57
Polk	4	198.42	7.79
Putnam	17	84.99	26.99
Rhea	8	313.51	18.80
Roane	271	378.38	28.55
Robertson	5	14.11	9.76
Rutherford	4	23.81	36.57
Scott	61	175.19	18.92
Sequatchie	0	35.15	2.22
Sevier	229	523.61	54.74

APPENDIX H1 (cont)

Total County Enrollment Predictions for Pellissippi State for Logit and Least Squares Regression Formulations of Gravity Model
Fall 1980 - Fall 1990

County	Actual Enrollment	Predicted Enrollment Logit Model	Predicted Enrollment LSR Model
Shelby	69	71.12	84.57
Smith	0	30.62	3.54
Stewart	0	1.31	0.06
Sullivan	46	3.51	50.36
Sumner	12	31.65	29.97
Tipton	1	1.11	2.64
Trousdale	0	9.56	0.16
Unicoi	2	7.30	4.82
Union	157	119.91	18.92
Van Buren	0	5.21	0.53
Warren	1	39.41	14.55
Washington	50	5.40	35.49
Wayne	2	2.68	0.58
Weakley	0	0.47	2.80
White	4	16.39	10.01
Williamson	13	11.02	21.11
Wilson	4	22.22	22.03

APPENDIX H2

Total County Enrollment Predictions for UT-Knoxville
for Logit and Least Squares Regression Formulations
of Gravity Model
Fall 1980 - Fall 1990

County	Actual Enrollment	Predicted Enrollment Logit Model	Predicted Enrollment LSR Model
Anderson	5,285	6,169.77	2,148.09
Bedford	343	92.34	161.30
Benton	94	25.63	52.59
Bledsoe	66	78.16	104.86
Blount	7,138	7,404.64	2,846.59
Bradley	1,278	622.95	616.70
Campbell	1,028	901.66	693.07
Cannon	20	33.52	73.53
Carroll	110	36.82	89.21
Carter	431	152.77	355.48
Cheatham	111	21.92	121.37
Chester	33	12.23	41.50
Claiborne	574	518.18	447.50
Clay	16	42.29	104.45
Cocke	655	619.00	451.41
Coffee	919	219.08	231.30
Crockett	123	16.44	39.15
Cumberland	612	425.89	388.59
Davidson	7,006	511.78	1,705.29
Decatur	59	18.51	38.00
DeKalb	117	58.62	108.92
Dickson	441	60.81	142.99
Dyer	400	41.59	93.23
Fayette	108	21.61	68.57
Fentress	210	256.66	178.06
Franklin	579	150.02	196.84
Gibson	358	64.78	131.63
Giles	278	68.39	114.69
Grainger	358	313.27	356.86
Greene	1,238	914.03	568.53
Grundy	36	43.67	99.34
Hamblen	1,812	1,676.62	767.70
Hamilton	5,025	1,344.22	1,599.17
Hancock	79	49.28	101.24
Hardeman	161	44.42	67.94
Hardin	110	50.17	76.47
Hawkins	779	575.46	442.22
Haywood	181	29.97	53.74
Henderson	131	33.17	72.74

APPENDIX H2 (cont)

Total County Enrollment Predictions for UT-Knoxville
for Logit and Least Squares Regression Formulations
of Gravity Model
Fall 1980 - Fall 1990

County	Actual Enrollment	Predicted Enrollment Logit Model	Predicted Enrollment LSR Model
Henry	221	38.43	92.71
Hickman	60	25.68	71.78
Houston	38	14.64	28.09
Humphreys	225	46.92	60.95
Jackson	21	27.86	77.04
Jefferson	1,265	1,281.67	734.45
Johnson	108	95.73	93.17
Knox	42,701	43,683.96	12,043.69
Lake	52	7.89	17.33
Lauderdale	171	32.32	62.95
Lawrence	180	69.98	138.81
Lewis	31	11.99	38.81
Lincoln	362	100.05	139.89
Loudon	1,819	1,681.30	776.34
McMinn	1,167	740.06	528.22
McNairy	124	52.53	71.16
Macon	133	115.79	170.27
Madison	907	140.46	210.39
Marion	229	67.98	169.08
Marshall	229	54.53	106.69
Maury	474	114.17	226.48
Meigs	95	83.40	111.75
Monroe	893	684.72	511.16
Montgomery	839	170.48	328.80
Moore	34	15.87	27.90
Morgan	239	257.94	323.06
Obion	324	26.38	89.90
Overton	140	113.89	165.40
Perry	18	10.13	25.12
Pickett	12	63.81	49.54
Polk	106	130.30	158.26
Putnam	552	232.74	393.93
Rhea	332	269.97	273.37
Roane	1,861	1,820.53	839.95
Robertson	411	61.28	187.05
Rutherford	910	263.07	547.88
Scott	394	347.90	286.67
Sequatchie	59	31.91	80.14
Sevier	2,832	2,748.92	1,280.13

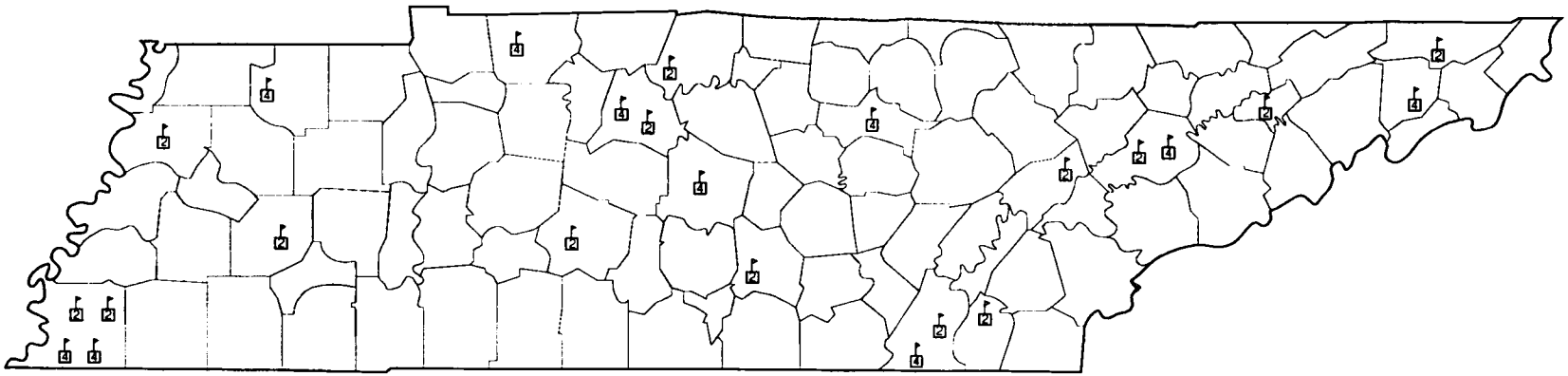
APPENDIX H2 (cont)

Total County Enrollment Predictions for UT-Knoxville
for Logit and Least Squares Regression Formulations
of Gravity Model
Fall 1980 - Fall 1990

County	Actual Enrollment	Predicted Enrollment Logit Model	Predicted Enrollment LSR Model
Shelby	7,619	924.70	1,333.59
Smith	120	46.98	100.43
Stewart	44	16.16	36.74
Sullivan	4,693	1,138.94	905.96
Sumner	2,285	218.51	458.76
Tipton	166	30.55	94.10
Trousdale	40	10.71	39.64
Unicoi	163	83.12	148.99
Union	413	418.19	442.76
Van Buren	10	23.42	47.43
Warren	357	173.83	237.31
Washington	1,690	246.17	652.42
Wayne	43	24.62	53.51
Weakley	182	20.63	95.89
White	162	112.63	176.33
Williamson	2,690	146.27	337.67
Wilson	924	159.43	345.23

APPENDIX I

Supplementary Maps



2 Two-Year Institution

4 Four-Year Institution

Figure 2: Map of the Location of Public Institutions of Higher Education in Tennessee

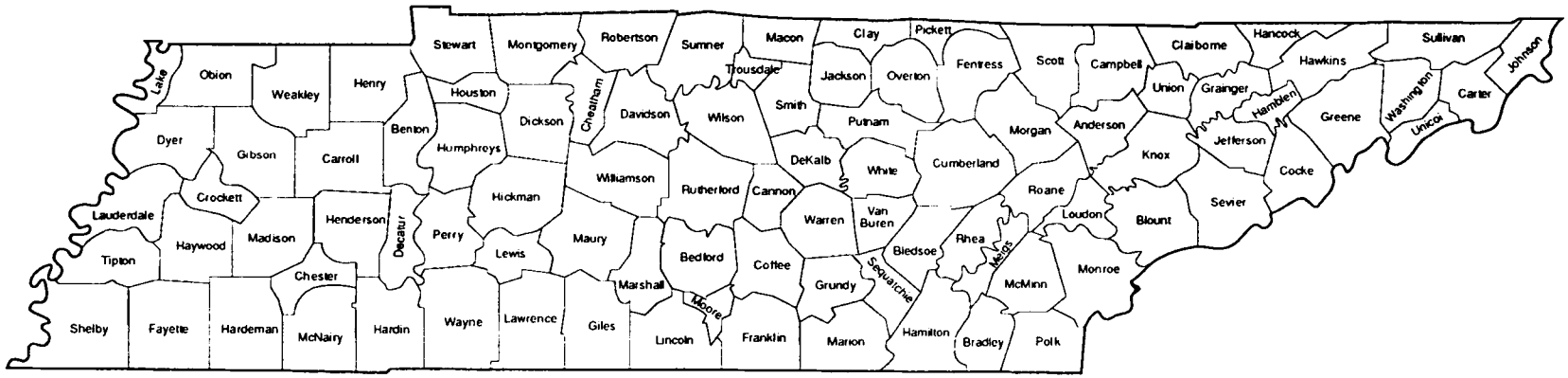


Figure 3: Map of Tennessee Counties

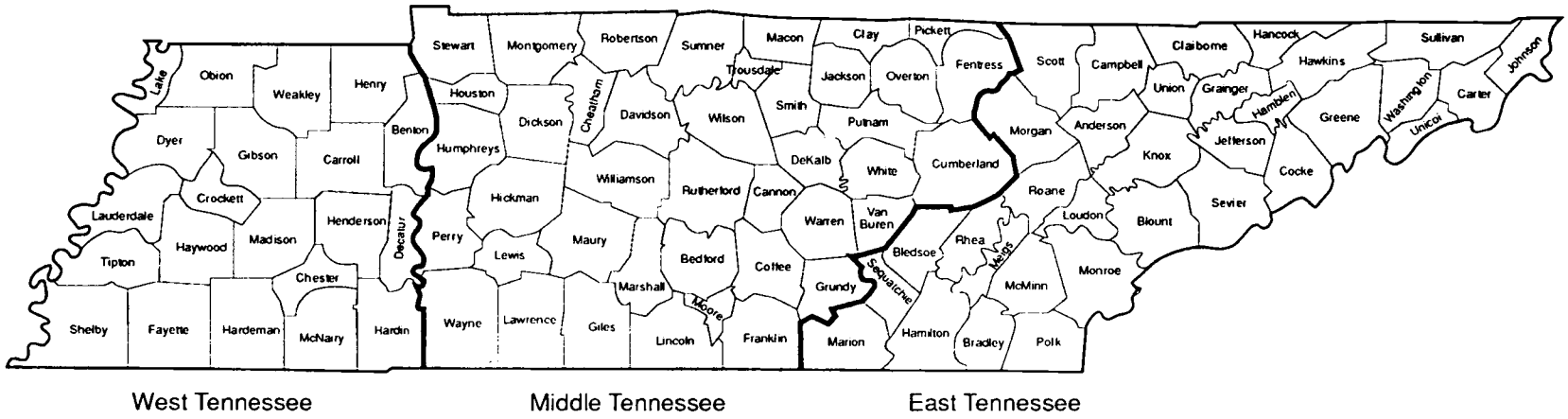


Figure 4: Map of Tennessee Grand Divisions

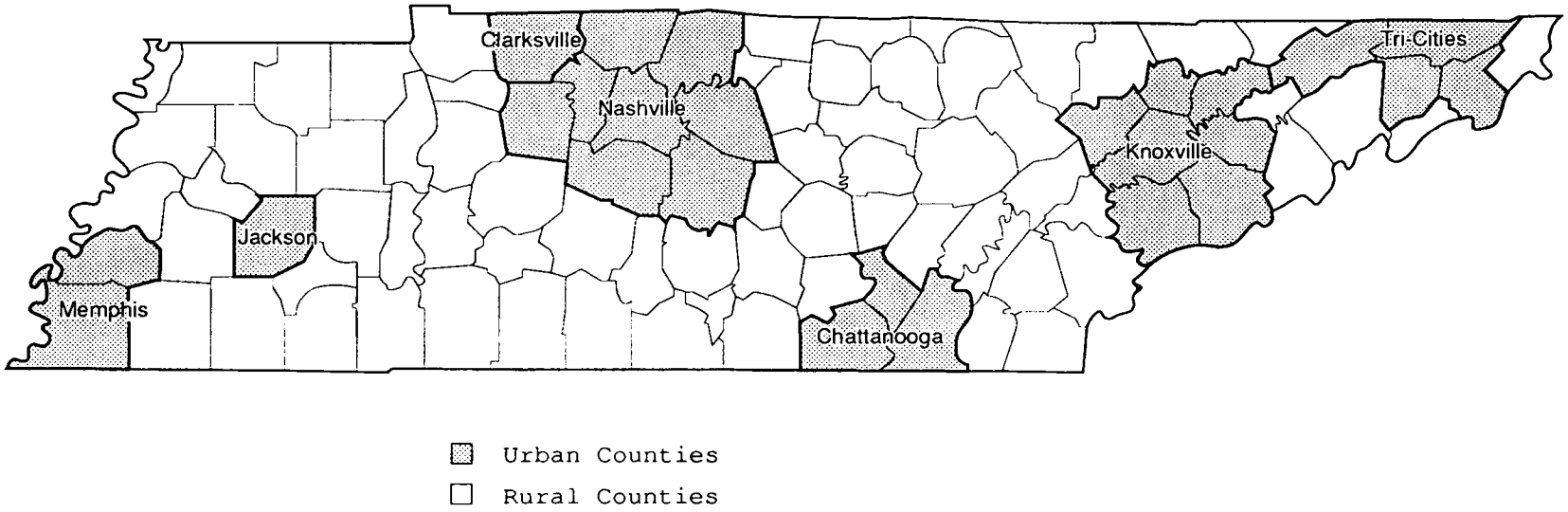


Figure 5: Map of Tennessee Urban and Rural Counties

VITA

George Allen Finchum, II was born in Johnson City, Tennessee on May 4, 1958. He attended public school in Johnson City and graduated from University High School in June, 1976. Following high school he attended East Tennessee State University in Johnson City and in December of 1979 received the Bachelor of Science degree with a major in Geography. During his enrollment at East Tennessee State he was named to Who's Who in American Universities and Colleges in 1979. Upon completion of the Bachelor's degree, he entered the graduate program in geography at the University of Cincinnati, from which he received the Master of Arts degree in August, 1985. In August, 1986, he began a doctoral program at The University of Tennessee, Knoxville. He was graduated with a Doctor of Philosophy degree in December, 1992, with a major in Education and collateral areas in Higher Education Administration, Educational Politics and Policy, and Planning.

Allen Finchum is a member of the Association of American Geographers, the Association for Institutional Research, the Southern Association for Institutional Research, and the Tennessee Association for Institutional Research.

He is presently employed as a Computer Systems Specialist in Administrative Information Systems at The University of Tennessee, Knoxville. He lives in Seymour, Tennessee, and is married to the former Tanya Lynn Ducker. They have one son, Curtis.