

THE DIFFUSION AND SPATIAL PROPERTIES OF
UNIVERSITY HINTERLANDS IN TEXAS

THESIS

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CHAPTER I

INTRODUCTION

For over 150 years, Texas colleges and universities have played a major role in providing higher education, attracting students from both nearby, as well as far-flung parts of the state. With the establishment of Baylor University in 1845, privately funded schools monopolized the collegiate market long before the creation of the first state university in 1872. Since then, some colleges and universities that once asserted prestigious academic influence and commanded large hinterlands, have seen the geographic territory from which they draw diminish as other relatively new schools have risen to prominence. Among the older schools, some have merely managed to maintain their reputations, while still others have expanded to establish themselves as premiere institutions with great drawing power not just on the state level, but nationwide and beyond. However, the cultural, economic, and demographic factors that have been at work throughout space and time, shaping the universities that now have the greatest attraction, remain largely undetermined.

Therefore, this study seeks to determine what underlies the spatial patterns in the hinterland diffusion of the major universities in Texas; with the following objectives and corollary questions:

- Which geographic, economic, demographic, historical, and educational variables explain the variation in student enrollment per county for each institution?
- What variables, such as population change or other demographic trends, cause universities to gain or lose students from certain counties?
- What factors have caused some institutions to achieve the geographic range of prominence while others diminish in enrollment and its relation to prestige?
- What is the best method for measuring hinterlands of universities, and what do spatial changes in a particular university's hinterland mean for the overall welfare of that university?

Justification

The state of Texas constitutes a large and diverse study area. Ranked second among the United States in both land area and in population, many experts from a wide range of disciplines have used Texas alone as an area of study. Some researchers have noticed a mystique which makes Texas unique, with a chauvinistic, enterprising, and even boisterous reputation, and an outlook of openness, optimism, and a pride in its past (McComb 1989). Others refer to a bright, colorful, and dynamic civilization with a mystique that holds together a large and complex region (Fehrenbach 1998). Cultural geographers have even referred to Texas as an empire due to its size and history of

conquest, and its self-confident, aggressive people driven by a sense of superiority and destiny (Meinig 1969).

Texas also has a vibrant history, which also serves to differentiate it from other states. In 1836, Texas claimed independence from Mexico, making it the only state that was once an independent nation. Some researchers believe that the ten years with Texas as a Republic contributed to a significant psychological impact on the population, providing a sustained sense of individuality, differentiating it from other states (Meinig 1969). The numerous groups of people who competed to settle in Texas have contributed to its diverse population of over 22 million people, of whom 32% are Hispanic and 11.5% are African American (U.S. Census Bureau 2004).

As a result of its distinctive size, colorful history, and diverse population, Texas has no shortage of institutions of higher education, including 35 public universities, 39 independent, or privately funded, senior colleges and universities, and two independent junior colleges (Texas Higher Education Coordinating Board 2004). Eight schools were selected based on enrollment and geographic criteria for this study. The schools selected appear to draw students from significant portions of the state (Figure 1).

In 2000, the Texas Higher Education Coordinating Board (THECB) created an initiative called "Closing the Gaps," which sets forth policies and objectives designed to increase student participation, success, institutional excellence, and research at all Texas public universities by 2015. One component of the participation objective includes the goal of increasing Texas enrollment by approximately 500,000 students, in order to raise percentage of the state's population enrolled in public universities from 5.0 to 5.7 (THECB 2000). Such rapid growth undoubtedly will change the spatial dynamics of

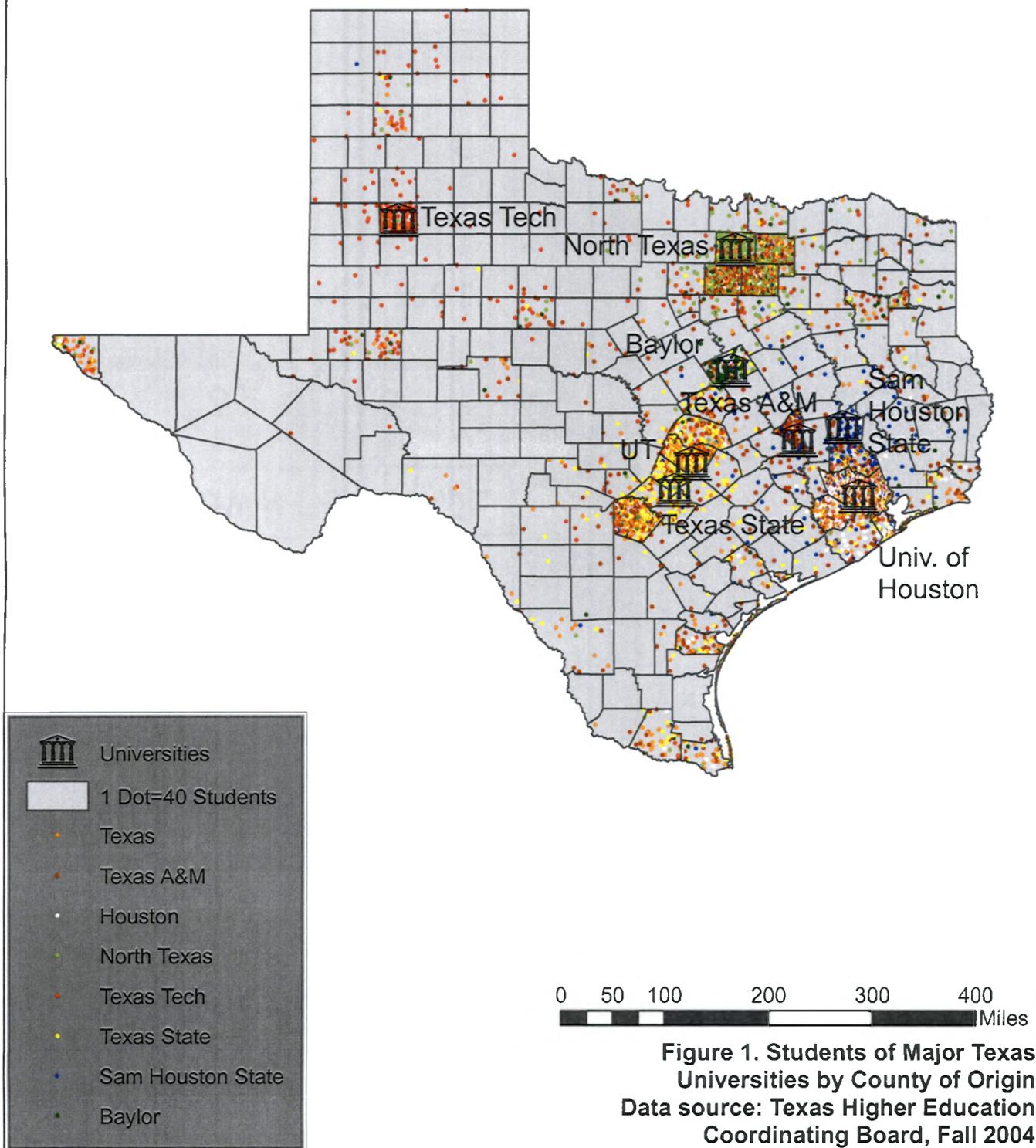


Figure 1. Students of Major Texas Universities by County of Origin
Data source: Texas Higher Education Coordinating Board, Fall 2004

students enrolled at each university, necessitating research on the diffusion and spatial properties of university hinterlands in Texas.

Conceptual Considerations: Spatial Distributions and Diffusion

Further justification for this research comes from the apparent absence of similar studies on the spatial properties of colleges and universities. Conceptual aspects of spatial distributions and interaction can be found in great detail in *Spatial Organization* (Abler, Adams, and Gould 1971). This classic geographic work also describes the concepts of spatial interaction and relative distance. It defines the core components of spatial interaction, including intervening opportunities, which contribute to determining which institutions of higher education certain students are more likely to attend, as well as the concept of complementarity, which indicates students will be less likely to attend one school if another school offers similar services.

Spatial Organization also introduces important concepts of spatial diffusion processes, described as a meshing of spatial and temporal elements of dynamic socio-economic processes (Abler, Adams, and Gould 1971). Expansion diffusion processes have played a role in the establishment of the early colleges and universities in Texas. This conceptual framework also identifies several potential barriers and carriers, which tend to influence spatial diffusion patterns. Accessibility to a transportation network acts as a major carrier to diffusion, as the construction of the rail network in Texas greatly aided the expansion of colleges and universities.

In *Innovation Diffusion* Brown (1981), emphasizes an alternative conceptual perspective of diffusion, observing the innovation diffusion process from the supply side.

By shifting the focus back to the innovating agency before diffusion, this research highlights the innovation life cycle, broken down into phases of introduction, growth, maturity, and decline. The innovation life cycle appears to apply to the colleges and universities of Texas, with some of the state's oldest institutions struggling to exist while relatively new institutions are growing to become among the largest in enrollment. Brown's work applies to the diffusion of university hinterlands when considering the origin of colleges and universities as an innovation process, with the state government and other private entities acting as supply-side facilitators.

More recent research has offered commentary on the various aspects of diffusion, such as in the development of a retail market area (Allaway et al. 1994). This work contrasts the temporal diffusion process as described by Rogers (1962) with Brown's (1981) perspective. Allaway and his colleagues state the "early adopter, early majority, late majority, and laggard" categories of the population devised by Rogers relate closely to the innovating firm Brown mentioned in his research. In such a relationship, the early adopters will be more likely to receive the marketing firm's marketing efforts, with the laggards being the last group to apply the message. Similarly, as the drawing power of a university diffuses spatially, potential new students will adopt the recruitment innovation employed by that university over time.

A further extension of diffusion theory germane to this research can be found in a study on the diffusion process of Wal-Mart (Graff and Ashton 1993). The authors observe a reverse hierarchical diffusion process, in which Wal-Mart's first stores remained confined to towns with small populations, establishing themselves in a rural setting, before expanding into larger markets. Reverse hierarchical diffusion appears to

prevail in the establishment of the first colleges and universities in Texas, with many of the initial institutions originating in small towns before relocating to larger markets.

Edward Taaffe (1997) provides conceptual discussion on spatial organization that links individuals, cities, regions, and nations. The recognition of these linkages has led to a greater emphasis on interdependence, which has become a basis for identifying functional regions, or hinterlands. A growing concern for the study of various hinterlands reinforces the need to examine the linkages and other factors underlying the spatial properties of university hinterlands in Texas.

Methodology

The percent share of enrollment of all the major Texas universities will be measured and mapped by county for each of the universities. By examining the spatial patterns of percent share of enrollment, dominance trends should show from which parts of the state certain universities have strong attraction, as well as the counties from which those universities have low drawing power.

Of the eight universities that were contacted, Texas State University provided the most comprehensive enrollment dataset. Starting in 1983, the Texas State University dataset contains student enrollment by county for each fall semester from 1983-2005. Diffusion data of Texas State's hinterland will be analyzed with trend analysis, which will examine the spatial and temporal aspects of the enrollment data.

Variables expected to have an association with the drawing power of the universities will be tested in a series of eight multivariate regression analyses, one for each of the major universities, in order to determine which variables are most influential for each

institution. The dependent variable will be the percent share of students enrolled by county at each of the eight major universities in this study. The independent variables will be broken into six categories, with each variable possessing an expected relationship with the dependent variable (Table 1).

Table 1- List of Independent Variables and Categories			
Category	Conceptual Variable	Operational Variable	Expected Relationship with Dep. Var
Geographic	distance	distance in miles from county centroid to school	inverse
	distance to intervening opportunities	distance in miles from county centroid to next closest school	positive
	proximity to satellite campuses	distance in miles from county centroid to satellite campus	inverse
Economic	median county income	median county income	positive
Cultural	conservatism of county	percent in county who voted for Bush in 2004 election	will vary for each school
	percent Anglo	percent Anglo	will vary for each school
	percent Hispanic	percent Hispanic	will vary for each school
	land use	percent agricultural land in county	will vary for each school
Demographic	land use	percent cotton land in county	will vary for each school
	population	county population for 2000 Census	positive
	density	2000 Census population divided by area in square miles	will vary for each school
Historical	rate of change	1990 Census population subtracted from 2000 Census	positive
	relative county age	difference in years between establishment of county and school	inverse
Educational	higher education	percent of population over 25 with a college degree	positive

This study will analyze Texas at the county level, including data for the 254 counties of Texas. County-level analysis is often effective due to the tendency for spatial patterns to emerge that might otherwise be lost on larger or smaller scales. Most counties in Texas have relatively homogenous characteristics, allowing meaningful aerial studies of variation across Texas counties.

Due to the lack of literature directly related to the geographic aspects of colleges and universities, this study is exploratory in nature, seeking to generate new hypotheses and identify spatial patterns and relationships that have not received much attention. However, before examining current patterns, it is necessary to review the history and initial diffusion process of colleges and universities in Texas.

CHAPTER II

HISTORY AND DIFFUSION OF TEXAS UNIVERSITIES

The state of Texas consists of 254 counties, more than any other state. As a result, keeping track of where each one is located is difficult. This work will refer to several counties, but they will not always be labeled, due to the complexities of the maps in this study, many of which contain detailed thematic information and other additional labels. Therefore, a map displaying the names of every county can be useful for reference (Figure 2).

Although 56 county seats share the exact name as their county, 24 county seats have the same name as that of another county (Kelsey and Dyal 1993). Most of these county seats are of no consequence to this study, but some will be mentioned and could use clarification. In addition, several county seats or other major cities have names other than the counties in which they reside. Many of these counties will be mentioned in this study, so understanding which urban areas are located within them will provide clarification (Table 2).

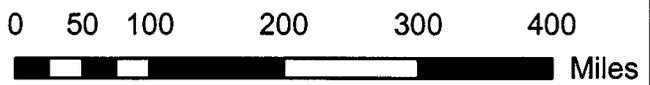
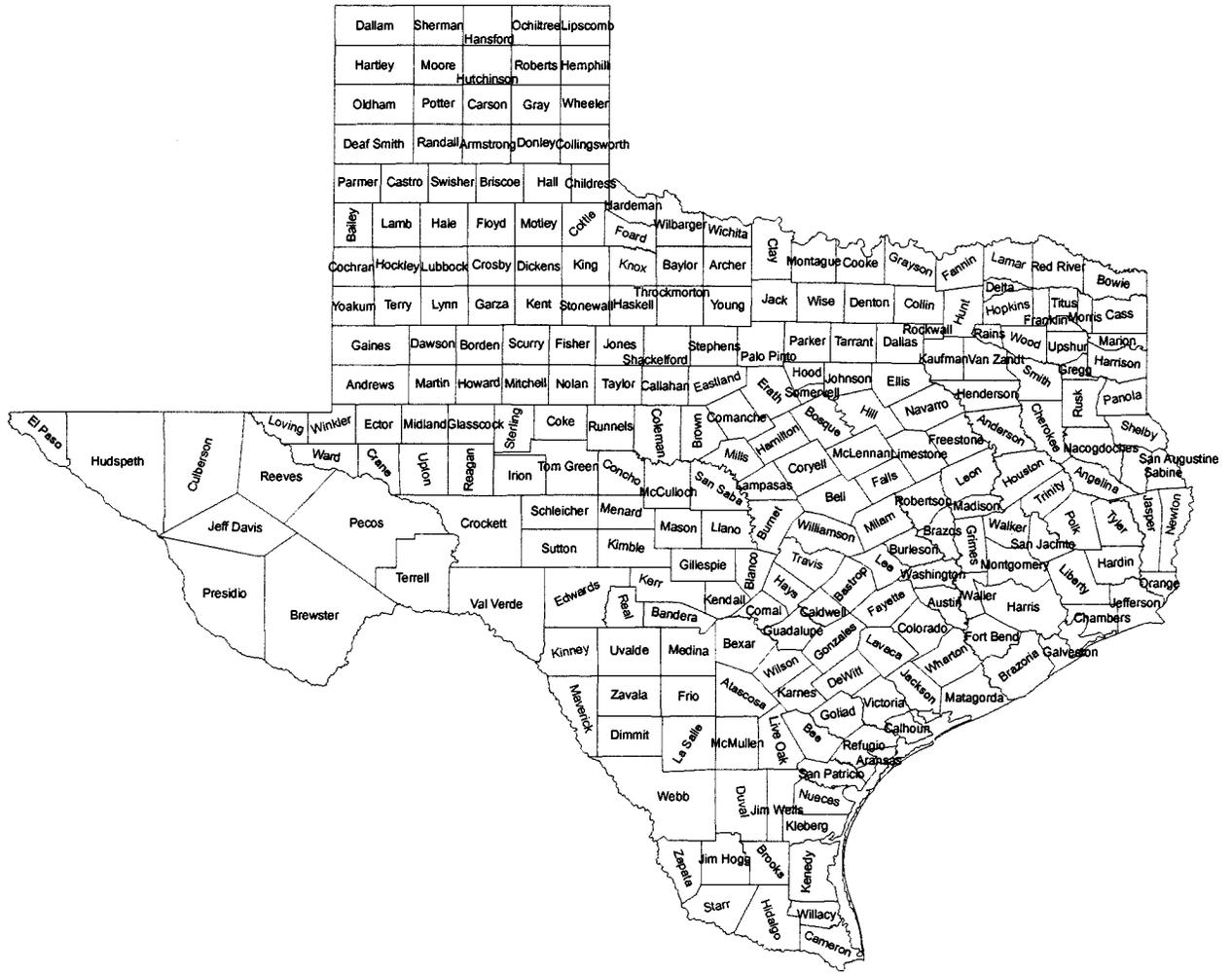


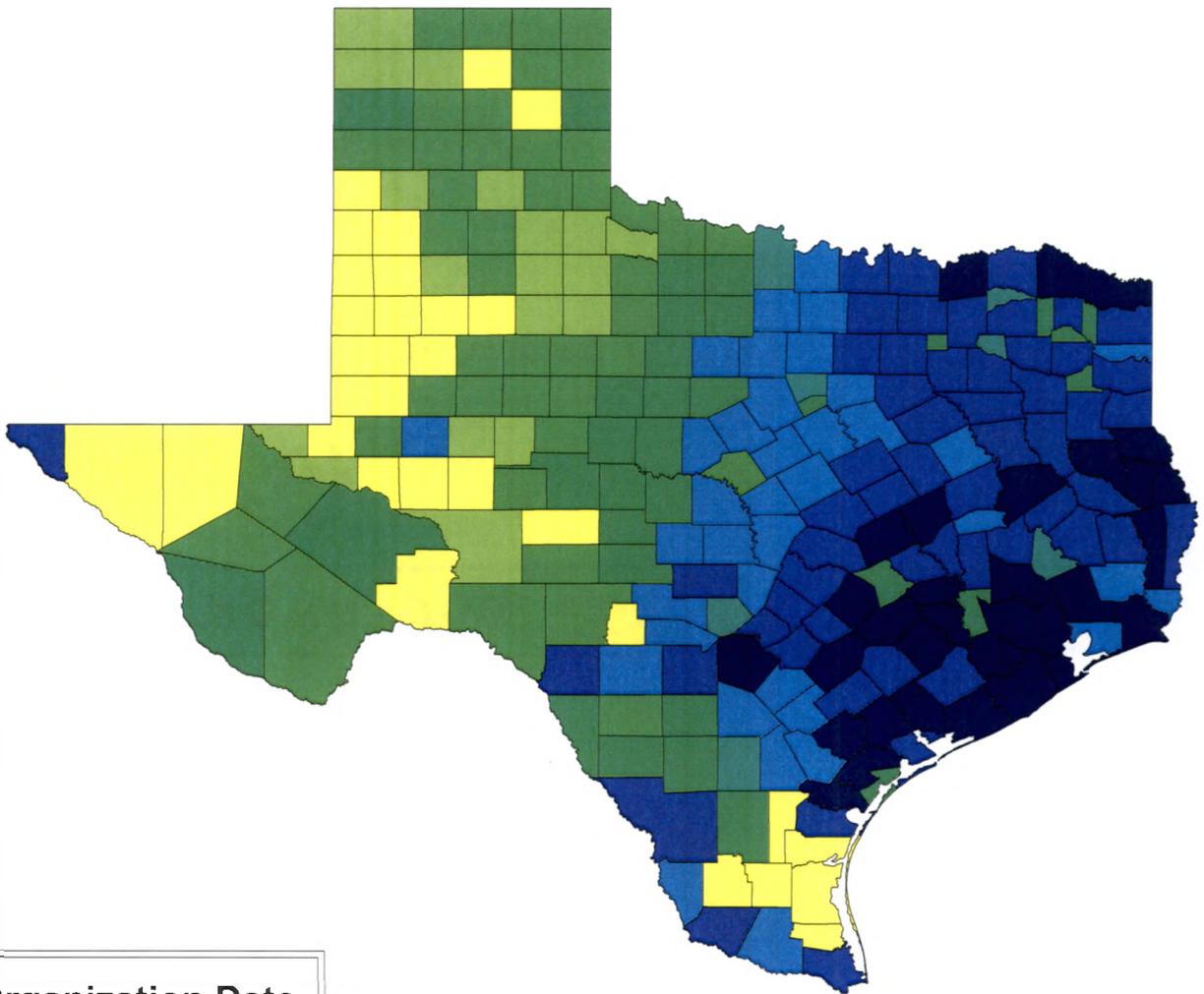
Figure 2. Texas Counties

County	County Seat	Other Urban Area
Austin	Bellville	
Bell	Belton	Killeen-Temple MSA
Bexar	San Antonio	
Bowie	New Boston	Texarkana
Brazoria	Angleton	Houston-Galveston-Brazoria CSMA
Brazos	Bryan	Bryan-College Station MSA
Cameron	Brownsville	Brownsville-Harlingen-San Benito MSA
Collin	McKinney	Dallas-Fort Worth CSMA
Coryell	Gatesville	Copperas Cove
Dallas	Dallas	
Denton	Denton	Dallas-Fort Worth CSMA
Ector	Odessa	Midland-Odessa MSA
El Paso	El Paso	
Ellis	Waxahachie	Dallas-Fort Worth CSMA
Fort Bend	Richmond	Houston-Galveston-Brazoria CSMA
Galveston	Galveston	Houston-Galveston-Brazoria CSMA
Grayson	Sherman	
Gregg	Longview	
Harris	Houston	
Hays	San Marcos	Austin-San Marcos-MSA
Hidalgo	Edinburg	McAllen-Edinburg-Mission MSA
Houston	Crockett	
Hunt	Greenville	Commerce
Jefferson	Beaumont	Beaumont-Port Arthur MSA
Johnson	Cleburne	Dallas-Fort Worth CSMA
Lubbock	Lubbock	
McLennan	Waco	
Midland	Midland	Midland-Odessa MSA
Montgomery	Conroe	Houston-Galveston-Brazoria CSMA
Nueces	Corpus Christi	
Parker	Weatherford	Dallas-Fort Worth CSMA
Potter	Amarillo	
Randall	Canyon	Amarillo MSA
Rockwall	Rockwall	Dallas-Fort Worth CSMA
Smith	Tyler	
Tarrant	Fort Worth	Dallas-Fort Worth CSMA
Taylor	Abilene	
Tom Green	San Angelo	
Travis	Austin	
Walker	Huntsville	
Waller	Hempstead	Prairie View
Webb	Laredo	
Williamson	Georgetown	Austin-San Marcos-MSA

The first successful attempts at offering higher education to the population of Texas arose approximately 160 years ago from the private sector in the form of religiously affiliated colleges and universities. These schools formed, in large part, following the typical pattern of expansion diffusion, which follows the basic concept that the means to accessibility must first diffuse before the innovations (Abler, Adams, and Gould 1971). In the case of the universities in Texas, the spatial distribution of natural commodities and water resources determined the location of population centers, which then determined the allocation of the first rail, and eventually road networks. Only after the arrival of the rail network did most of the private schools and all of the public schools begin to diffuse. Thus, institutions of higher education provided a higher order, specialized good with a high market threshold (Abler, Adams, and Gould 1971) that only a few of the state's largest and wealthiest cities could initially support.

Colleges and universities established themselves in Texas in a spatial process similar to that of the initial settlements, initially concentrating just south of the central part of the state (Figure 3). Some of the counties organized during the first year of statehood were hosts to the state's first colleges and universities.

In 1853, the predecessor to the Missouri Pacific Railroad Company constructed the state's first 20 miles of rail in Houston. The railroad became such a useful innovation as the transportation mode of choice that Texas soon had more miles of rail than any other state, with new networks redefining urban form and settlement patterns. With few exceptions, a town would receive its first institute of higher education within a few years after the first railroads arrived. Austin College moved from Huntsville to Sherman in



Organization Date

-  1836 - 1840
-  1841 - 1850
-  1851 - 1860
-  1861 - 1870
-  1871 - 1880
-  1881 - 1890
-  1891 - 1900
-  1901 - 1927



Figure 3. Organization Dates of Texas Counties

1876, three years after the first two railroads arrived in 1873. Mary Hardin-Baylor moved to Belton in 1886, five years after the Gulf, Colorado, & Santa Fe Railroad reached the town in 1881. The Houston & Texas Central Railroad linked Houston to Bryan in 1867, passing through what is now College Station, where the State placed Texas A&M in 1872. The Pecan Valley Baptist Association established Howard Payne in Brownwood in 1889, four years after the Gulf, Colorado, & Santa Fe Railroad arrived in 1885. And Sul Ross State appeared in Alpine in 1917, four years after the arrival of the first railroad.

Due in part to its location not lying directly between the major eastern rail towns and the West Coast, the railroads of Texas appeared relatively late in comparison with other areas of the United States (Zlatkovich 1981). Additional factors also may have contributed to the slow development of rail infrastructure, and consequently institutions of higher education, in Texas. The unsettled nature of the region in the years both preceding and following the war with the Mexico for independence, as well as the chronic confrontations between settlers and Comanche Native Americans, undoubtedly played a role in delaying the rise of colleges and universities (Southwestern University website).

Several colleges that received charters from the Republic and later from the State were ultimately unsuccessful. The historical section of Southwestern University's website lists four root institutions that suffered from unfortunate consequences. Ruterville College, a school founded by Methodists, located six miles north of La Grange, predates all existing institutions with a founding date of 1840. However,

disagreement and scandal forced Ruttersville to close in 1856 (Southwestern website). The other Methodist predecessor schools include Wesleyan College in San Augustine (1844-1847), McKenzie College in Clarksville (1845-1861), and Soule University near Brenham (1854-1887). Institutions of higher education founded by other religious groups early in Texas history met similar fates. In addition, countless schools never received official charters from the Republic or the State. Therefore, these schools are not included in this study.

Similar to the earliest colleges that ultimately failed, all of the first colleges and universities that have survived were and still are privately funded (Table 3). From 1845 to 1871, Texas saw the establishment of six surviving institutions of higher education, all of which are affiliated with a Christian denomination. These schools originated in what was the economic and demographic center of the state at the time (Figure 4), farther east and south of what has become the focal point of Texas today.

Located approximately 85 miles northwest of Houston and a mere 13 miles west of Washington on the Brazos, where in 1836 the Texas Declaration of Independence became a reality, the small town of Independence received the first institute of higher education in Texas still in existence. Established by the Union Baptist Association in 1845, Baylor University has the only college charter still remaining that was chartered by the Republic of Texas. The school thrived and was divided into male and female schools in 1851. Independence was the wealthiest community in Texas during Baylor's first years of existence (Augustin and Pitts 2001). However, in 1860 the Houston & Texas Central Railroad bypassed Independence, ultimately causing university officials to desire

a less remote location. In 1886, the men's college moved to Waco and the women's college moved to Belton, and subsequently became Mary Hardin-Baylor.

Table 3: The First 21 Colleges and Universities in Texas Still in Existence

Established	Original Name	Original Location	Current Name	Current Location	Funding	
1	1845	Baylor University	Independence	Baylor University	Waco	Baptist
2	1849	Austin College	Huntsville	Austin College	Sherman	Brazos Presbytery
3	1852	St Mary's College	San Antonio	St Mary's University	San Antonio	Catholic Marianist
4	1854	New Danville Masonic Female Academy	Kilgore	Lon Morris College	Jacksonville	United Methodist
5	1866	Baylor Female College	Independence	University of Mary Hardin-Baylor	Belton	Baptist
6	1869	Trinity University	Tehuacana	Trinity University	San Antonio	Presbytenan
7	1872	Agricultural and Mechanical College of Texas	College Station	Texas A&M University	College Station	State of Texas
8	1872	Paul Quinn College	Dallas	Paul Quinn College	Dallas	African Methodist
9	1873	Addran Male and Female Academy	Thorp Springs	Texas Christian University	Fort Worth	Disciples of Christ
10	1873	Wiley College	Marshall	Wiley College	Marshall	Freedman's Aid Society
11	1875	Texas University	Georgetown	Southwestern University	Georgetown	United Methodist
12	1875	Huston-Tillotson College	Austin	Huston-Tillotson University	Austin	Methodist, Church of
13	1876	Alta Vista Ag and Mech Coll of Texas for Colored Youth	Prairie View	Prairie View A&M University	Prairie View	State of Texas
14	1878	St Edward's Academy	Austin	St Edward's University	Austin	Catholic
15	1879	Sam Houston Normal Institute	Huntsville	Sam Houston State University	Huntsville	State of Texas
16	1881	Academy of the Incarnate Word	San Antonio	University of the Incarnate Word	San Antonio	Catholic
17	1883	University of Texas	Austin	University of Texas at Austin	Austin	State of Texas
18	1889	East Texas Normal College	Pans	Texas A&M University-Commerce	Commerce	State (after 1917)
19	1889	Howard Payne College	Brownwood	Howard Payne University	Brownwood	Pecan Valley Baptist
20	1890	Texas Normal College and Teacher Training Institute	Denton	University of North Texas	Denton	State of Texas
21	1890	Texas Wesleyan University	Fort Worth	Texas Wesleyan University	Fort Worth	United Methodist

In 1849 the Brazos Presbytery received a charter to create Austin College in Huntsville, a small town approximately 70 miles north of Houston and 50 miles northwest of Independence. Modeled after Princeton University, this college claims to be the oldest school in Texas still operating under its original charter (Austin College website). Like Baylor, Austin College also moved northwest from its original location. In 1876, the school relocated to Sherman, approximately 65 miles north of Dallas. The

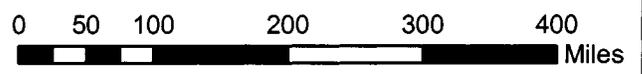
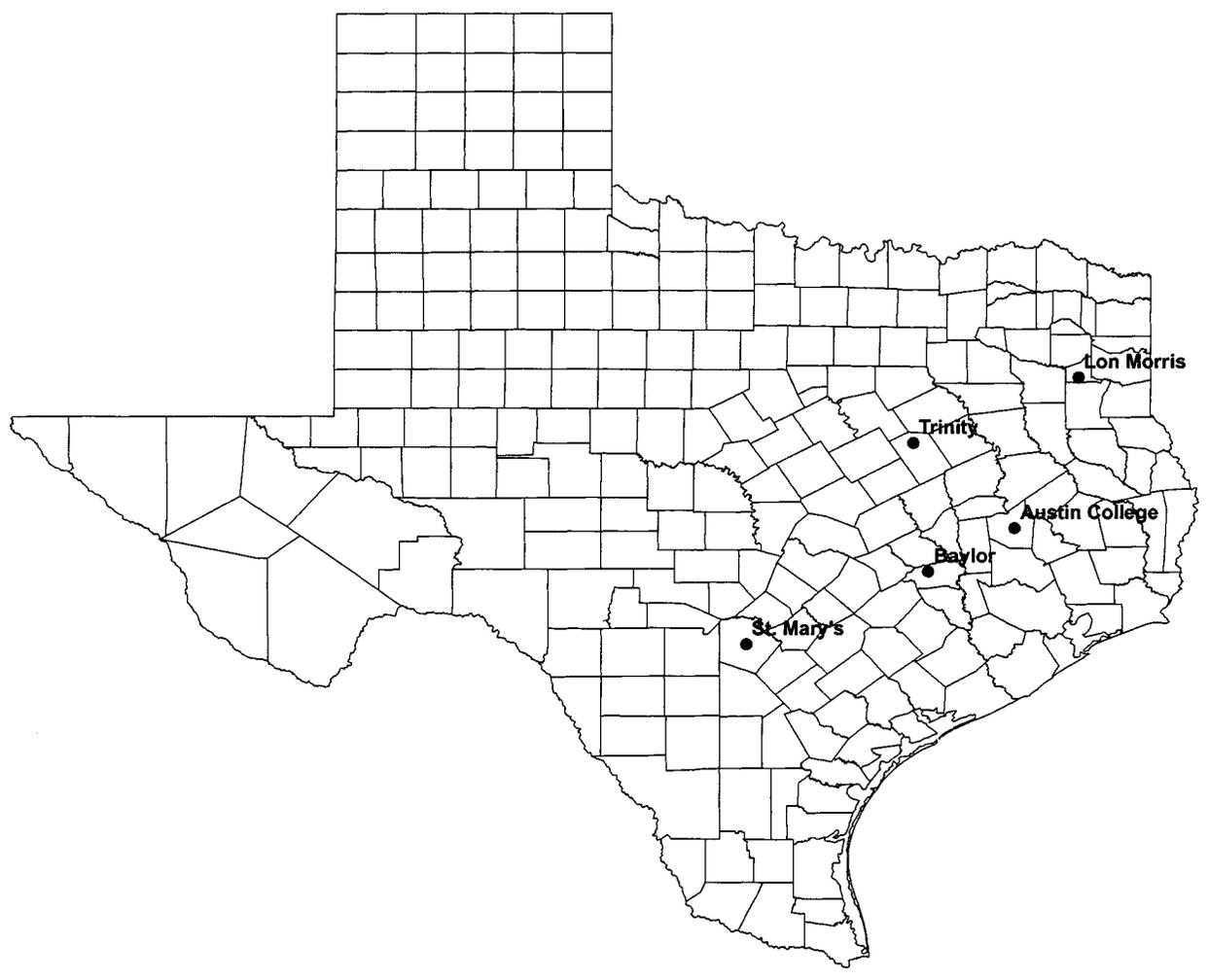


Figure 4. Colleges and Universities in 1870
All colleges and universities were privately funded in 1870.

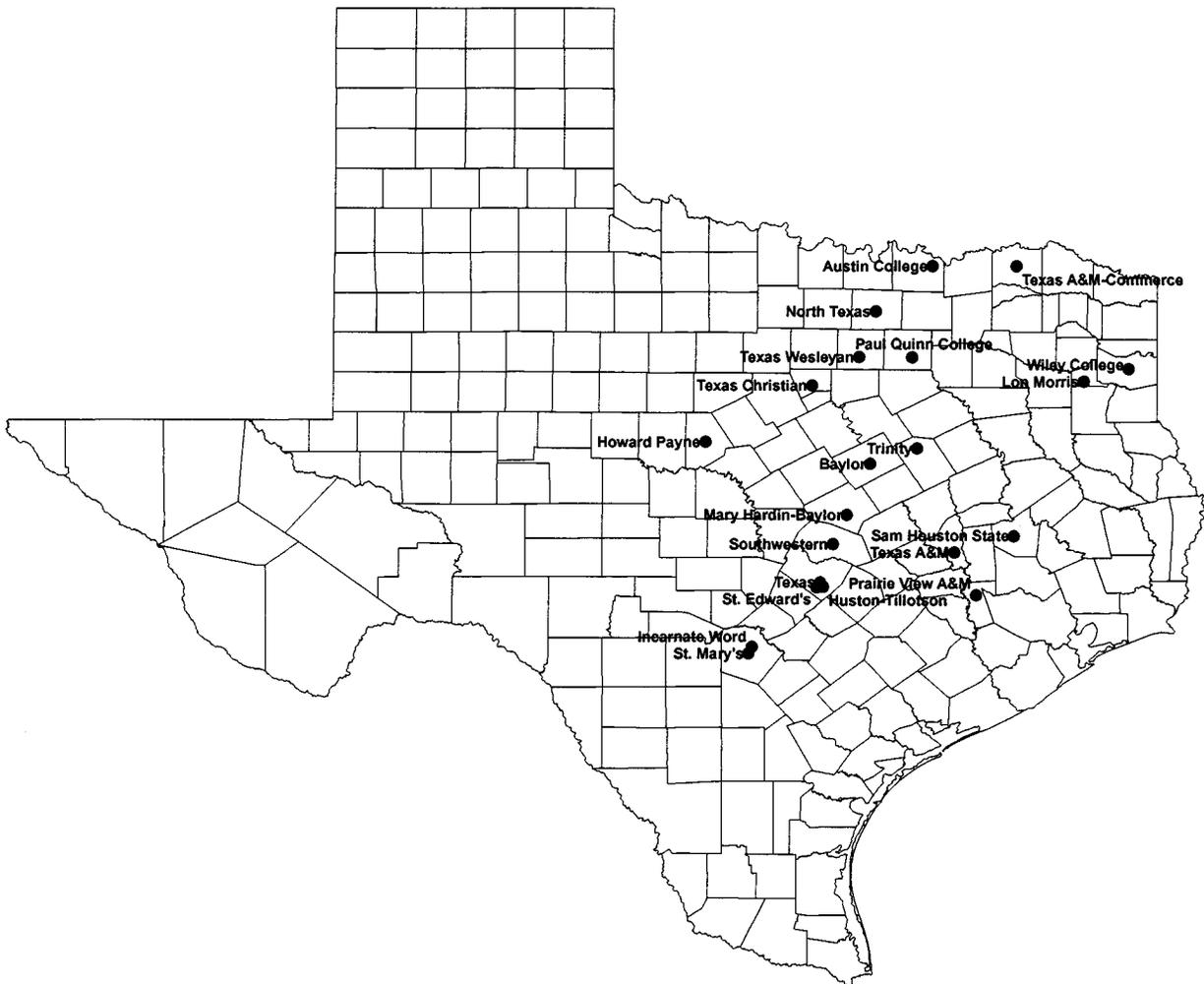
college considered Sherman a more promising location (Austin College website), likely due in part to the arrival of two railroads to the town three years earlier in 1873.

Privately owned institutions also developed in San Antonio, which at the time was the largest city in Texas. In 1852 the Catholic Marianists established St. Mary's University to support the large Catholic population of San Antonio. In 1869, Presbyterians founded Trinity University in Tehuacana, a small town 40 miles east of Waco. In 1904, the university moved to Waxahachie, approximately 30 miles south of Dallas, before eventually relocating to San Antonio in 1952. By that time, San Antonio had received two other private institutions, University of the Incarnate Word in 1881, and Our Lady of the Lake University in 1895.

Another of the first colleges originated near Kilgore, approximately 120 miles east of Dallas, in 1854. The United Methodist Church established the New Danville Masonic Female Academy, the first Methodist institution and oldest two year college in Texas. After a series of name changes, the school ultimately became Lon Morris College and moved to Jacksonville, south of Tyler, in 1894.

Texas' earliest colleges originated in or near the oldest and most established counties, with most of them relocating west towards railroads. The Civil War put a temporary halt to the creation of new universities, and to settlement expansion as well. Not until well into Reconstruction would another wave of universities follow the first (Figure 5).

All of the first six institutions of higher education still in existence today receive their funding from private sources. Despite the fact that the Republic of Texas authorized the allocation of 50 leagues of land to support the creation of two universities in 1839, the



Source of Funding

- Private
- State

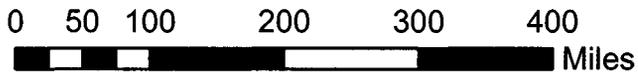


Figure 5. Colleges and Universities in 1890

state played no direct role in the creation or funding of colleges or universities for over 30 years, limited merely to granting charters to private schools. In 1862, The United States Legislature passed the Morrill Act, which gifted states with land grants to sell, creating endowments for certain types of universities. Once returning to the Union after the Civil War, Texas became eligible to receive the land grant benefits of the Morrill Act. Not until the state legislature created the Agricultural and Mechanical College of Texas in 1872 did the state alter its relationship from that of merely granting charters to becoming directly involved in creating and controlling institutions of higher education.

Sixteen years before Baylor left Independence, the State of Texas allocated land for its first public university, what would later become Texas A&M University, less than 30 miles to the northeast, in College Station. Perhaps the proximity of the Agricultural and Mechanical College of Texas to Baylor, combined with its direct access to the Houston & Texas Central Railroad, saturated the local market and accelerated Baylor's departure from the area.

In 1876, the state established a second school by way of land grant, Alta Vista Agricultural and Mechanical College of Texas for Colored Youth. The college, now known as Prairie View A&M University, was the first state supported college for African Americans in Texas (Prairie View A&M website), and shares multiple commonalities with Texas A&M. In addition to both being land grant universities, both focused on degree programs in agriculture, appealing to a predominantly rural population. Despite being only 50 miles apart, the two schools avoided market saturation by their complementarity, each offering education to different racial groups.

The third public institution arose to serve a market that once had a college. Three years after Austin College left Huntsville, Sam Houston State University took its place and distinction as the closest non African American school to Houston, one of the largest cities in the state. SHSU has always had a close relationship with the city of Houston, benefiting greatly from its recent population growth. SHSU is now the 11th largest university in Texas, with 14,333 students, of whom 4,586 come from Harris County (THECB 2004).

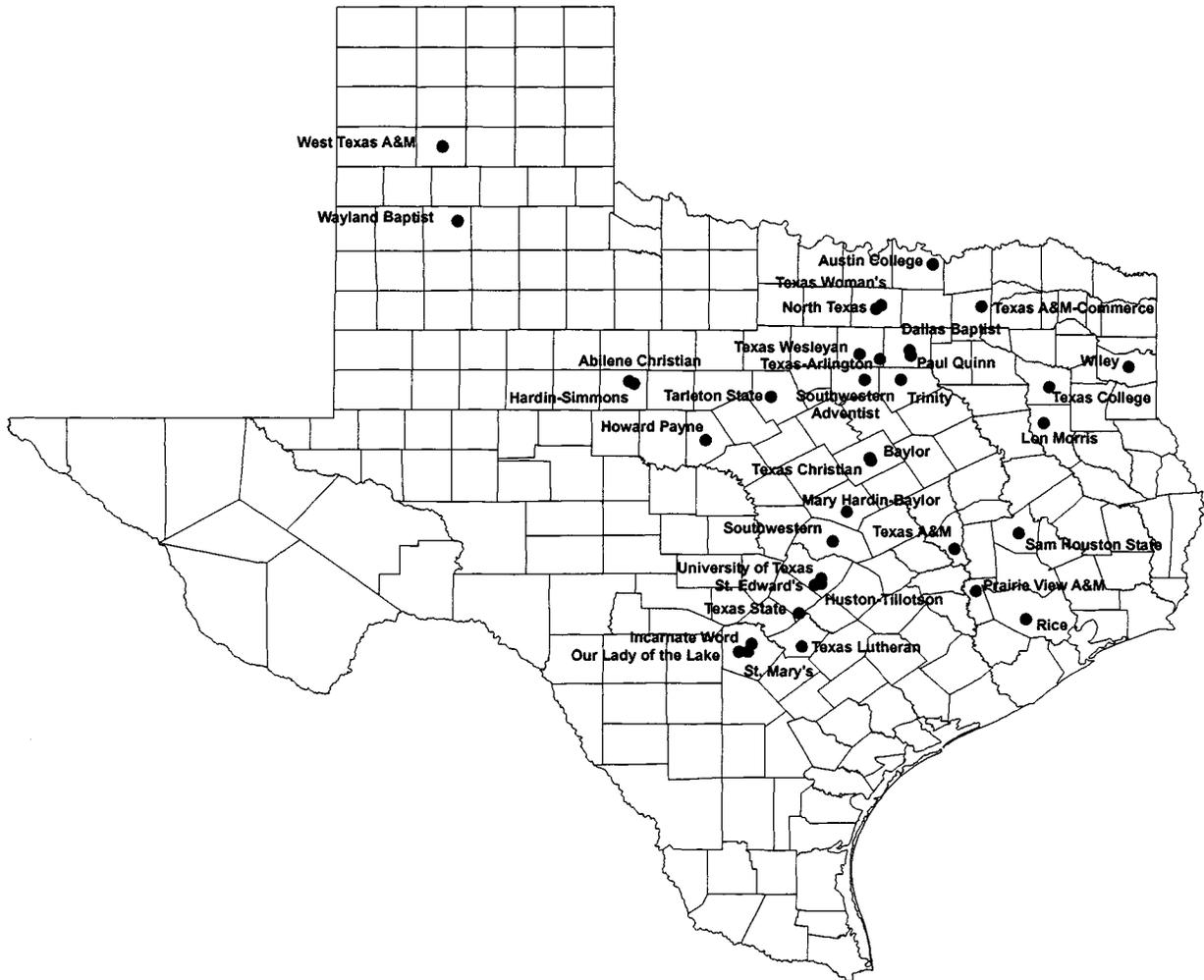
The state created its fourth university and third by way of land grant at a location significantly west of Texas A&M, Prairie View A&M, and Sam Houston State University. Just as the decision to make Austin the state capital was an ambitious and forward thinking decision designed to encourage westward expansion (Meinig 1969), the location of the University of Texas was chosen with the intent for it to serve as the capital of higher education in Texas. Located in the state capital of Austin, the University of Texas has become the largest and arguably most prestigious school in the state, with eight colleges and seven schools offering 170 graduate degree programs, a presidential library, and is the flagship university in a system of eight other universities.

Private religious and scholarly entities remained prolific during the 1870s and 1880s as well, establishing 10 new colleges and universities. In 1889, Howard Payne University was established in Brownwood, the first school to open west of the main rail corridor linking San Antonio to Fort Worth. The state also established two normal, or teaching, colleges in 1889 and 1890 that would later become Texas A&M University-Commerce and the University of North Texas, respectively.

The period between 1890 and 1910 saw continued expansion beyond the well-established parts of the state among the privately funded colleges, generally followed by the establishment of a few state institutions (Figure 6). In addition to the creation of 5 private schools east or along the main rail corridor, schools began to emerge in the western portions of the state. Abilene received Baptist-funded Hardin Simmons in 1891, making it the westernmost institute of higher education, a distinction it held for 15 years. In 1906, Wayland Baptist University opened its doors in Plainview, 50 miles from Lubbock and over 150 miles from the nearest college at that time.

As privately owned colleges and universities took the initiative in expanding to previously remote, inaccessible, and sparsely populated areas of Texas, the State gradually followed their lead. Located between Dallas and Fort Worth, the school that eventually would become the University of Texas at Arlington opened in 1895. The State Legislature established Southwest Texas State Normal School in San Marcos in 1899. At the time, it was the southernmost of all public universities, allowing it apparent geographic control over Bexar County and the vast expanse of approximately 35 counties near the border to the south and west, a region it dominated alone until 1917. Only after the recent expansion of public universities in San Antonio and along the border has Texas State seen its drawing power diminish in the southwest.

Other public universities established in this time period include Tarleton State in 1899 in Stephenville, located within 100 miles of Fort Worth, Brownwood, and Abilene, but arriving eight years after all respective private schools in those cities had been established. Texas Woman's University was created in 1901, making Denton the only city with two public institutions. West Texas College was established in 1910. Located



Source of Funding

- Private
- State

0 50 100 200 300 400 Miles

Figure 6. Colleges and Universities in 1910

in Canyon, 20 miles south of Amarillo and 55 miles north of Plainview, the school that would eventually become West Texas A&M has always been the northernmost university in Texas and the only university in the Panhandle.

The expansion of colleges and universities after 1910 would create the general spatial distribution by 1930 that is still recognizable today (Figure 7). The next five publicly funded colleges arose progressively west and south to the geographic extremities of the state. The school that would become the University of Texas at El Paso was established in 1914, and Texas A&M-Kingsville in 1917. Both schools served markets in close proximity to the Mexico border, parts of the state that had long been isolated, without easy access to higher education. Sul Ross State was established in Alpine, 150 miles west of San Antonio, in 1917. That same year Midwestern State was established in Wichita Falls. In 1923, the State Legislature established Texas Technological College, allowing the city of Lubbock to become the major hub of the region. Despite the fact that Texas Tech arrived amidst an apparently well-established higher education structure in West Texas, it became the largest and most prominent university in the region within a few years.

Similar events took place in the eastern half of the state. Stephen F. Austin and Lamar both opened in 1923 in Nacogdoches and Beaumont, 135 and 90 miles from Houston, respectively. Four years later, the University of Houston opened in 1927. Today, Houston is the third largest university in the state, with an enrollment over 35,000 (THECB 2004). What took place that caused such late-coming universities such as Texas Tech and Houston to become so large with such strong statewide attraction and drawing power instead of other, longer-established universities?

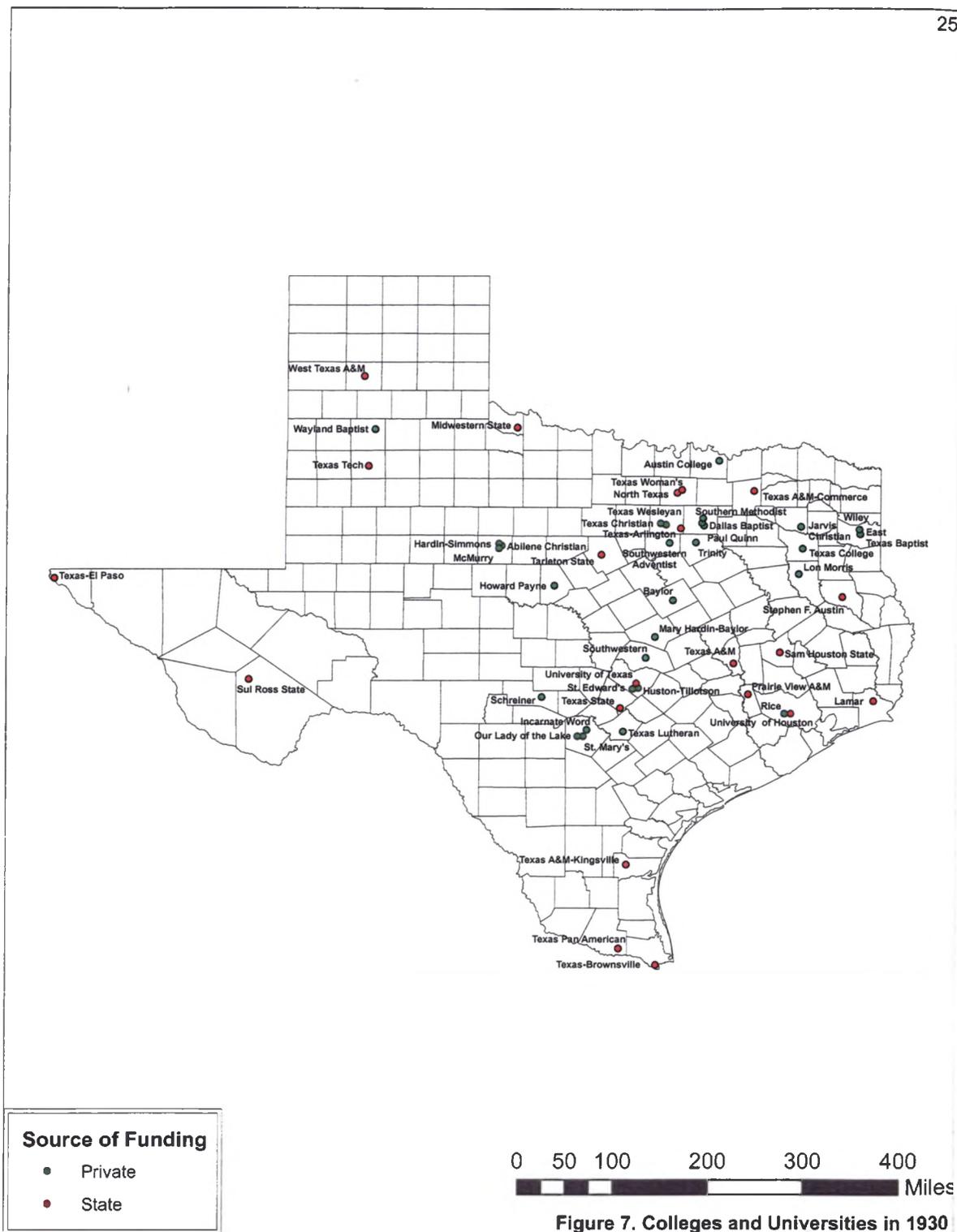


Figure 7. Colleges and Universities in 1930

A partial answer may be found in the creation of the Southwest Conference. Originally named the Southwest Intercollegiate Athletic Conference, it formed in 1914 following a trend that was taking place nationwide. With the increasing popularity of intercollegiate sports like football, schools with a strong interest in sports sought to join conferences to establish more regular and organized competition, and to proliferate their reputations on a statewide and eventually nationwide level. The Southwest Conference charter members were Texas, Texas A&M, Baylor, Arkansas, Oklahoma, Oklahoma A&M (now Oklahoma State), Southwestern University, and Rice. By 1925, Oklahoma, Oklahoma A&M, and Southwestern University had dropped out, replaced by Southern Methodist and Texas Christian.

The SWC became the most prominent athletic conference in Texas, and it carried its members to greater prestige as intercollegiate sports shifted from a matter of popularity to a matter of emphasis. The emergence of radio and later television coverage of sports brought even more exposure to those schools in the SWC while all of the other schools of Texas remained outside the spotlight. The conference expanded to nine with the addition of two schools not even in existence when the SWC was created. Texas Tech joined in 1958 and Houston joined in 1972.

Disbanded in 1996, the SWC reigned over intercollegiate athletics in Texas for over 80 years. After the departure of Arkansas in 1990, the continued expansion of other prominent conferences across the nation made a one-state conference obsolete and unable to compete as it once did (Pfeifle 2001). The four SWC universities that had achieved the greatest recent success, Texas, Texas A&M, Texas Tech, and Baylor, were reunited with the Oklahoma schools as part of the Big 12 Conference.

After almost a century of the existence of athletic conferences in Texas, the gap between the schools that do and do not compete has widened consistently. Some smaller private institutions have never embraced intercollegiate sports and continue their emphasis on academics, maintaining some of the highest admissions standards in the state. However, the schools that did choose to compete have instilled tremendous drawing power throughout the state, in great part explaining why Texas, Texas A&M, Houston, and Texas Tech are now among the top five in enrollment.

But the effects of the SWC do not explain why other universities, such as North Texas, Texas State, and the University of Texas at San Antonio have seen such immense enrollment growth, placing them all in the top seven statewide. One possible explanation for their recent emergence may stem from the same influence the railroad system exerted on the first colleges and universities. The extensive growth of the major metropolitan areas Houston, Dallas-Fort Worth, and the Austin-San Antonio Corridor has created an insatiable demand for higher education opportunities. As a result, schools in close proximity to these major urban areas have seen spiking enrollment, regardless of their lack of reputation or prestige. The dynamically changing urban structure is necessitating a reorganization of the institutions of higher education in Texas.

CHAPTER III

THE RISE OF THE SYSTEMS

Not long after the completion of statewide diffusion of colleges and universities, a few schools began to separate themselves financially and in enrollment. As the sole beneficiaries of the Permanent University Fund, the University of Texas and Texas A&M University were better positioned for a higher magnitude of expansion than the other universities in the state.

Both the University of Texas and Texas A&M envisioned themselves as the flagships of university systems long before the vision became a reality (UT System website). As permitted by the Texas State Legislature, the University of Texas opened a Galveston medical branch in 1891, which eventually moved to Austin. The State Legislature also created what eventually became Prairie View A&M University in 1876, affiliating it with the Texas A&M System from the school's inception. It offered similar degree programs as Texas A&M, but exclusively to Blacks until the school was integrated in 1963. Tarleton State University also joined the A&M System relatively early, in 1917.

The advantages of joining a system meant financial protection at the cost of surrendering most operational and administrative decisions to the flagship university. In addition to these universities with limited autonomy, both the University of Texas and Texas A&M also established various medical, dental, and nursing branches in the large cities. Not until the 1960s would these schools respective systems witness such unforeseen expansion that has created the current structure.

Today, the University of Texas and Texas A&M Systems have assimilated universities and community colleges from all over the state, controlling a combined 19 universities, and enrolling more than 265,000 students (Table 4). The assimilation of smaller schools into the systems appears to represent an attempt of the State Legislature, on behalf of the two systems, to diversify the overall enrollment, both in terms of programs offered, and geographically (Figure 8).

Name	Enrollment	Established	Assimilated
University of Texas at Austin	50403	1883	1883
Texas A&M University	44564	1872	1872
University of Texas at San Antonio	26175	1969	1969
University of Texas at Arlington	25297	1895	1965
University of Texas at El Paso	18918	1914	1919
University of Texas-Pan American	17025	1927	1989
University of Texas at Dallas	14113	1961	1969
Tarleton State University	9021	1899	1917
Texas A&M University-Commerce	8558	1889	1996
Prairie View A&M University	8351	1876	1876
Texas A&M University-Corpus Christi	8234	1947	1989
West Texas A&M University	7314	1910	1990
Texas A&M University-Kingsville	7102	1917	1989
University of Texas at Tyler	5311	1971	1979
Texas A&M International University	4428	1970	1989
University of Texas at Brownsville	4059	1926	1989
University of Texas of the Permian Basin	3347	1969	1969
Texas A&M University at Galveston	1636	1962	1962
Texas A&M University-Texarkana	1542	1971	1996

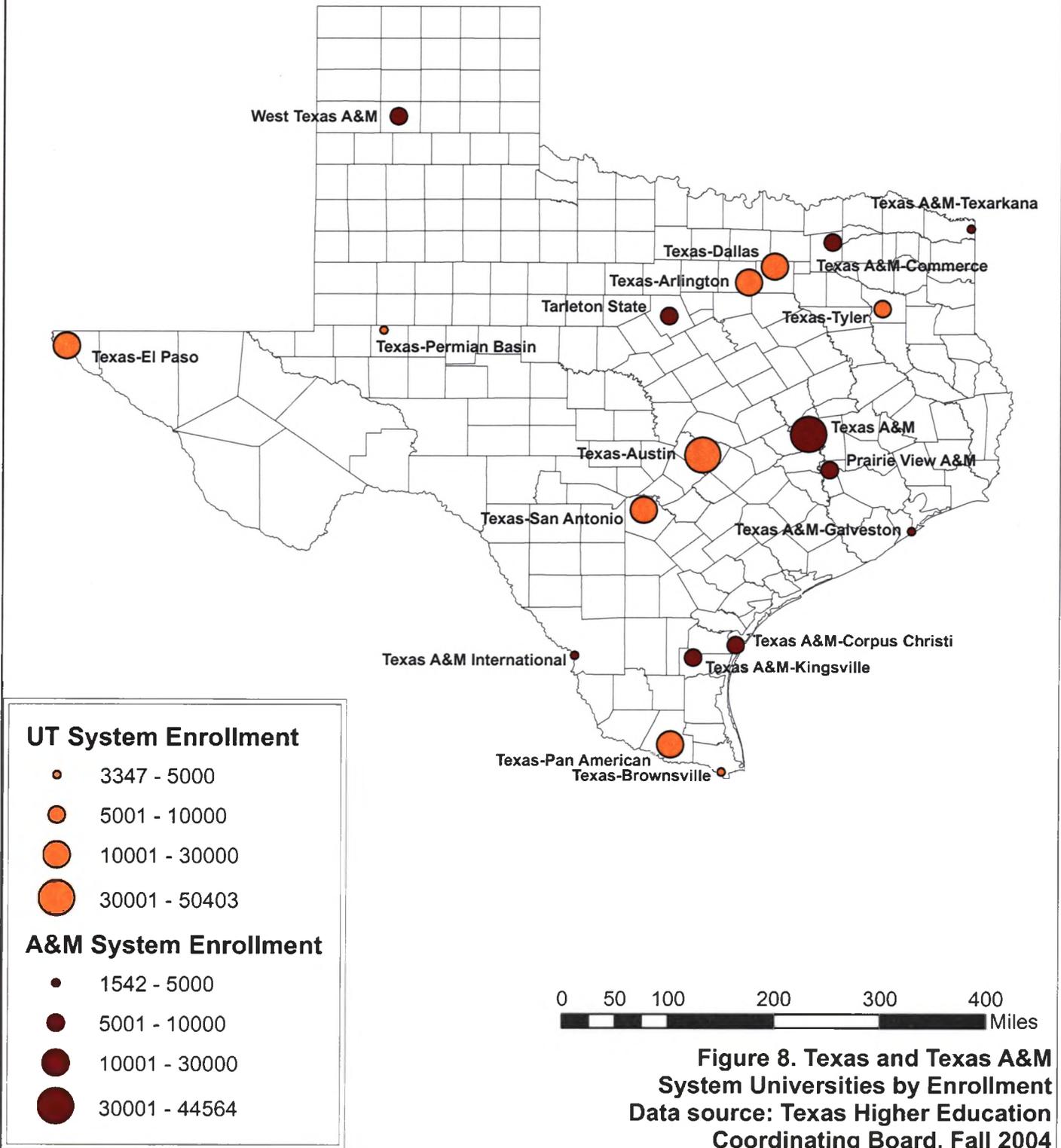


Figure 8. Texas and Texas A&M System Universities by Enrollment
Data source: Texas Higher Education Coordinating Board, Fall 2004

Generally, the University of Texas System developed first, adding the Texas School of Mines and Metallurgy in 1919, which later became the University of Texas at El Paso. In 1965, Arlington State College was dropped from the A&M System and picked up, becoming the University of Texas at Arlington. 1969 proved to be the most prolific year for the University of Texas expansion, when universities in San Antonio, Dallas, and Midland joined. The Midland school was named University of Texas of the Permian Basin. The University of Texas at Tyler joined the system in 1979. And the two most recent additions, the University of Texas at Brownsville and the University of Texas-Pan American joined in 1989. The University of Texas-Pan American is located in Edinburg.

The University of Texas System appears to have expanded in a hierarchical diffusion process, with four of the first five universities to join located in four of the ten largest cities in Texas. Overall, each university in the system is located in an urban setting. Tyler is the smallest of all the cities of the University of Texas System with an MSA population of 174,706 (U.S. Census Bureau 2000).

Despite its early possession of Prairie View A&M and Tarleton State, the Texas A&M University System developed slower, and typically in a reactionary manner, to the development of the University of Texas System. Texas A&M University at Galveston opened in 1962, 35 years after the University of Texas' Medical Branch moved from Galveston to Austin. It was not until 1989 when the Texas A&M System expanded again. That year, the State Legislature added Texas A&M University-Kingsville, Texas A&M University-Corpus Christi, and Texas A&M International University, which is located in Laredo. In 1990, West Texas A&M University joined the system. And in

1996, the two most recent schools, Texas A&M University-Commerce, and Texas A&M University-Texarkana, joined the system.

The Texas A&M University System tended to follow a reverse hierarchical diffusion pattern, initially expanding to small towns. As with the flagship university located in College Station, which was originally an agriculture-based institution, most of the system's schools are located in or near rural, agricultural settings. Only in the 1989 expansion did the A&M System receive schools located in cities with a population larger than 100,000 with Corpus Christi and Laredo (U.S. Census Bureau 2000). The 1989 expansion as a whole saw the addition of five schools, all of which are located in the southern part of the state, within 150 miles of the Mexico border. This expansion by the State Legislature evidently reflects the rapid population growth of the South Texas region, particularly among Hispanics, the ethnic group which higher education officials most want to attract (THECB 2000). The last three expansions may represent the Texas A&M System's attempt to capture the other geographic extremities of the state. Located in Canyon, approximately 20 miles south of Amarillo, West Texas A&M is the northern and westernmost school in the system. The 1996 expansion added two schools in northeast Texas to the system. Interestingly, the addition of Texas A&M-Commerce has made it the third largest component of the Texas A&M System based on enrollment. If the Commerce University were in the University of Texas System, it would only rank seventh. Therefore, as the Texas A&M System expanded to predominantly smaller market areas, it has also created generally smaller schools than of those of the University of Texas System.

Some universities within these two systems have seen rapid enrollment growth in recent years. With a fall 2004 enrollment of 26,175, University of Texas at San Antonio has become the largest tributary university among either of the systems. The university has experienced almost a 32% growth rate since 2001, when the enrollment was only 19,388. Such rapid growth stems from the rapid growth of the San Antonio MSA, which has a population of 1,592,383 and experienced a 20% growth rate in the 1990s (U.S. Census Bureau 2000). As a further incentive for growth, UTSA is the only public school in San Antonio, which has four private religious institutions with a combined enrollment under 20,000. UTSA is also starting to draw from more remote parts of the state, with at least one student from 187 counties in 2004. This enrollment expansion has come at the expense of Texas State University-San Marcos, which has seen enrollment decline from Bexar County and other nearby counties to the south and west. With present growth rates, UTSA should pass Texas State and Texas Tech in the next two years to become among the top 5 universities in enrollment in the state. Such healthy numbers warranted serious consideration for inclusion among the major universities in this study. However, the fact that the majority of its enrollment still comes from Bexar County, combined with its status as a subservient component of the University of Texas System, prevented it from inclusion.

Now ranked eighth in the state, the University of Texas at Arlington has also benefited from its membership of the University of Texas System. With a 2004 enrollment 25,297, it has also seen a strong growth rate since 2001, at 19%. UTA has grown for many of the same reasons as UTSA. Long composed of religious institutions, the Dallas/Fort Worth MSA has traditionally sent its students to more distant universities

in the state, only recently realizing the potential for quality education at the University of North Texas one county north in Denton, and now UTA. Centrally located between Dallas and Fort Worth, UTA's growth has mirrored that of the DFW MSA, which has a population of 5,221,801, a 29% growth rate in the 1990s (U.S. Census Bureau 2000). UTA draws from an impressive 214 counties, but more than two thirds of the enrollment comes from contiguous counties. The geographically local nature of the enrollment, combined with its subservient status in the University of Texas System, also excluded it from this study.

One of the last additions to the University of Texas System, the University of Texas-Pan American is also experiencing rapid growth. UTPA's 2004 enrollment was 17,030, almost a 25% increase since 2001. UTPA is located in Edinburg, one of the largest cities along the Mexico border. The McAllen-Edinburg-Mission MSA has a population of 569,463, growing at a rate of over 48% in the 1990s. Over 94% of UTPA's enrollment comes from contiguous counties (not including Mexico), which indicates it does not yet command a large geographic hinterland. Such a strong growth rate may strengthen their drawing power in the future, but competition with its sister school in Brownsville may prevent both from achieving prominence on a statewide scale.

Of the larger schools among the Texas A&M System, Prairie View A&M has seen the most growth in recent years. With a 2004 enrollment of 8,350, PVAMU has seen almost a 24% increase since 2001. Some of this growth is a result of the nearby Houston MSA, but they also have at least one student from 123 counties, a high number for a relatively small university.

Other large universities in Texas appear to be in the development phases of creating systems to exert greater drawing power and replicate the aspects of success achieved by the University of Texas and Texas A&M. The best example of a developed system is the Texas State University System. Originally formed by the State Legislature in 1911 to control the state's normal, or teacher colleges, the Texas State System enrolls more than 70,000 students today. The system now consists of Angelo State University, Lamar University and three community colleges, Sam Houston State University, Sul Ross State University, Sul Ross State University Rio Grande College, and Texas State University-San Marcos (Table 5).

Name	Enrollment
Texas State University-San Marcos	26799
Sam Houston State University	14370
Lamar University	10756
Angelo State University	6159
Sul Ross State University	1976
Sul Ross State University Rio Grande College	1086

In a sense, this system was created in reverse order relative to the other two major systems, because it was not manifested out of the growth of a single flagship university. Of the schools in the TSUS, Texas State University-San Marcos is almost twice as large as the next largest university at 26,799 in 2004. Texas State's high enrollment and range of degrees offered would suggest it would assume flagship status if the other schools conformed to such a reorganization of the hierarchy, especially considering Texas State is the only university that has approved a name change to reflect the system. In September 2003, the Texas State Legislature approved the name change from Southwest Texas State University to Texas State University-San Marcos. The System Board of Regents also considered changing the name of Angelo State University to Texas State University-San

Angelo in November 2003 on the grounds of marketing analyses that found the university did not have good name recognition on a statewide level. However, the general sentiment voiced by faculty, staff, students, and community supporters was one of disapproval (Angelo State University website), a sentiment apparently reflected at other TSUS universities that do not wish to share part of their identity with other universities.

On the whole, the assimilation process created by the State Legislature has instilled a series of institutional systems that appear to have benefited the overall welfare of the component universities. Enrollment has leveled off at the flagship universities, but their respective systems continue to grow, allowing for increased enrollment on a less direct basis. Some critics say that name changes of conformity represent a loss of integrity contributing to an environment of placelessness (Relph 1976). As a result, students enrolled at these subordinate universities may not have as much pride in their school that is perceived as merely an insignificant part of a bloated whole. Nevertheless, the University of Texas and Texas A&M Systems have increased their marketability by disseminating their respective names throughout the state, and are increasing the ease at which some students can enroll by increasing accessibility to higher education. Such enhanced accessibility should lead to greater student participation, one of the core objectives of the Closing the Gaps Initiative set forth by the Texas Higher Education Coordinating Board (THECB 2000). This increased participation rate promoted by the University of Texas and Texas A&M Systems will cause more recruiting competition among the more established universities in the state, which undoubtedly will lead to spatial changes in the attraction and drawing power of all universities, making the study of the spatial properties of university hinterlands of great importance.

CHAPTER IV

SELECTING THE MAJOR UNIVERSITIES FOR STUDY

As a result of its distinctive size, colorful history, and diverse population, Texas has no shortage of colleges and universities from which to study, including 35 public universities, 39 independent, or privately funded, senior colleges and universities, and two independent junior colleges (THECB 2004). Each institution doubtlessly has a distinctive hinterland, and studying the smaller colleges at a more detailed scale could offer interesting insights at the local level. However, selecting too many universities for a study by county in a state as large as Texas could create confusing results. Therefore, selecting approximately eight schools will provide good contrast without overlap created by other schools with similar spatial hinterlands.

Several geographic and enrollment-based criteria exist to assist in the selection of universities (Table 6). Choosing the largest schools would lead to the study of larger populations of university students and possibly from more distant areas, suggesting the schools with the most enrollment would have the largest hinterlands. However, some of the largest institutions of higher education in the state have the tradition of catering

merely to the local population, serving as schools consisting primarily of commuters from within a large metropolitan area. Schools that were once commuter colleges tend to retain high percentages of enrollment from the local county. Examples include the University of Houston, the University of Texas at El Paso, and the University of Texas at San Antonio.

Another similar criteria for inclusion in this study, the percent of enrollment from the contiguous counties, measures the percent of total enrollment from the local county and the counties sharing a border with the local county. Schools with high contiguous percentages, such as Houston, the University of North Texas, and UTSA, tend to be schools in close proximity to the major metropolitan areas of Houston, Dallas/Fort Worth, and San Antonio, respectively. Generally, these beneficiary schools have seen growth only due to the recent growth of metropolitan areas and are not likely candidates to have significant geographic hinterlands beyond their respective metropolitan areas.

Table 6: Enrollment of Largest Texas Universities by Origin, 2004

University	Enrollment	Tot. Counties	Local County		Contiguous Counties		Texas		Out of State/Foreign	
			Count	%	Count	%	Count	%	Count	%
University of Texas	50377	233	7664	15 0%	9824	19 5%	40694	80 8%	9683	19 2%
Texas A&M University	44435	251	2760	6 2%	3426	7 7%	38511	86.7%	6066	13 7%
University of Houston	35180	185	22438	63 8%	28169	80 1%	31846	90 5%	3334	9 5%
University of North Texas	31155	224	6031	19 4%	19636	63 0%	28041	90 0%	3114	10 0%
Texas Tech University	28325	246	4318	15 2%	5251	18 5%	25364	89 5%	2961	10 5%
Texas State University	26783	230	1921	7 2%	8698	32 5%	25828	96 4%	955	3 6%
University of Texas - San Antonio	26175	187	15021	57 4%	16742	64 0%	24892	95 1%	1283	4 9%
University of Texas - Arlington	25297	214	10667	42 2%	17484	69 1%	22073	87 3%	3224	12 7%
University of Texas - El Paso	18918	92	15588	82 4%	15606	82 5%	16040	84 8%	2878	15 2%
University of Texas - Pan American	17030	75	13997	82 2%	16047	94 2%	16522	97 0%	508	3 0%
Sam Houston State University	14333	183	1288	9 0%	3642	25 4%	13920	97 1%	413	2 9%
University of Texas - Dallas	14092	151	4748	33.7%	8579	60 9%	10335	73 3%	3757	26 7%
Baylor University	13799	198	2315	16 8%	2635	19 1%	11233	81 4%	2479	18 0%
Texas Southern University	11635	116	7073	60 8%	8180	70 3%	10182	87 5%	1453	12 5%
University of Houston - Downtown	11408	62	9391	82 3%	10772	94 4%	10996	96 4%	412	3 6%
Stephen F. Austin State University	11172	187	1483	13 3%	2921	26 1%	10848	97 1%	324	2 9%

Determining the number of Texas counties in which a university records at least one student as part of its enrollment also serves as an effective measurement for selecting schools likely to have large hinterlands. As of fall 2004, Texas A&M University reported

among its enrollment at least one student from 251 out of the 254 counties of Texas. Despite the fact that the University of Texas at Austin has almost 6,000 more students than Texas A&M, it draws students from only 233 counties. Other universities ranking high in total counties include Texas Tech University, Texas State, North Texas, the University of Texas at Arlington, and Baylor University.

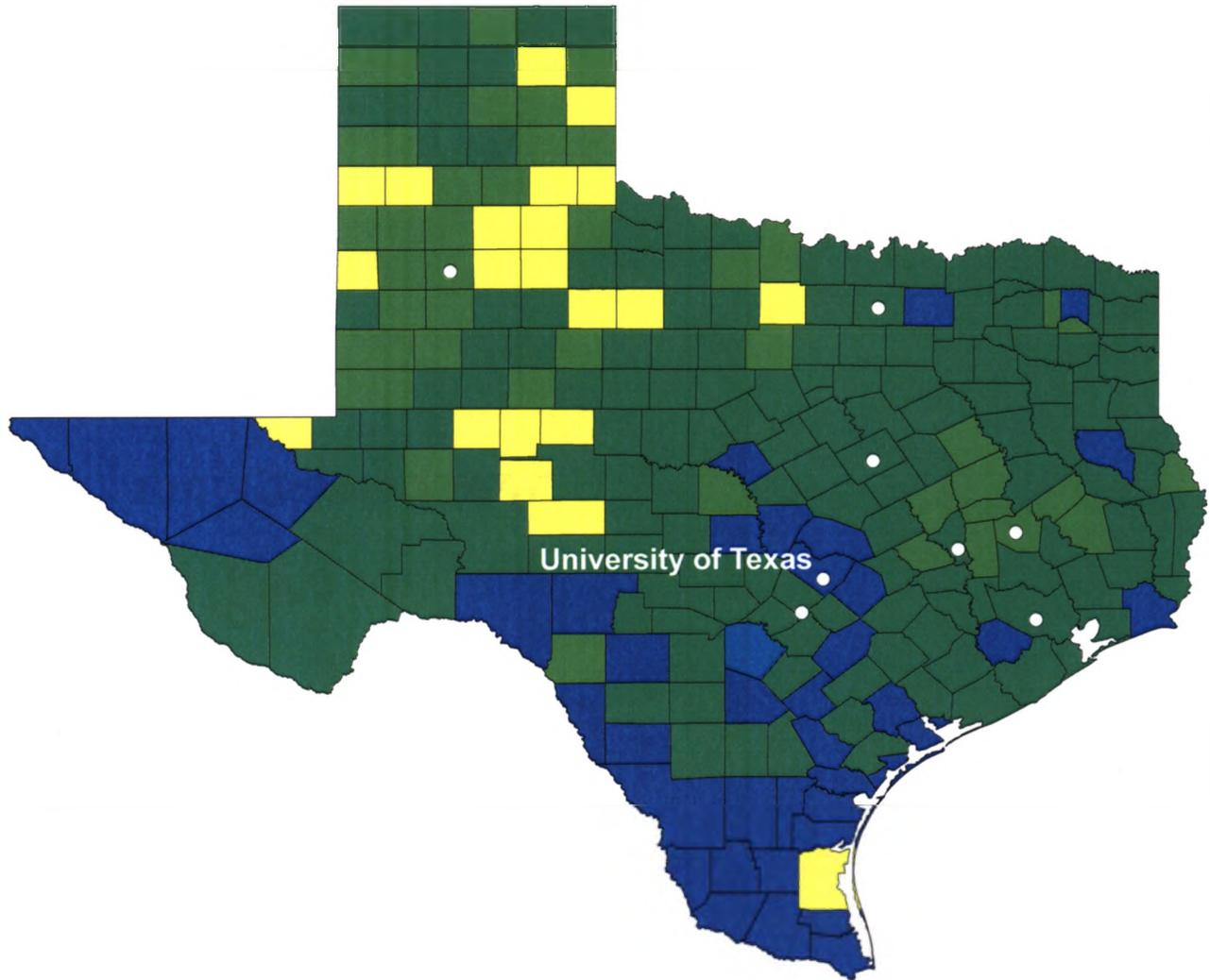
Another factor important to consider for selecting schools with the largest hinterlands is the university's status within its respective system. The University of Texas at Austin and Texas A&M University are both flagship universities in their respective systems, containing nine and ten universities, respectively. Most of these subordinate schools have been recently established and are currently experiencing high growth rates, with UTSA, UTA, UTEP, UTPA, and the University of Texas at Dallas all among the top 12 in enrollment. Some of these schools rank high on the geographic criteria, with UTA and UTSA 6th and 8th in total Texas counties, respectively. However, schools within the same system tend to collaborate instead of compete with the flagship university. Therefore, the 17 subsidiary universities of the Texas and A&M Systems were not included among the major universities in this study of university hinterlands in Texas.

Another similar criteria considered is the university's status in major athletic conference. When the Southwest Conference disbanded in 1996, Texas, Texas A&M, Texas Tech, and Baylor were invited to the Big 12 Conference, which has been designated one of the six major conferences in the nation in most intercollegiate sports. Houston became a charter member of Conference USA, a less prominent conference. Southern Methodist University, Rice University, and UTEP have since joined it as well. Texas Christian University recently moved to the Mountain West Conference, and North

Texas is a member of the Sunbelt Conference, generally considered the weakest Division 1-A conference in football.

Based on the criteria considered, the eight major universities to be included are the University of Texas at Austin, Texas A&M University, the University of Houston, the University of North Texas, Texas Tech University, Texas State University-San Marcos, Sam Houston State University, and Baylor University. Together, these universities comprise the six largest in enrollment and the eight largest among flagship universities. Each school possesses unique attributes which contribute to the construction of a distinct university hinterland.

The University of Texas at Austin is the largest institution of higher education in the state with 50,377 students, and among the largest universities in the nation. The school has 100 undergraduate and 170 graduate degree programs among eight colleges and seven schools, and also houses the Lyndon Baines Johnson Library. As one of the original land grant universities, the University of Texas receives some funding from the Permanent University Fund, which works as an endowment. Despite not having a majority of students from a single county, the University of Texas appears to draw well throughout the state, with high concentrations in El Paso and the Rio Grande Valley (Figure 9). The University of Texas also draws well beyond the state, with almost one fifth of the enrollment coming from out of state or from a foreign country.



Percentage of Major University Students

-  0.0
-  0.1 - 5.0
-  5.1 - 20.0
-  20.1 - 50.0
-  50.1 - 100.0

○ Major Universities

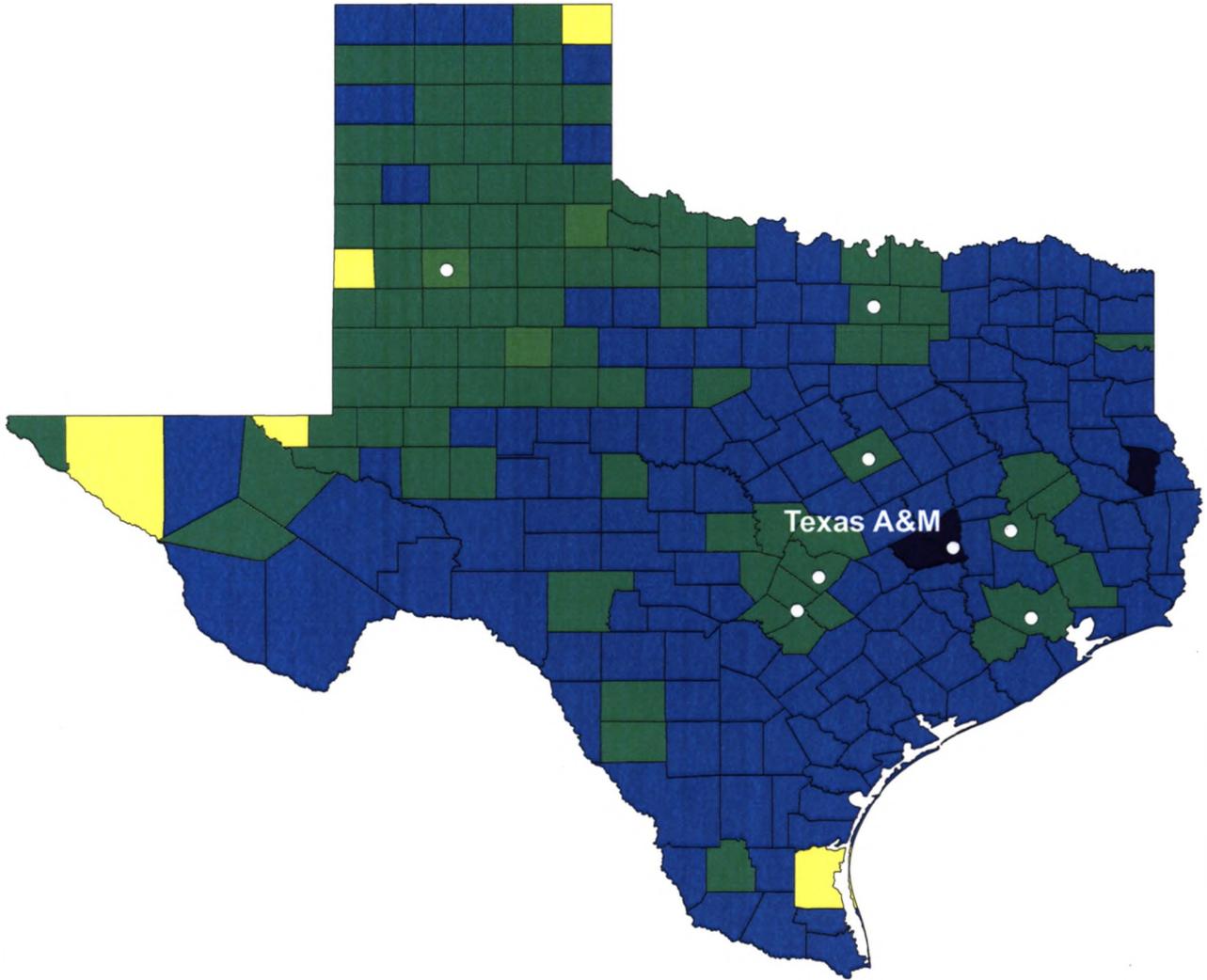
0 50 100 200 300 400 Miles

Figure 9. Percent of Major University Students in County Enrolled at University of Texas, Fall 2004

Established in 1872, Texas A&M University is the oldest public school in the state. Second in enrollment with 44,435 students, Texas A&M ranks high in enrollment criteria, with at least one student from 251 counties in Texas. Texas A&M also receives funding from the Permanent University Fund, due to its status as the state's first land grant university. With ten colleges and the George Bush Presidential Library, Texas A&M is the only other institution in the state other than the University of Texas to house a presidential library. Texas A&M appears to obtain students from northeastern Texas and rural parts of the state (Figure 10), and also draws well beyond the state.

The University of Houston has taken a relatively short amount of time to reach its status as the third largest university in the state, from its start in 1927, to 35,180 in 2004. Established 82 years after the establishment of Baylor, Houston is the youngest school included in this study of the eight major universities. Having always been an institution catering primarily to the city of Houston, two of the University of Houston's three satellite campuses reside in the city. As a result, Houston showed a strong local concentration, with more than 63% of the university's enrollment coming from Harris County. Nevertheless, Houston commands a small but distinct hinterland when compared to the other major universities (Figure 11). Despite only a fifth of the enrollment coming from beyond the contiguous counties, Houston does draw from a respectable 185 counties, certainly evidence to include it in this study.

The University of North Texas has a reputation of marketing primarily to the nearby Dallas/Fort Worth metropolitan area, with both cities approximately 35 miles southeast and southwest, respectively, from Denton. The university's name changes reflect its attempt to capture the lucrative market from the Metroplex, starting with the Texas



Percentage of Major University Students

-  0.0
-  0.1 - 5.0
-  5.1 - 20.0
-  20.1 - 50.0
-  50.1 - 100.0

○ Major Universities

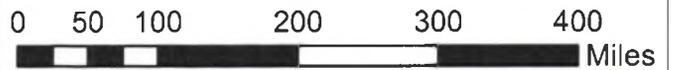
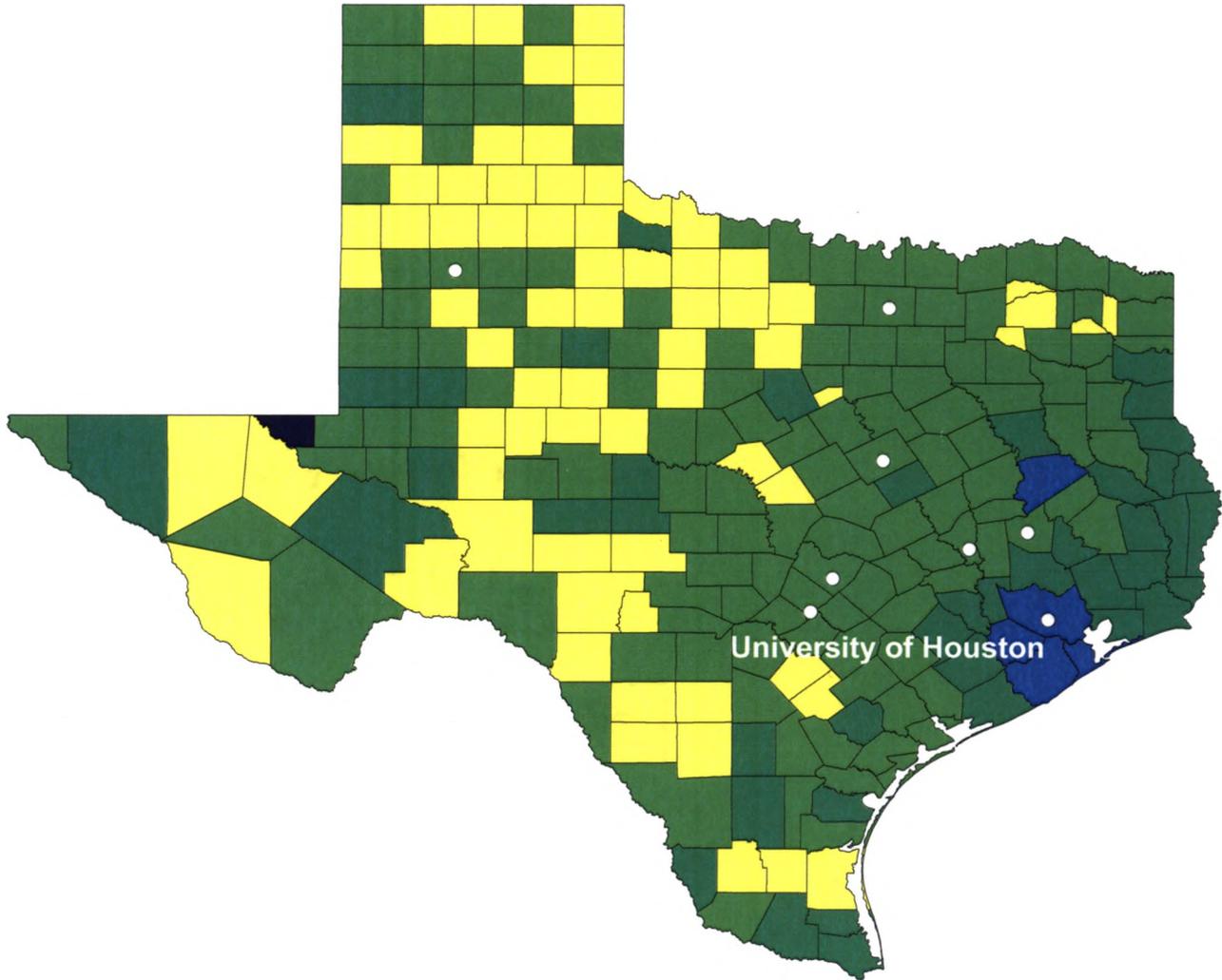


Figure 10. Percent of Major University Students in County Enrolled at Texas A&M University, Fall 2004



Percentage of Major University Students

- 0.0
- 0.1 - 5.0
- 5.1 - 20.0
- 20.1 - 50.0
- 50.1 - 100.0

○ Major Universities

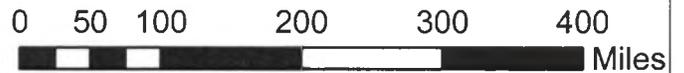
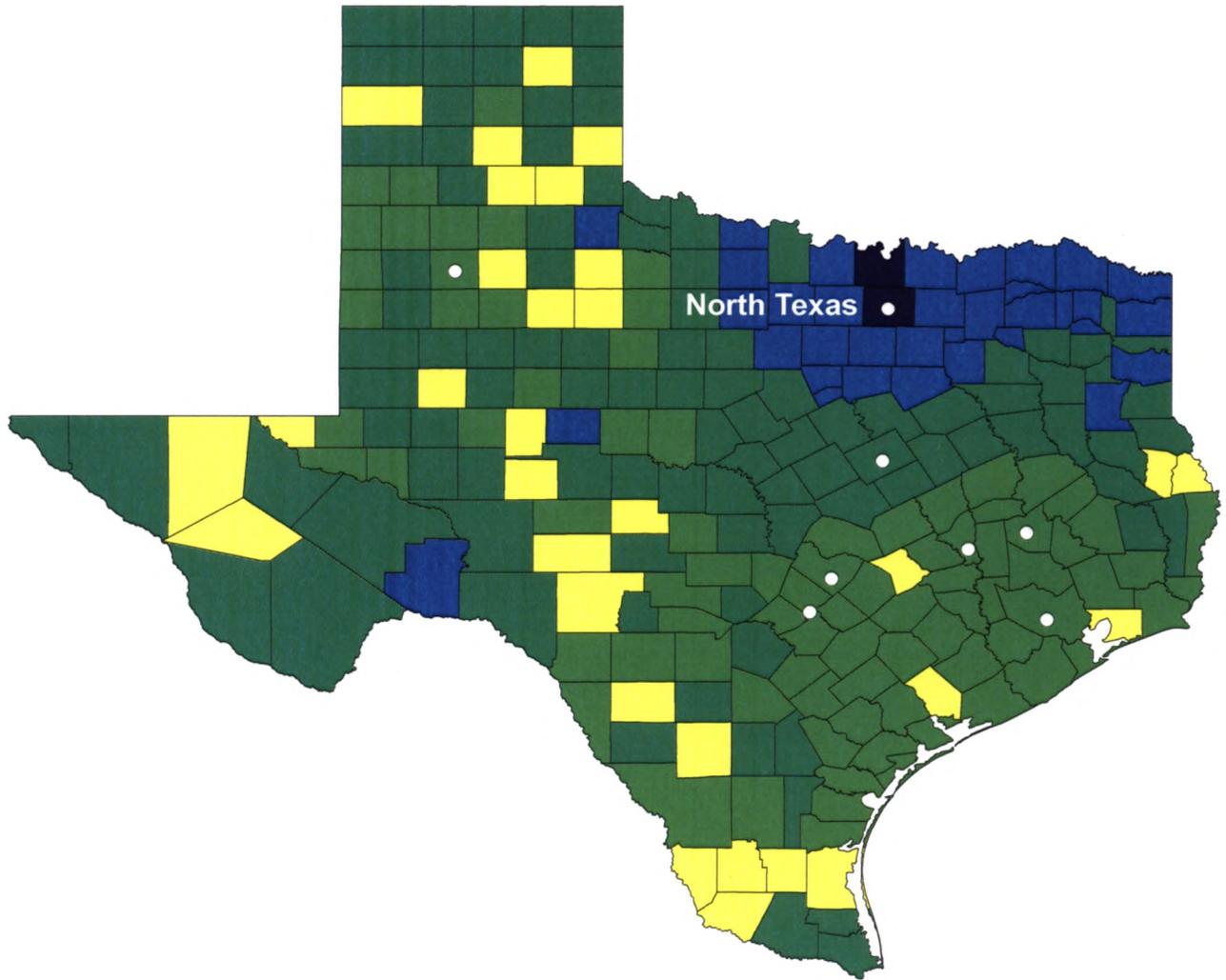


Figure 11. Percent of Major University Students in County Enrolled at University of Houston, Fall 2004

Normal College and Teacher Training Institute in 1890 and eventually becoming the University of North Texas in 1988. Fourth in enrollment with 31,155 students, North Texas has also seen growth and prosperity resulting from the growth of the Metroplex. The university ranked 5th in total counties with at least one student, with 224, and also has a low percentage of enrollment from the local county at 19%. However, 63% of enrollment comes from the counties contiguous to Denton, including heavily populated Dallas, Tarrant, and Collin Counties. Compared with the other major universities in this study, North Texas controls a hinterland true to its name, expanding along the Red River eastward to the Louisiana border, in addition to the Metroplex (Figure 12). North Texas also draws well in a few Panhandle counties, as well as a few in far western counties along the Rio Grande.

Geographically isolated from the other major universities of this study, Texas Tech University is the largest university in Texas west of the Interstate 35 corridor. Established relatively late compared to the other major universities in 1923, Texas Tech is fifth in enrollment with 28,325 students. Texas Tech has at least one student from 246 counties, and a low percentage from contiguous counties at 18.5%, second in both categories only to Texas A&M. As a result, Texas Tech controls a hinterland very large in land area, covering the Panhandle and the western third of the state, ending abruptly just west of the I-35 Corridor (Figure 13).

Sixth in the state with an enrollment of 26,783, Texas State University-San Marcos has benefited greatly from the rapid growth of Austin, approximately 30 miles to the north. In 2004, 4,982 of Texas State's students originated from Travis County, contributing to a slightly elevated enrollment from contiguous counties. At 32.5%, Texas



Percentage of Major University Students

- 0.0
- 0.01 - 5.0
- 5.1 - 20.0
- 20.1 - 50.0
- 50.1 - 100.0

○ Major Universities

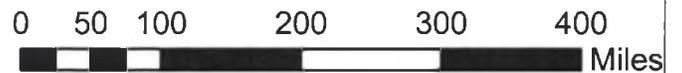
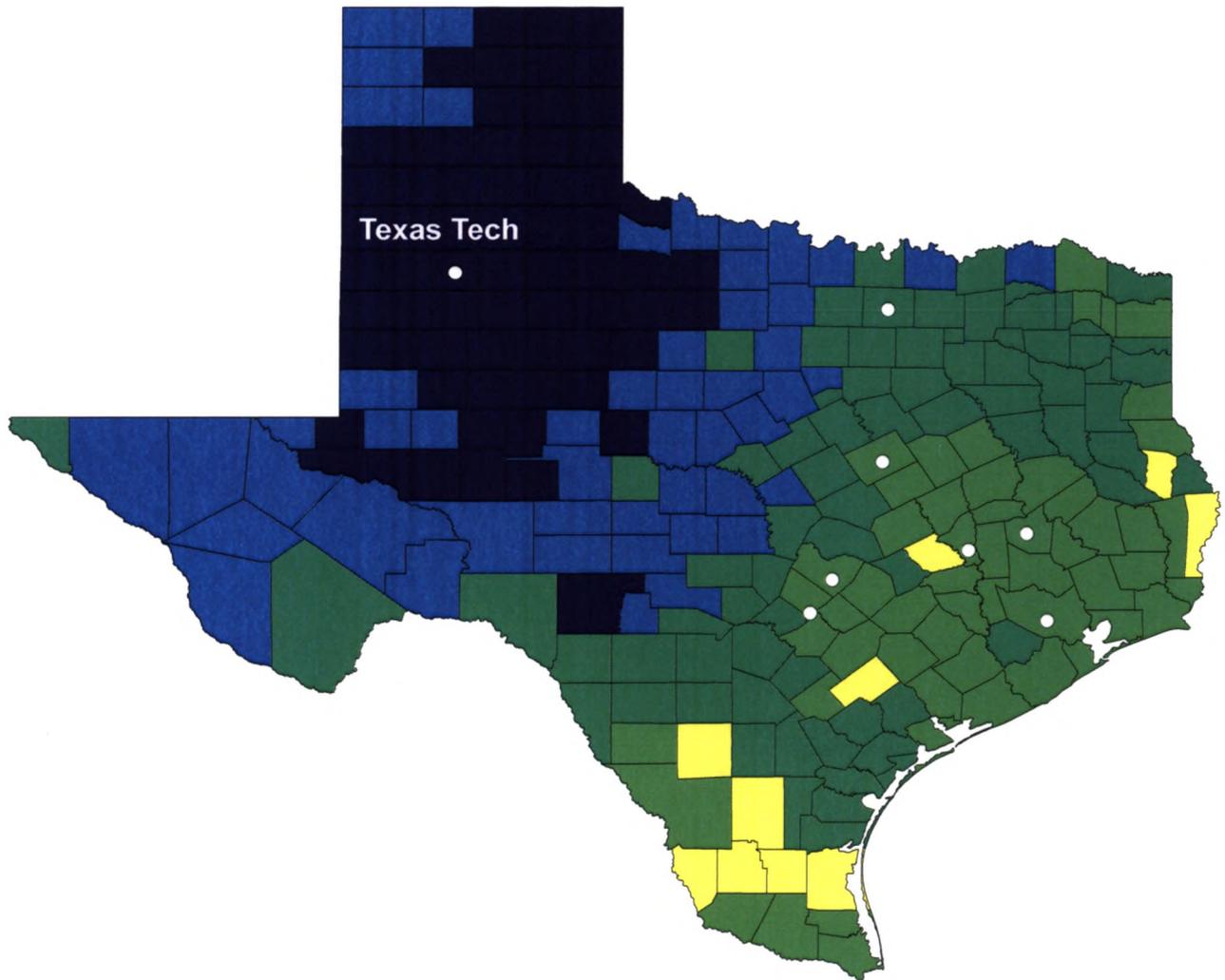


Figure 12. Percent of Major University Students in County Enrolled at University of North Texas, Fall 2004



Percentage of Major University Students

-  0.0
-  0.1 - 5.0
-  5.1 - 20.0
-  20.1 - 50.0
-  50.1 - 100.0

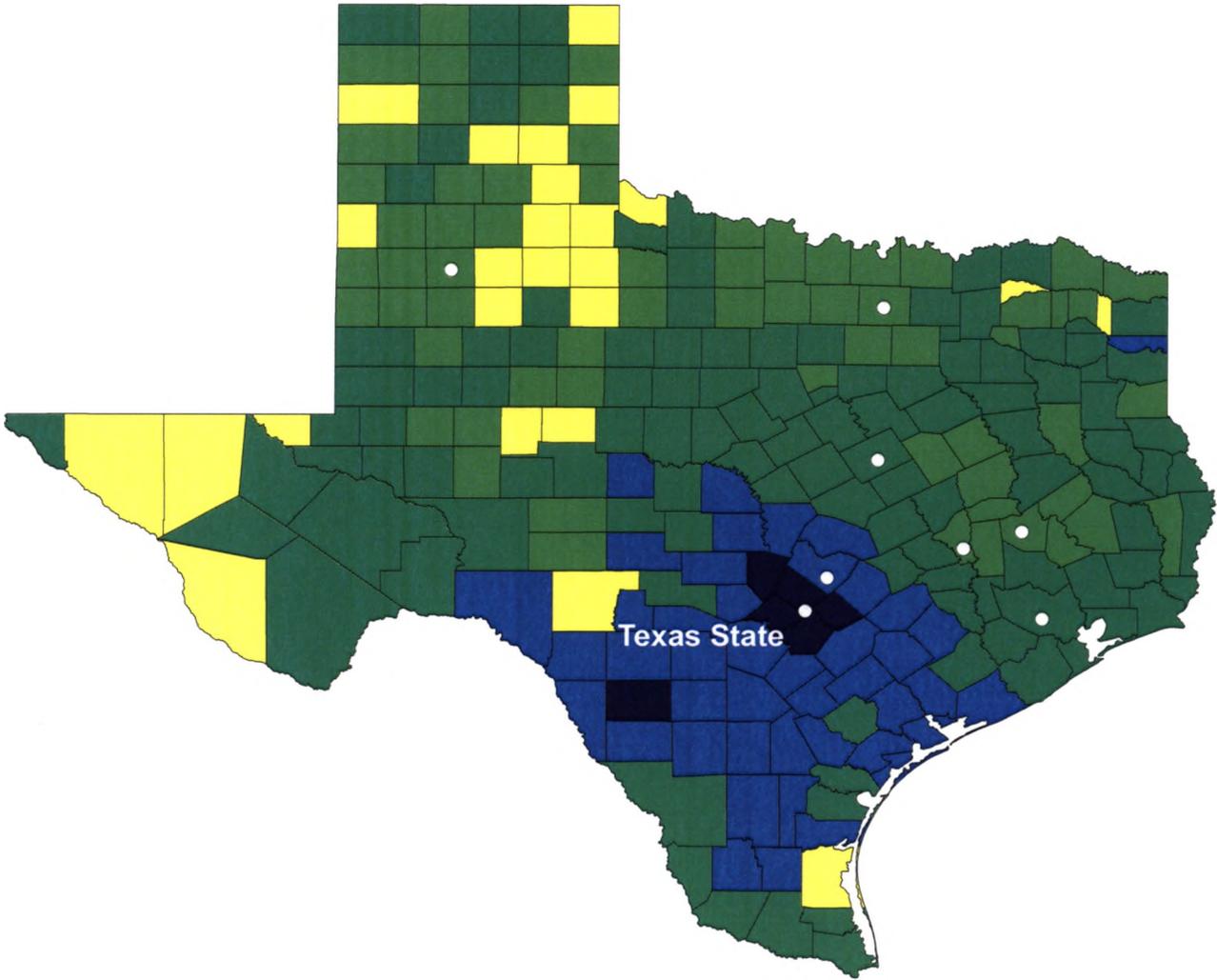
 Major Universities

0 50 100 200 300 400 Miles

Figure 13. Percent of Major University Students in County Enrolled at Texas Tech University, Fall 2004

State ranks 3rd among the universities in this study, well below Houston and North Texas, indicating its status as an institution serving a significant number of Austin commuters. Nevertheless, Texas State has recently achieved a larger geographic drawing area, to be examined in detail elsewhere in this study. Texas State has at least one student from 230 counties, only three fewer than the University of Texas, their neighbor of almost twice the enrollment 30 miles to the north. 97% of Texas State's enrollment still comes from the state of Texas, suggesting the university's changing reputation has not yet reached far beyond the state borders. Nevertheless, its rapid growth rate combined with its status in the Texas State System includes Texas State in this study of major universities. Within the state, Texas State draws students from the Hill Country to the west of San Marcos, as well as from counties southwest of San Antonio and from parts of East Texas (Figure 14).

Located in Huntsville, approximately 65 miles northwest of Houston, Sam Houston State is the second largest school in the Texas State University System. Established in 1879, Sam Houston State is the third oldest publicly funded institution of higher education in Texas. Sam Houston State ranks only 11th in enrollment with 14,333 students, but is the next largest university in the state behind the four largest subsidiary universities of the University of Texas. Despite its proximity to the Louisiana border and distance from the central portions of the state, Sam Houston State still records at least one student from 183 counties, only two fewer than nearby University of Houston, which has more than twice the enrollment. As with Houston, Sam Houston State has also benefited with the growth of the Houston Metropolitan area, with 4,586 students originating from Harris County in 2004. Sam Houston State controls a small, yet concentrated hinterland covering the southern portion of East Texas (Figure 15).



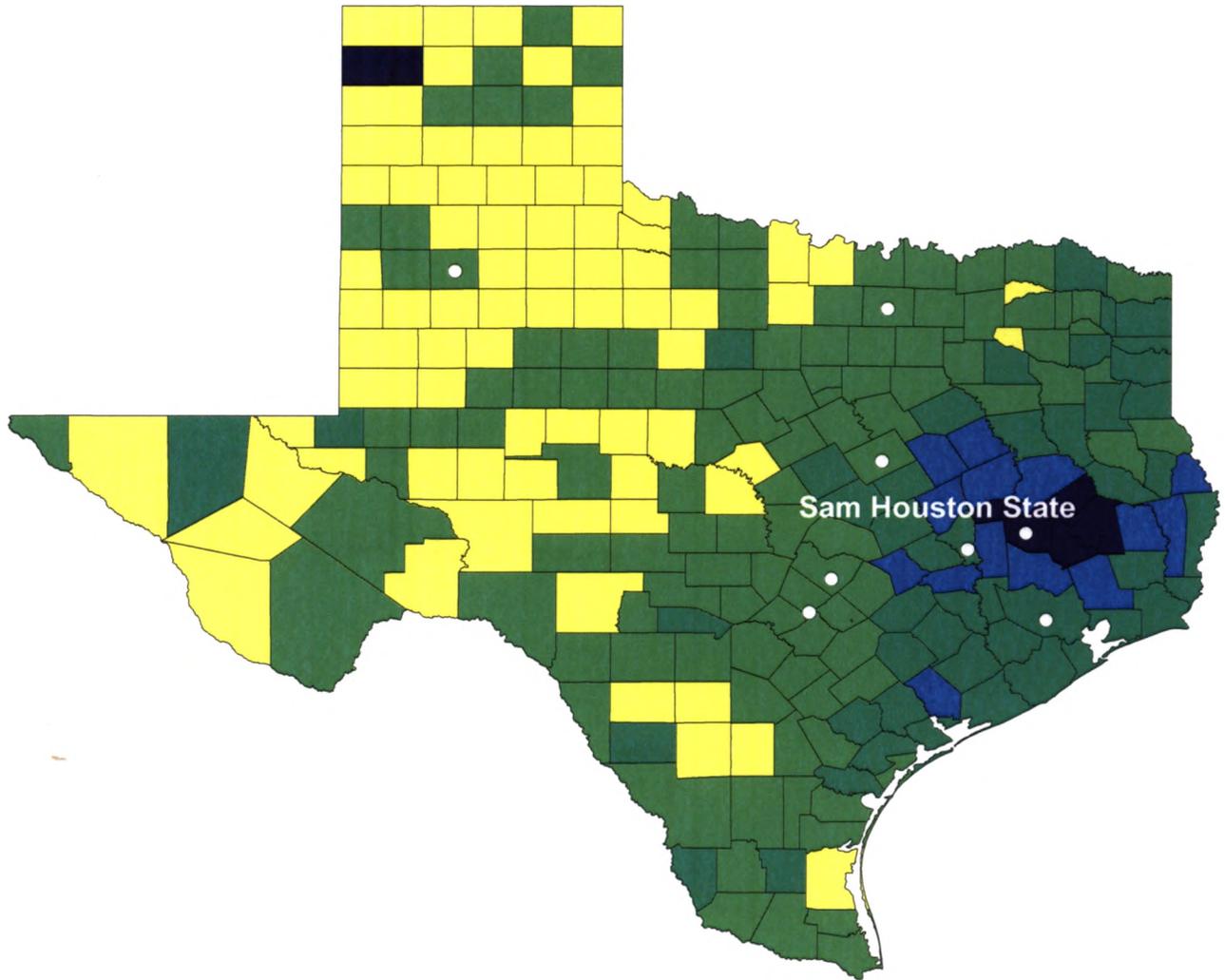
Percentage of Major University Students

- 0.0
- 0.1 - 5.0
- 5.1 - 20.0
- 20.1 - 50.0
- 50.1 - 100.0

○ Major Universities



Figure 14. Percent of Major University Students in County Enrolled at Texas State University-San Marcos, Fall 2004



Percentage of Major University Students

- 0.0
- 0.1 - 5.0
- 5.1 - 20.0
- 20.1 - 50.0
- 50.1 - 100.0

○ Major Universities

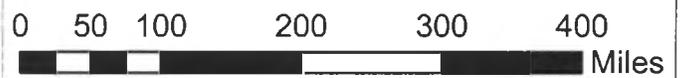
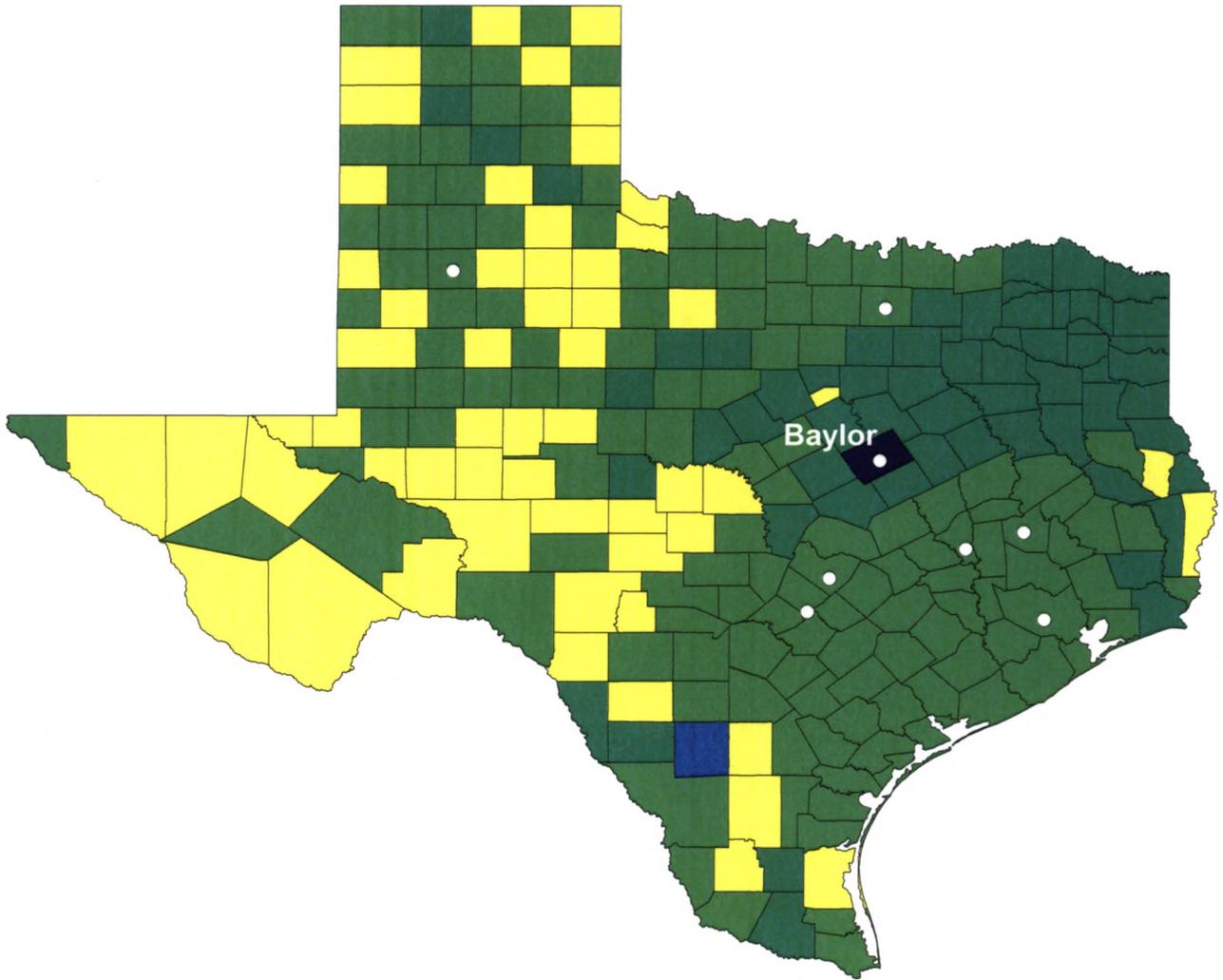


Figure 15. Percent of Major University Students in County Enrolled at Sam Houston State University, Fall 2004

With a charter granted by the Republic of Texas 1845, Baylor University is the oldest existing school in the state. Affiliated with the Union Baptist Association, Baylor is the largest privately funded institution in the state and among the largest in the nation. It is also the smallest school selected for this study, with an enrollment of 13,799 (THECB 2004). However, the university's having at least one student from 198 Texas counties suggests it commands a large hinterland with statewide drawing power (Figure 16). Baylor students generally come in smaller concentrations throughout the state, with stronger shares in some of the oldest counties in Northeast and Central Texas. Baylor also draws well beyond state lines, with approximately 18% of its enrollment originating from out of state or from a foreign country, ranking only slightly below UT-Dallas and UT-Austin. Baylor has risen to prominence due in part to its long and distinguished history as a charter member of both the SWC and the Big 12 Conference, which overrides its relatively small enrollment to include it in this study.

Case Study of Religious Institutions

Baylor's status as a privately funded university serves as a major reason both for and against its inclusion in the study of major universities. Despite its smaller enrollment and a different funding source from the other universities, Baylor has competed with the public universities in multiple forums, as a charter member of the Southwest Conference and the Big 12, as well with its geographic reach. However, unlike the state-funded institutions, Baylor also competes on another dimension: with schools affiliated with other denominations, as well as with schools associated with the Baptist church.



Percentage of Major University Students

-  0.0
-  0.1 - 5.0
-  5.1 - 20.0
-  20.1 - 50.0
-  50.1 - 100.0

○ Major Universities

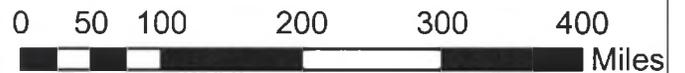


Figure 16. Percent of Major University Students in County Enrolled at Baylor University, Fall 2004

Although the majority of Texas' privately funded colleges and universities have small enrollments with insignificant hinterlands, they play a unique role in the Texas higher education structure, marketing to a different type of student than the state-funded universities, generally offering a smaller campus with smaller class size, and in most cases, a faith-based education. Of the 41 privately funded junior and senior colleges in Texas, 36 are affiliated with at least one Christian denomination (THECB 2004). As a legacy to the history of religious tolerance and diversity in Texas, several denominations fund institutions, with the 8 largest denominations accounting for 100,832 students enrolled at 34 colleges and universities (Table 7).

Rank	Denomination	Schools	Enrollment
1	Baptist	8	32603
2	Catholic	6	20265
3	Methodist	7	18163
4	Disciples of Christ	2	9170
5	Church of Christ	4	7667
6	Nondenominational	2	5462
7	Presbyterian	3	4926
8	Lutheran	2	2576

The Baptists lead both in overall enrollment and in number of schools, with Baylor's enrollment representing well over a third of the total. Catholics rank second in total enrollment with only six schools, with the University of the Incarnate Word, St. Edward's University, and St. Mary's University, each with at least 4,000 students. Third in enrollment, the United Methodists have more schools than the Catholics, but most of them have small enrollments. SMU, the second largest privately funded university in the state, constitutes more than half of the Methodist total.

The privately funded, religiously affiliated colleges and universities of Texas displayed an intriguing diffusion process. As with all institutions of higher education, the first religiously affiliated schools originated in the small towns and in rural settings. But today, more than half of these schools have agglomerated to seven cities of varying size, with almost every city having no more than one school of each denomination (Table 8).

Rank	City	Schools	Denominations	Enrollment
1	Dallas	3	3	16569
2	San Antonio	4	2	15194
3	Ft. Worth	3	3	11405
4	Abilene	3	3	8545
5	Austin	3	3	6498
6	Houston	2	2	5875
7	Marshall	2	2	2187

San Antonio is the only city that has more than one university of the same religious affiliation. Home to St. Mary's University, Our Lady of the Lake University, and University of the Incarnate Word, San Antonio hosts three of the state's six Catholic schools. Their second denomination came with the arrival of Trinity University, which has a Presbyterian affiliation. Dallas has the greatest enrollment among religiously affiliated colleges and universities. Its 3 denominations consist of SMU, Dallas Baptist University, and Paul Quinn College, which is African Methodist Episcopalian. Fort Worth also has 3 denominations, with TCU (Disciples of Christ), Texas Wesleyan University (Methodist), and the College of St. Thomas More (Catholic). Abilene's triumvirate of schools appears to be an aberration. Ranked 20th among Texas metropolitan areas with a population just above 126,000 (U.S. Census Bureau 2000), and over 80 miles from the next closest university, Abilene seems to be a small and remote location not conducive to supporting private institutions. Nevertheless, Abilene Christian University (Church of Christ), McMurry University (Methodist), and Hardin-Simmons

University (Baptist) all reside there. Austin also has three denominations, with St. Edward's University (Catholic), Huston-Tillotson University (Methodist/Church of Christ), and Concordia University of Austin (Lutheran).

The trend of religiously affiliated colleges and universities of different denominations to settle in the same cities appears to reflect a combination of cultural, demographic, and economic factors worthy of examining further. However, detailed examination of the spatial properties of religious institutions of higher education must await future research.

Measuring Hinterlands of Major Universities

Measuring the geographic hinterlands, or territories controlled, among the major universities remains a difficult task. If all public and private colleges and universities were included, each school, including the major universities, would control only a handful of counties, and some schools would not control any. As a result, the measurement of the hinterlands should include only the major universities. Viewing concentrations of students from all universities juxtaposed on one map (Figure 1) provides some indication as to which parts of the state are attracted to which schools. However, some counties with high concentrations or in areas equidistant from certain schools make the measurement of hinterlands unintelligible.

Separating the universities and displaying their share of enrollment among the other major universities (Figures 9-16) gives insight as to where each university draws in comparison to the other seven. However, this method does not show the other universities, which may be drawing more students from counties that appear to be well represented for a particular university.

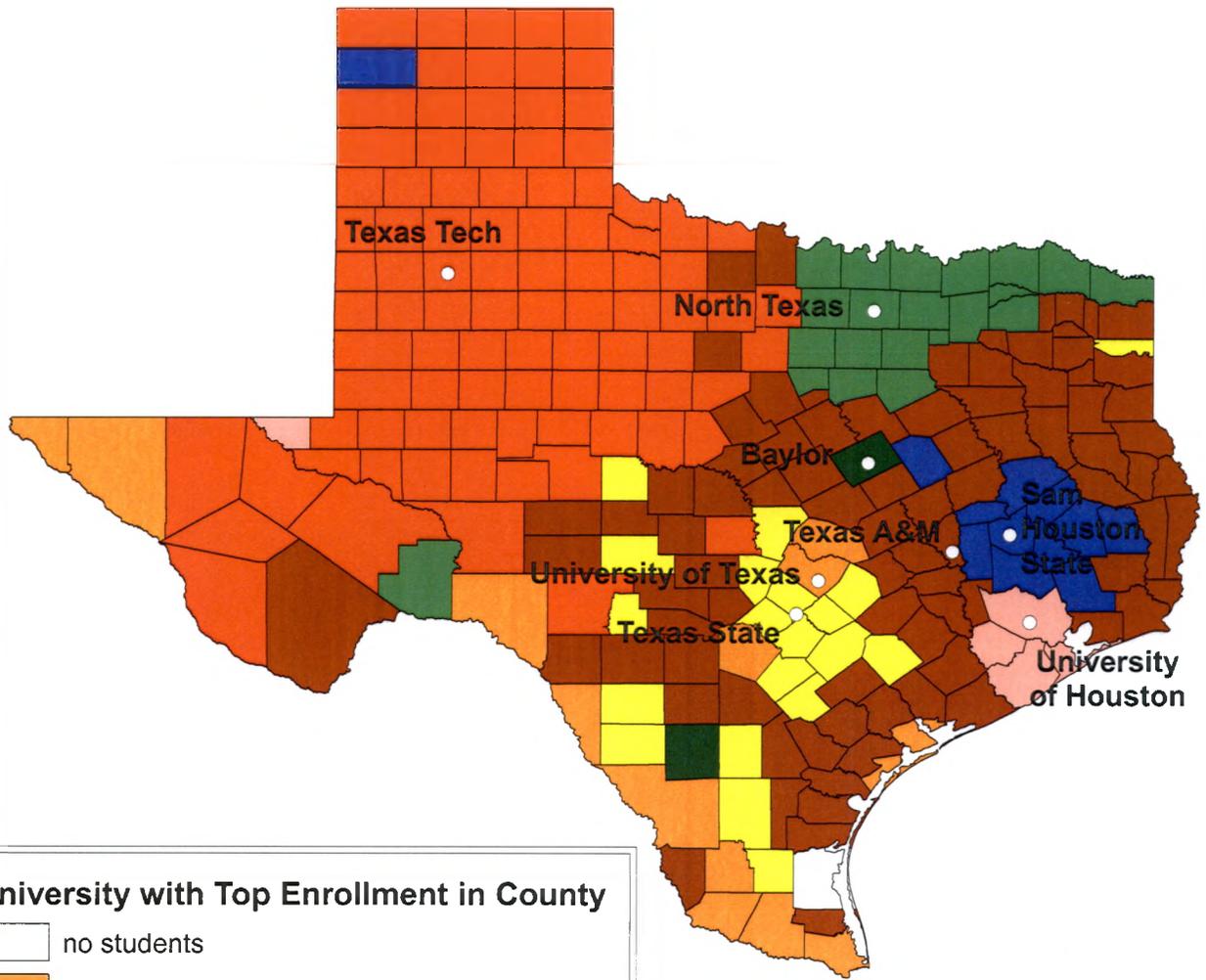
Another possible method would include demarcating the borders at the precise midpoint between each school. However, based on the unequal spatial distribution apparent in Figure 1, drawing the hinterlands based solely on distance would oversimplify the territories, leaving a cluster belonging to a particular school outside of its hinterland and including concentrations of the population not enrolled at that school.

Therefore, the best method for presenting the hinterlands of the major universities appears to be determining which university has the greatest enrollment among each county, and declaring it a part of that university's hinterland (Figure 17), in a similar manner as the electoral college awards entire states to candidates.

According to this method, Texas Tech controls both the most counties, having the most students in 93 out of 254, as well as the largest geographic area. With one exception Texas Tech controls the entire Panhandle, and almost all of the counties north of the Pecos and Colorado Rivers. To the east, Texas Tech's hinterland mixes with Texas A&M counties before reaching the hinterland of North Texas.

Texas A&M controls the second most counties, with 87. Most of these counties are primarily rural and are scattered across central Texas, with the largest contiguous cluster in East Texas stretching to the Louisiana border. Texas A&M controls counties surrounding the counties of the Austin and San Antonio metropolitan areas, as well as those surrounding McLennan County, the home of Baylor. Texas A&M's hinterland also comes close to surrounding those of Houston and Sam Houston State.

North Texas controls 31 counties, outlining a very concentrated hinterland, with all but one of the counties in the northeastern portion of the state. North Texas controls every county in the Dallas/Fort Worth metropolitan area, as well as all of the counties



University with Top Enrollment in County

-  no students
-  Texas
-  Texas A&M
-  Houston
-  North Texas
-  Texas Tech
-  Texas State
-  Sam Houston State
-  Baylor
-  Major Universities



Figure 17. Hinterlands of Major Texas Universities

along the Red River to the Arkansas border. North Texas' primary hinterland shares borders only with Texas Tech to the west, and Texas A&M to the south.

Texas State controls 20 counties, of which about half comprise a core near San Marcos. Texas State does not control the counties containing San Antonio and Austin, but it does have several contiguous counties. Texas State's other counties are to the west, intermingled among Texas A&M and Texas Tech counties west of the Hill Country. Texas State also controls one county in northeast Texas, surrounded by Texas A&M counties.

Despite being the largest university in the state, the University of Texas dominates only 14 counties. In addition to controlling Bexar, Travis, and Williamson Counties along the I-35 Corridor, all of its other counties are scattered along the Gulf Coast and the Rio Grande. The University of Texas' counties include the urban areas of Austin, San Antonio, El Paso, Laredo, and the Rio Grande Valley. The University of Texas' lack of a well-defined hinterland reflects its tendency to draw low percentages of students from all over the state, not concentrating on a certain geographic area.

Sam Houston State controls ten counties in a highly concentrated hinterland surrounding Huntsville. The hinterland abruptly ends when it meets Brazos County, the home of Texas A&M, to the west, and Harris County, the home of Houston, to the south. Such intense geographic competition renders the prospect of hinterland expansion of Sam Houston State unlikely.

The University of Houston has the most students in only five counties, also in a tightly compressed hinterland encompassing most of the Houston metropolitan area. The fact that Houston currently enrolls more than 35,000 students while controlling only five

counties underscores the immense population concentrated in those counties, with most of those students choosing to enroll at Houston.

Baylor only controls two counties: McLennan and La Salle. The fact that Baylor is a privately funded university implies that students select it to gain an education not on the basis of location as much as on the basis of its religious affiliation and prestige. As a result, Baylor shares characteristics with the University of Texas in that both draw low concentrations throughout the state without a true geographic concentration.

Identifying Battlefield Areas

Based on this method of measuring hinterlands, several localized groupings of counties appear to owe allegiance to more than one, and in some cases, several schools. Most of these groupings occur in parts of the state remote from most, if not all, of the major universities.

Perhaps the most noticeable of the meshing clusters lies south of San Antonio. Despite the fact that an increasing number of students from these counties now attend UTSA, the students enrolled at the major universities have made multiple selections. Texas State controls Zavala, Dimmitt, McMullen, Duval, and Brooks Counties, with Baylor controlling La Salle, their only other county in the state. The University of Texas occupies the border with Maverick, Webb, Jim Hogg, Starr, Hidalgo, and Cameron Counties. Texas A&M controls the other counties, as well as the counties to the north before reaching Bexar County and the core of Texas State's hinterland.

Another cluster occurs to the north, in an area just west of the Hill Country. At a distance of over 200 miles from Lubbock, Texas Tech's drawing power in the rural

counties is overridden by Texas A&M. Despite the fact that the University of Texas is the closest of the major universities, it does not have the most students in a single county in this part of the state. However, A&M does not fully dominate the area west of the Hill Country, with Texas State controlling Concho, Kimble, and Real Counties, and Tech controlling Llano and Edwards.

Another potential battlefield for territory lies near the Red River, where Tech meets North Texas. However, A&M controls Clay, Archer, and Stephens Counties, even though College Station is over 200 miles away and four of the major universities are closer to those counties.

These three primary areas of competition lie approximately on a north-south axis extending from the Mexico border to the Oklahoma border. One likely cause of these areas may be the predominantly rural counties, and the subsequent low populations. With a small enrollment from each county, an additional student from a certain university will skew the percentages more dramatically.

Nevertheless, displaying the university hinterlands in this manner raises several questions. Why do some universities draw from so far away while not drawing from counties much closer in proximity? Why, for example, do the hinterlands of Tech and North Texas not meet halfway in between the universities, with Tech reaching to within two counties of Denton? Why does the University of Texas, the largest university in the state, fail to attract the most students from even the counties immediately to the east and west of Austin? Do these hinterlands expand and contract predictably over time, and if so, where are universities winning their recruitment battles geographically?

Unfortunately, obtaining all of the enrollment data to observe these diffusion trends on a statewide level proved too daunting of a task. However, examining the geographic characteristics of one university's hinterland over time may provide valuable insight as to how the universities behave as a whole.

CHAPTER V

HINTERLAND DIFFUSION OF TEXAS STATE UNIVERSITY-SAN MARCOS

Each of the major universities was contacted, with a request for enrollment data by county for the longest time period available. Of the universities that responded to this data request, Texas State provided the most information spanning the longest time period. Starting in 1983, the Texas State data set contains county of origin for all students enrolled for each fall semester.

Due to its rapid enrollment growth rate, Texas State makes a good case study for the diffusion of a university's hinterland. In 1983, the enrollment of Texas State stood at 18,343, compared with 27,195 in 2005, an increase of more than 48%. During this time period, the years of greatest increase were 2002 and 1991, with times of decrease occurring in 1990, 1992-93, and 1996-97 (Table 9).

Texas State's consistent growth stems primarily from the population growth of the major metropolitan areas, and from counties that have become predominantly suburban. Texas State had already established a strong attraction in the counties containing Texas' three largest cities by 1983, when it enrolled 2,966 from Bexar County, 2,763 from Harris

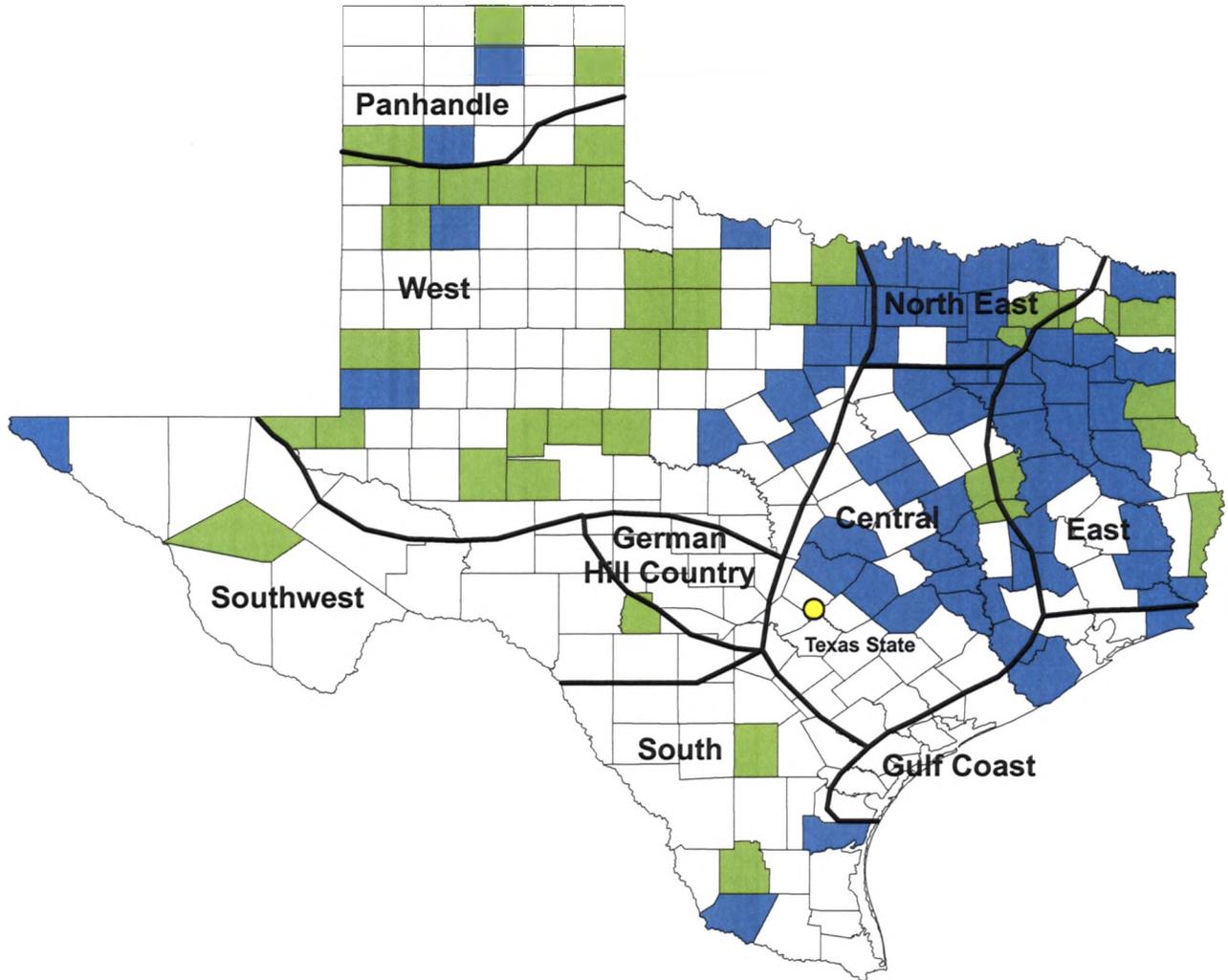
County, and 731 from Dallas County. Since then, these numbers have merely maintained, or even declined, while enrollment has exploded in the counties contiguous to the cores of the respective metropolitan areas, largely as a result of suburbanization and rural gentrification (Friedberger 2000). Examples of these counties include Brazoria, Collin, Denton, Ellis, Fort Bend, Montgomery, Parker, Rockwall, and Waller Counties, all of which have seen a suburbanization process from Houston and Dallas that has included the construction of new schools and the formation of entire school districts, which are better equipped with greater tax revenues, to prepare more students for college.

Year	Enrollment	Change
1983	18343	
1984	19223	4.80%
1985	19309	0.45%
1986	19798	2.53%
1987	20066	1.35%
1988	20524	2.28%
1989	20794	1.32%
1990	20322	-2.27%
1991	21595	6.26%
1992	21345	-1.16%
1993	20941	-1.89%
1994	20940	0.00%
1995	20968	0.13%
1996	20824	-0.69%
1997	20714	-0.53%
1998	21532	3.95%
1999	21811	1.30%
2000	22471	3.03%
2001	23556	4.83%
2002	25063	6.40%
2003	26375	5.23%
2004	26887	1.94%
2005	27195	1.15%

Suburbanization of the major metropolitan areas has not been the only geographic trend fueling the growth of Texas State. During the time period from 1983-2005, Texas State's enrollment has doubled in over 100 counties, 62 of which had at least 10 students

in 2005 (Table 10). Spatial patterns among these counties can be discerned when juxtaposed with Donald Meinig's (1969) cultural regions of Texas (Figure 18). Based on Meinig's cultural regions, most growth in Texas State's enrollment occurred in the East, Northeast, and Central Regions. Wood County's jump from 0 to 17 students exemplifies the recent attraction Texas State has acquired in the East Region. Large cities in the East Region participating in this phenomenon include Tyler, Nacogdoches, Lufkin, and Texarkana. In the Northeast Region, almost every county doubled its enrollment. Dallas, the only county that failed to double, already had 731 students at Texas State in 1983. Despite the school's proximity and consequent established drawing power in the Central Region, it also saw significant growth. Travis County has continuously reinforced its status as the primary supplier of students to Texas State, doubling from 2,467 to 4,958, constituting more than 18% of the university's enrollment

Table 10. Counties in which Texas State Enrollment has Doubled, 1983-2005 (minimum 10 students)				
County	County Seat (Largest City)	1983 Enrollment	2005 Enrollment	Change
Anderson	Palestine	8	23	287.5%
Andrews	Andrews	4	10	250.0%
Angelina	Lufkin	7	24	342.9%
Austin	Bellville	31	74	238.7%
Bastrop	Bastrop	119	275	231.1%
Bowie	New Boston (Texarkana)	4	13	325.0%
Brazoria	Angleton (Lake Jackson)	144	332	230.6%
Brazos	Bryan (College Station)	48	148	308.3%
Brown	Brownwood	18	36	200.0%
Burleson	Caldwell	2	18	900.0%
Cherokee	Rusk (Jacksonville)	5	10	200.0%
Collin	McKinney (Plano)	178	395	221.9%
Cooke	Gainesville	4	16	400.0%
Denton	Denton	43	262	609.3%
Ellis	Waxahachie	16	97	606.3%
El Paso	El Paso	47	229	487.2%
Erath	Stephenville	5	12	240.0%
Falls	Marlin	5	11	220.0%
Fannin	Bonham	3	12	400.0%
Fayette	La Grange	49	104	212.2%
Fort Bend	Richmond (Sugar Land)	211	832	394.3%
Grayson	Sherman	10	41	410.0%
Gregg	Longview	13	52	400.0%
Hale	Plainview	4	12	300.0%
Hamilton	Hamilton	2	10	500.0%
Hardin	Kountze	9	30	333.3%
Harrison	Marshall	6	23	383.3%
Henderson	Athens	8	42	525.0%
Hood	Granbury	7	14	200.0%
Houston	Crockett	5	19	380.0%
Hunt	Greenville	11	22	200.0%
Hutchinson	Stinnett (Borger)	1	10	1000.0%
Jefferson	Beaumont	50	137	274.0%
Kaufman	Kaufman (Terrell)	5	37	740.0%
Kleberg	Kingsville	16	34	212.5%
Lamar	Paris	4	10	250.0%
McLennan	Waco	112	228	203.6%
Montgomery	Conroe (The Woodlands)	165	409	247.9%
Nacogdoches	Nacogdoches	4	23	575.0%
Navarro	Corsicana	10	30	300.0%
Orange	Orange	13	36	276.9%
Parker	Weatherford	12	62	516.7%
Randall	Canyon	15	44	293.3%
Robertson	Franklin (Hearne)	3	12	400.0%
Rockwall	Rockwall	18	40	222.2%
Rusk	Henderson	3	16	533.3%
Smith	Tyler	25	83	332.0%
Starr	Rio Grande City	4	23	575.0%
Tarrant	Ft. Worth	255	658	258.0%
Travis	Austin	2467	4958	201.0%
Tyler	Woodville	3	12	400.0%
Uphsur	Gilmer	1	12	1200.0%
Van Zandt	Canton	4	18	450.0%
Walker	Huntsville	10	23	230.0%
Waller	Hempstead	13	35	269.2%
Washington	Brenham	23	68	295.7%
Wichita	Wichita Falls	18	39	216.7%
Williamson	Georgetown (Round Rock)	377	1568	415.9%
Wise	Decatur	3	11	366.7%
Wood	Quitman (Mineola)	0	17	



County Growth Rate

-  Did not Double
-  Doubled (to less than 10 students)
-  Doubled (to 10 or more students)
-  Texas State University
-  Regional Boundaries

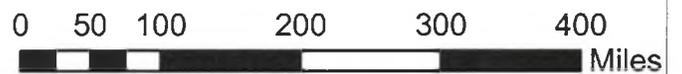


Figure 18. Texas Counties in Which Texas State Enrollment Doubled by Cultural Regions, 1983-2005
Data source: Texas State University Office of Institutional Research
Texas Cultural Regions Source: D.W. Meinig (1969)

in 2005. Within the Austin Metropolitan Area, Bastrop County doubled, and Williamson County, the site of Austin's northward suburban growth, increased fourfold. Other areas in the Central Region sending larger groups of students include the college towns of Waco and Bryan-College Station.

Texas State received sporadic growth from the Gulf Coast Region. Orange County and Jefferson County, which contains Beaumont, recorded significant growth. Also within the Region, Brazoria County doubled its enrollment, but its growth may have been more a function on the southern suburban development of the Houston metropolitan area.

The West and Panhandle Regions have also seen moderate expansion, although generally on a smaller scale. Cities making significant contributions include Amarillo, Wichita Falls, and Brownwood.

With a few exceptions, very little growth occurred in the South and Southwest Regions. El Paso County expanded from 47 to 229, and Starr County, on the western fringe of the rapidly growing Rio Grande Valley, grew from 4 to 23. These counties reflect Texas State's arrival to the extremities of the state, and also imply its attempt to market to the Hispanic population that dominates in the U.S.-Mexico border counties (THECB 2000). Aside from El Paso and Starr Counties, Texas State saw virtually no growth from the South and Southwest Regions. The recent growth of upstart subsidiary schools, such as the University of Texas at San Antonio and the University of Texas-Pan American, has contributed to Texas State's failure to draw more students from the rapidly expanding markets of San Antonio, Laredo, Brownsville, and McAllen. Perhaps Texas State's strong expansion north and east, combined with its sluggishness to compete with

smaller schools closer to the border, precipitated the name change in 2003 that divorced Southwest from Texas State.

Texas State's enrollment data by county covers a significant amount of time. However, even in 1983 the university's hinterland is fairly well established among most of the counties in the state. To truly determine the diffusion pattern of a university's hinterland, the existence of geographic enrollment data dating from its establishment is crucial. Nevertheless, various trends regarding geographic expansion and contraction can be observed during the time period between 1983 and 2005.

Excluding predominantly urban counties, the fact that Texas State did not see its enrollment double from a single county suggests its southern hinterland is receding. A recruitment area that once stretched to the Mexico border has been creeping northward at least since 1983, as the school has not taken advantage of the population growth to the extent of the University of Texas and Texas A&M System schools have. Of the three counties that did double, all have a population of at least 30,000 (U.S. Census Bureau 2000), one of which is El Paso. This growth implies a reverse hierarchical diffusion trend (Graff and Ashton 1993), in which the university has expanded from rural counties with low population to those containing urban centers, a trend reflected in most other Texas regions.

In the West Region, most of the counties that doubled their enrollment at Texas State were predominantly rural, with low overall totals. However, at least one band is visible (Figure 18), stretching from southwest to northeast almost undisturbed across the width of the region. This band of counties could imply a wave of expansion diffusion (Abler,

Adams, and Gould 1971) that is moving towards the Panhandle, potentially increasing enrollment from those counties in the coming years.

The Northeast and East Regions show the most growth, represented by the counties in which Texas State enrollment has doubled. Expansion in these two regions seems counterintuitive when considering the potential intervening opportunities in the form of other large universities with strong drawing power that are located closer, if not within, the Northeast and East Regions. Schools such as North Texas, Sam Houston State, Baylor, and even Houston are better positioned geographically to accommodate potential college students in these regions. Nevertheless, the growth found in such a large number of counties suggests a thorough spatial diffusion process occurring that will continue to enhance Texas State's enrollment and resulting attraction from the Northeast and East Regions.

Overall, Texas State appears to have a hinterland with both areas of expansion, and areas of attraction. As the university continues to contribute to meeting the increased statewide student participation rate by 2015 (THECB 2000), its hinterland will doubtlessly experience more dynamic expansions and contractions as more universities begin to compete within the same markets for students that consistently will become a more valued commodity.

CHAPTER VI

MULTIVARIATE ANALYSIS OF UNIVERSITY DRAWING POWER

The multivariate regression analysis for this study will consist of one dependent variable, to be tested to measure influence from a series of independent variables from multiple aspects. In order to determine the dependent variable, it is important to consider the spatial properties of the major universities. Since each school's hinterland is doubtlessly shaped by a unique set of variables, each school should be tested independently, meaning a multivariate regression analysis should be used with the same set of independent variables for every university.

Given the data available, the most accurate method of measuring a school's drawing power in a given county appears to be to examine the school's percent share among total students enrolled at all eight major universities. Despite the relatively high accuracy of this dataset, the percent share among total students enrolled at all major universities also has some weaknesses when used as a dependent variable. For instance, including enrollment from only the eight major universities excludes the enrollment from other smaller universities, junior colleges, and other types of institutions of higher education.

Including all of these institutions to calculate the percent share would create a more accurate percentage, but the data collection process would become unnecessarily exhaustive. The Texas Higher Education Coordinating Board possesses in-state enrollment by county for all universities and community colleges, but compiling all of these data would create confusion.

As a result, the dependent variable will test each major university's drawing power by county compared to that of the other seven major universities. By excluding the smaller colleges and universities, this variable displays the attraction a certain university exerts while in direct competition for presumably the most desirable students who are trying to attend the largest, most popular, and to some extent, the most prestigious universities. Therefore, the dependent variable will probably have be less reliable in counties with high enrollment among schools not included in this study, such as Bexar (University of Texas at San Antonio), Tarrant (University of Texas at Arlington), Dallas (University of Texas at Dallas), and El Paso (University of Texas at El Paso).

The independent variables will include a thorough, but not comprehensive, collection of factors representing geographic, economic, cultural, demographic, historical, and educational disciplines. In many cases, a surrogate variable is used to represent the actual variable. Each of the variables is comprised with a conceptual variable specified by an operational variable, each of which is expected to have some relationship with the dependent variable for all of the major universities (Table 1).

Category	Conceptual Variable	Operational Variable	Expected Relationship with Dep Var
Geographic	distance	distance in miles from county centroid to school	inverse
	distance to intervening opportunities	distance in miles from county centroid to next closest school	positive
Economic	median county income	median county income	positive
Cultural	conservatism of county	percent in county who voted for Bush in 2004 election	will vary for each school
	percent Anglo	percent Anglo	will vary for each school
	percent Hispanic	percent Hispanic	will vary for each school
	land use	percent agricultural land in county	will vary for each school
Demographic	land use	percent cotton land in county	will vary for each school
	population	county population for 2000 Census	positive
	density	2000 Census population divided by area in square miles	will vary for each school
	change	1990 Census population subtracted from 2000 Census	positive
Historical	relative county age	difference in years between establishment of county and school	inverse
Educational	higher education	percent of population over 25 with a college degree	positive

Establishing the Independent Variables

Geographic Variables

Geographic variables, especially those related to distance, are expected to assert the strongest association with the dependent variable. The distance from a county to the school being tested should have a strong inverse relationship with that school's percent share of the total enrollment among the major universities. As a result, counties closest to the university should send greater percentages of their students to that school.

Intervening opportunities play a major role in the interaction between the suppliers of education and the market looking for service opportunities (Abler, Adams, and Gould 1971). In this case, intervening opportunities will constitute only the distance to the next closest of the other seven universities. For example, when the distance from a county to the next smallest school is greater than that of the school in the analysis, then the percent share from that county should be larger. Therefore, the intervening opportunities variable should have a positive relationship with the dependent variable.

Economic Variables

The monetary cost of attending college contributes in determining which high school graduates can afford to go to college, as well as influencing where potential students will go to college, since all universities have differing tuition and fees. Therefore, the median

county income should be an important factor in determining not only how many students enroll in the major universities, but also which universities in which they enroll. For instance, counties with higher median income should send more students to private schools like Baylor, which has a higher cost of admission than the state universities.

Cultural Variables

Several cultural variables are also expected to have a strong association with the drawing power a school has in each county. However, each cultural variable to be examined should have a unique relationship in comparison with the other major universities. One such variable measures the political ideology of each county. In a state that has become so predominantly conservative, consistently voting for Republicans at all political levels, it is more accurate to measure the conservatism of each county. The operational variable to represent the conservatism is the percentage of voters who voted for George W. Bush in the 2004 Presidential Election. In an election in which the nationwide popular vote was virtually even, Texans voted differently, with 236 of 254 counties casting at least 50% of the ballots in favor of Bush (USA Today 2004). To reinforce the strong conservatism of Texas, of the 236 counties that voted in favor of Bush, 52 voted by a margin of 80% or more. The conservatism of counties almost certainly plays a role in determining the school of choice for a certain county due to the perception of some schools as having more conservative or liberal reputations. These reputations stem in part from the types of degree programs offered and the general atmosphere of the campus and its community. Such elements are difficult to measure, so as a result, conservatism should act as a good independent variable.

Other county-level cultural variables, such as percent Anglo and percent Hispanic, are also expected to have strong relationships with the dependent variable. Some more tradition-bound schools, such as Baylor and Texas A&M, may appeal to the longer-established Anglo populations, and would therefore have stronger drawing power from counties with a high Anglo percentage. Schools drawing well from counties with a higher Hispanic percentage should tend to be those located closest to the border, such as Texas State.

Land use may also determine the school with the greatest attraction in a particular county. For instance, schools with agricultural colleges may attract students from predominantly agricultural counties, and schools with strong engineering programs may draw students from counties with petroleum deposits. Several datasets could be used as an operational variable for measuring land use, such as the percent urban or rural. However, due to the dominance of the predominantly agricultural hinterlands of Texas A&M and Texas Tech, the most appropriate variable to use is percent agricultural land for each county. Farm acreage by county comes from the 2002 Census of Agriculture, conducted by the United States Department of Agriculture. It includes acreage of farmland that was used, or would have been used, to grow wheat, cotton, peanuts, sorghum, oats, corn, sunflower seed, rice, and soybeans. Of course, universities located in urban settings will probably have an inverse relationship with this land use variable.

In addition, the percentage of land in a county devoted to cotton may exert some influence over the dependent variable. As the principal source of farm income, cotton is the most prominent irrigated crop in the West Texas Region (McKnight 2001). With Lubbock as the primary city in the West Texas Region, cotton should have a positive

association with enrollment at Texas Tech. Similarly, enrollment at other universities should have a negative relationship with percentage of land devoted to cotton, except for those in close proximity to other cotton-growing clusters in the state.

Demographic Variables

Several basic demographic variables, such as population size, should also shape the attraction power of the major universities. Generally, counties with larger populations will send more students to universities, creating a strong positive relationship. Population density is also an important variable. Universities located in urban settings, such as the University of Texas and Houston, probably will have larger percent shares from counties with higher population density. Both population and density serve as good measurements to quantify the urban/rural ratio of the counties.

Population change, as defined by the percent change between the 2000 Census and 1990 Census, may also play a role with the dependent variable. Counties experiencing rapid population growth may be located on the fringes of metropolitan areas with newer and wealthier school districts equipping more students to attend the most prestigious schools. Population increase among counties should have a positive relationship with all major universities, but especially those currently showing the greatest growth rates, such as Houston, North Texas, and Texas State.

Historical Variables

The counties of Texas were organized over a period spanning more than 90 years, with municipalities under Mexican rule dating even farther back. Likewise, the major

universities of this study were established over a significant time period as well, with Baylor established in 1845 and Houston in 1927. Therefore, county age relative to university age may exhibit an influence on the dependent variable. This operational variable is calculated by comparing the establishment date of the university in the multivariate regression analysis with the organization date of each county. Presumably, the oldest counties will gravitate towards the oldest universities, with newer counties showing less preference.

Educational Variables

Of course, educational elements definitely should affect a certain university's percent share of the total enrollment of the major universities. Performance indicators, such as average test scores of high school students by county, may operate as an important independent variable. Counties with higher SAT or ACT scores should increase the drawing power of all of the major universities, especially those with the highest admission standards, such as the University of Texas and Texas A&M. Unfortunately, data for this variable were unavailable.

Higher education may also play a role in determining what university exerts the greatest drawing power on certain counties. The operational variable for higher education will be the percentage of the population over 25 with a college degree. This variable will also probably have a positive relationship with all of the major universities. There may also be some signs of a "legacy effect" in which students choose to attend the universities where their parents or other family members attended. Such an effect may

favor those universities whose reputations have been established for the longest amount of time, such as Baylor, Texas A&M, and the University of Texas.

Results of the Multivariate Analysis

Collectively, these independent variables should all relate to the dependent variable, each in varying degrees, and some exerting more influence at some universities than at others. As a result, all of the independent variables should be put into the multivariate regression analysis. Such a “kitchen sink,” or all-possible regressions approach has potential problems, especially the risk of multicollinearity, in which two or more independent variables are accounting for the same variance within the dependent variable. However, in this study it is unknown which variables will be the most important in determining the percentage of enrollment from a county of a certain university as a percentage compared with all of the major universities. Therefore, due to the exploratory and relatively unprecedented nature of this study, an all-possible regressions approach could prove effective in generating new hypotheses (Rogerson 2001) for future study.

In the multivariate regression for the University of Texas, the independent variables explain much of the variation, with an r square of 0.591 (Table 11). The variables with the greatest significance are intervening opportunities, percent Hispanic, conservatism, county age, distance, all at the 0.01 level, and population change at the 0.05 level of confidence. These findings indicate that the University of Texas’ percent share of enrollment among major universities has a positive relationship with population change and with percent Hispanic by county, which makes sense in context with the school’s

drawing power along the Mexico border (Figure 9). The enrollment share by county also has a strong negative association with percent of voters for George W. Bush in the 2004 Presidential Election. Ironically, the city that once housed Bush as governor resides in a county where only 42% voted in approval of his second term for president. County distance from the University of Texas also had an inverse relationship, but the intervening opportunities exerts the strongest positive relationship, suggesting as the other major universities become more spatially distant, potential students are more likely to choose the University of Texas as their college of choice.

Table 11. Multivariate Regression Analysis for the University of Texas						
Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Est		
1	0.769	0.591	0.569	0.060		
a Predictors: (Constant), CNTYAGE, WHITE, HIGHERED, POP, CTTNPCT, AGPCT, HISPANIC, POPCHNG, INTERVEN, DISTANCE, POPDEN, CONSERV, MEDHHINC						
ANOVA(b)						
Model	Regression	Sum of Squares	df	Mean Square	F	Sig.
	Residual	1.253	13.000	0.096	26.693	0.000
1	Total	0.867	240.000	0.004		
a Predictors: (Constant), CNTYAGE, WHITE, HIGHERED, POP, CTTNPCT, AGPCT, HISPANIC, POPCHNG, INTERVEN, DISTANCE, POPDEN, CONSERV, MEDHHINC						
b Dependent Variable: UTSHARE						
Coefficients(a)						
Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Beta		
	(Constant)	0.065	0.056		1.159	0.248
	POP	0.000	0.000	0.070	1.174	0.242
	POPCHNG	0.001	0.000	0.142	2.131	0.034
	WHITE	0.001	0.001	0.089	1.678	0.095
	HISPANIC	0.001	0.000	0.337	4.823	0.000
	HIGHERED	0.001	0.001	0.046	0.948	0.344
	MEDHHINC	0.000	0.000	0.132	1.892	0.060
	POPDEN	0.000	0.000	0.045	0.690	0.491
	CONSERV	-0.194	0.051	-0.261	-3.793	0.000
	DISTANCE	0.000	0.000	-0.182	-2.797	0.006
	INTERVEN	0.001	0.000	0.340	5.173	0.000
	AGPCT	-0.038	0.035	-0.061	-1.101	0.272
	CTTNPCT	-0.029	0.097	-0.016	-0.297	0.767
1	CNTYAGE	-0.001	0.000	-0.191	-2.820	0.005
a Dependent Variable: UTSHARE						
** Significant at the 0.01 level						
* Significant at the 0.05 level						

The three variables accounting for the least amount of variation include percentage of a county devoted to cotton, population density, and percent of population over 25 with a college degree.

The Texas A&M regression analysis explained a lower percentage of the variation, with an r square of 0.413 (Table 12). Only three independent variables are significant, all at the 0.01 level. As with the University of Texas, distance and intervening opportunities have strong negative and positive relationships, respectively. County age also has a

strong negative relationship, suggesting Texas A&M has strong drawing power from counties with the oldest establishment dates, which is justified by their status as the oldest public university in the state.

Model		R	R Square	Model Summary		
1		0.643	0.413	Adjusted R Square	Std. Error of the Est	
				0.381	0.094	
a Predictors (Constant), CNTYAGE, WHITE, HIGHERED, POP, CTTNPCT, AGPCT, HISPANIC, POPCHANG, INTERVEN, POPDEN, CONVERV, MEDHHINC, DISTANCE						
Model		Sum of Squares		ANOVA(b)		
		Regression	1.488	df	Mean Square	Sig
		Residual	2.114	13.000	0.114	12.997
1		Total	3.603	240.000	0.009	0.000
				253.000		
a Predictors (Constant), CNTYAGE, WHITE, HIGHERED, POP, CTTNPCT, AGPCT, HISPANIC, POPCHANG, INTERVEN, POPDEN, CONVERV, MEDHHINC, DISTANCE						
b. Dependent Variable: AMSHARE						
Model		Coefficients(a)				
		Unstandardized Coefficients	Std. Error	Standardized Beta	t	Sig
		B				
(Constant)		0.274	0.085		3.225	0.001
POP		0.000	0.000	0.034	0.468	0.640
POPCHANG		0.000	0.001	-0.006	-0.073	0.941
WHITE		-0.001	0.001	-0.041	-0.652	0.515
HISPANIC		0.000	0.000	0.077	0.916	0.361
HIGHERED		0.000	0.001	-0.005	-0.092	0.927
MEDHHINC		0.000	0.000	-0.100	-1.203	0.230
POPDEN		0.000	0.000	-0.152	-1.948	0.053
CONVERV		0.145	0.082	0.150	1.772	0.078
DISTANCE		-0.001	0.000	-0.639	-6.347	0.000
INTERVEN		0.001	0.000	0.333	4.081	0.000
AGPCT		0.048	0.053	0.059	0.904	0.367
CTTNPCT		-0.088	0.152	-0.037	-0.579	0.563
CNTYAGE		-0.001	0.000	-0.229	-2.625	0.009
a. Dependent Variable: AMSHARE						
** Significant at the 0.01 level						
* Significant at the 0.05 level						

The three variables with the least explanatory power for Texas A&M are population change, percent of the population over 25 with a college degree, and population.

The regression analysis for the University of Houston performed significantly lower than either the University of Texas or Texas A&M, with an r square of only 0.213 (Table 13). The regression sum of squares was a mere 0.273 compared with the residual at 1.008. Median household income has the strongest positive relationship with Houston, perhaps a reflection of the high median incomes of Brazoria, Fort Bend, Galveston, and Montgomery Counties, all of which are contiguous to Harris County, which also has a high median household income. Interestingly, population change between 1990 and 2000 has a strong negative association with Houston. Evidently, counties that are not rapidly growing tend to have a higher percentage of students enrolled at Houston, not at all

characteristic of the Houston MSA. Of course, distance and intervening opportunities have strong negative and positive relationships as well.

The three variables with the weakest associations with the dependent variable for Houston include percent of land devoted to agriculture, population, and percent Hispanic.

		Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Est		
1	0.461	0.213	0.170	0.065		
a Predictors (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, PopChange, Interven, PopDen, Conserv, MedHhInc, Distance						
		ANOVA(b)				
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	0.273	13.000	0.021	4.994	0.000
	Residual	1.008	240.000	0.004		
1	Total	1.281	253.000			
a Predictors (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, PopChange, Interven, PopDen, Conserv, MedHhInc, Distance						
b Dependent Variable. UHShare						
		Coefficients(a)				
Model		Unstandardized Coefficients		Standardized		Sig.
		B	Std. Error	Beta	t	
	(Constant)	0.033	0.065		0.507	0.612
	Population	0.000	0.000	0.010	0.114	0.909
	PopChange	-0.001	0.000	-0.353	-3.855	0.000
	White	-0.001	0.001	-0.096	-1.306	0.193
	Hispanic	0.000	0.000	-0.016	-0.164	0.870
	HigherEd	-0.001	0.001	-0.124	-1.834	0.068
	MedHhInc	0.000	0.000	0.448	4.684	0.000
	PopDen	0.000	0.000	0.111	1.233	0.219
	Conserv	-0.045	0.057	-0.078	-0.790	0.430
	Distance	0.000	0.000	-0.312	-2.733	0.007
	Interven	0.000	0.000	0.174	1.969	0.050
	AgPct	0.003	0.037	0.006	0.086	0.931
	CottonPct	0.077	0.103	0.054	0.750	0.454
1	CountyAge	0.000	0.000	-0.043	-0.417	0.677
a Dependent Variable. UHShare						
** Significant at the 0.01 level						
* Significant at the 0.05 level						

The independent variables explained a larger amount of the enrollment share of the University of North Texas, with an r square of 0.525 (Table 14). The two variables with the strongest association are distance, with an inverse relationship, and intervening opportunities, with a positive relationship. As with Houston, median household income has a strong positive relationship, also reflecting the contiguous counties of the Dallas-Fort Worth MSA, such as Denton, Collin, Dallas, and Tarrant. Percent Hispanic also displays a positive relationship significant at the 0.05 level, a puzzling statistic due to North Texas' status as the most distant from the Mexico border of all the major universities in this study. County age also has a positive relationship significant at the 0.05 level.

Table 14. Multivariate Regression Analysis of University of North Texas						
		Model Summary				
Model	R	R Square	Adjusted R Square	Std Error of the Est		
1	0.725	0.525	0.500	0.079		
a Predictors: (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, Interven, PopChange, PopDen, Conserv, Distance, MedHhInc						
		ANOVA(b)				
Model		Sum of Squares	df	Mean Square	F	Sig
	Regression	1.672	13.000	0.129	20.425	0.000
	Residual	1.512	240.000	0.006		
1	Total	3.184	253.000			
a Predictors: (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, Interven, PopChange, PopDen, Conserv, Distance, MedHhInc						
b Dependent Variable: UNTShare						
		Coefficients(a)				
Model		Unstandardized Coefficients	Standardized	t	Sig	
		B	Beta			
	(Constant)	0.073		0.989	0.324	
	Population	0.000	0.045	0.688	0.492	
	PopChange	0.000	0.013	0.188	0.851	
	White	0.001	0.068	1.189	0.236	
	Hispanic	0.001	0.209	2.346	0.020	*
	HigherEd	-0.001	-0.064	-1.209	0.228	
	MedHhInc	0.000	0.212	2.837	0.005	**
	PopDen	0.000	0.079	1.066	0.288	
	Conserv	0.006	0.067	0.095	0.924	
	Distance	-0.001	-0.877	-11.936	0.000	**
	Interven	0.001	0.397	6.529	0.000	**
	AgPct	-0.054	-0.071	-1.192	0.234	
	CottonPct	0.150	0.066	1.220	0.224	
1	CountyAge	0.001	0.145	2.144	0.033	*
a. Dependent Variable: UNTShare						
** Significant at the 0.01 level						
* Significant at the 0.05 level						

The three variables providing the least explanation with the dependent variable for North Texas are conservatism, population change, and population. Apparently, North Texas draws well across counties with varying political ideologies and population concentrations, reflecting the schools location in Denton, on the fringe of both a large metropolitan area to the south and a vast rural expanse to the west.

The independent variables explained a greater proportion of the variation in the dependent variable of Texas Tech University, with an r square of 0.886, than with any of the other major universities (Table 15). As with the other universities, distance and intervening opportunities have negative and positive relationships, respectively, with the dependent variable. As anticipated, the percentage of land devoted to cotton exerts a strong positive relationship with the dependent variable, even more than that of intervening opportunities. Percent Hispanic has a negative relationship, reflecting the distance of Texas Tech from the Mexico border. County age relative to the school also has a positive relationship significant at the 0.05 level, partly due to the fact that almost every county in Texas had been organized by the time Texas Tech was established.

Table 15. Multivariate Regression Analysis for Texas Tech University						
		Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Est.		
1	0.941	0.886	0.879	0.093		
a Predictors: (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, PopChange, PopDen, Conserv, MedHhInc, Interven, Distance						
		ANOVA(b)				
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	16.149	13.000	1.242	142.942	0.000
	Residual	2.086	240.000	0.009		
1	Total	18.235	253.000			
a Predictors: (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, PopChange, PopDen, Conserv, MedHhInc, Interven, Distance						
b Dependent Variable: TechShare						
		Coefficients(a)				
Model		Unstandardized Coefficients	Standardized			
		B	Beta	t		Sig.
	(Constant)	0.620		5.884		0.000
	Population	0.000	-0.058	-1.799		0.073
	PopChange	-0.001	-0.063	-1.744		0.083
	White	-0.001	-0.022	-0.802		0.423
	Hispanic	-0.001	-0.103	-2.781		0.006
	HigherEd	0.001	0.023	0.883		0.378
	MedHhInc	0.000	-0.036	-0.985		0.326
	PopDen	0.000	0.036	1.027		0.305
	Conserv	0.160	0.073	1.881		0.061
	Distance	-0.001	-0.622	-13.921		0.000
	Interven	0.000	0.198	5.150		0.000
	AgPct	-0.090	-0.049	-1.546		0.123
	CottonPct	0.801	0.148	5.636		0.000
1	CountyAge	0.001	0.000	2.239		0.026
a Dependent Variable: TechShare						
** Significant at the 0.01 level						
* Significant at the 0.05 level						

Two variables with interesting associations almost qualified at the 0.05 level.

Conservatism, at 0.061, had a positive relationship, and population, at 0.073, had a negative relationship. Both variables show worthy, but not significant, signs of a conservative enrollment base at Texas Tech, possessing strong attraction in rural counties with low populations. The three variables with the least association with Texas Tech's dependent variable are percent White, percent over 25 with a college degree, and median household income.

The collection of independent variables also explained a relatively high amount of variation of dependent variable of Texas State University-San Marcos, with an r square of 0.520 (Table 16). Of the independent variables, distance exerts the greatest force, with a strong negative relationship. Percent Hispanic had a strong Beta value, reflecting Texas State's strong drawing power near the Mexico border (Figure 14). Population density also has a negative relationship, which is unusual considering the nearby Austin and San Antonio MSAs, from which Texas State draws almost half its enrollment. Median household income has a positive association with the dependent variable significant at the

0.05 level, showing similarities with Houston and North Texas. Like those universities, Texas State draws well from the affluent, highly urbanized counties of Comal, Hays, Travis, and Williamson.

Model		R	R Square	Model Summary		
1		0.721	0.520	Adjusted R Square	Std. Error of the Est.	
				0.494	0.088	
a. Predictors: (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, PopChange, Distance, PopDen, Conserv, Interven, MedHhInc						
Model		Sum of Squares	df	Mean Square	F	Sig.
1						
Regression		1.996	13.000	0.154	20.014	0.000
Residual		1.841	240.000	0.008		
Total		3.837	253.000			
a. Predictors: (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, PopChange, Distance, PopDen, Conserv, Interven, MedHhInc						
b. Dependent Variable: TxStShare						
Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Beta		
1						
(Constant)		0.122	0.085		1.426	0.155
Population		0.000	0.000	0.111	1.732	0.085
PopChange		0.000	0.000	-0.024	-0.335	0.738
White		0.001	0.001	0.050	0.853	0.395
Hispanic		0.002	0.000	0.305	3.795	0.000
HigherEd		0.000	0.001	0.022	0.410	0.682
MedHhInc		0.000	0.000	0.171	2.278	0.024
PopDen		0.000	0.000	-0.210	-2.989	0.003
Conserv		-0.077	0.074	-0.077	-1.033	0.302
Distance		-0.001	0.000	-0.612	-9.089	0.000
Interven		0.000	0.000	0.017	0.227	0.820
AgPct		0.006	0.051	0.007	0.110	0.913
CottonPct		-0.199	0.141	-0.080	-1.411	0.159
CountyAge		0.000	0.000	0.006	0.075	0.940
a. Dependent Variable: TxStShare						
** Significant at the 0.01 level						
* Significant at the 0.05 level						

The three variables providing the least explanation for the variability of the dependent variable are county age, percent of land devoted to agriculture, and intervening opportunities. Texas State is the only university in which intervening opportunities is not even remotely associated with the percentage of enrollment among major universities, demonstrating that despite the university's proximity to other major universities, it still draws well, and even succeeds in outdrawing the University of Texas in counties that are closer to Austin than San Marcos (Figure 17).

The independent variables failed to explain much of the variation of the dependent variable for Sam Houston State University, with an r square of 0.358 (Table 17). Percentage of land devoted to agriculture exerts the greatest negative influence on the dependent variable, reflecting Sam Houston State's distance from the High Plains of West Texas and other major agricultural regions. Percent White also has a negative

relationship, and with the percent Hispanic not significant at any level, other races, such as Blacks, may play a role in explaining this unusual relationship. Population density also displays a counter-intuitive negative relationship, given the large percentage of enrollment from the Houston area. Distance also has a negative association with the dependent variable.

Table 17. Multivariate Regression Analysis for Sam Houston State University						
		Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Est		
1	0.598	0.358	0.323	0.102		
a Predictors: (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, Interven, PopChange, PopDen, Conserv, MedHhInc, Distance						
		ANOVA(b)				
Model	Regression	Sum of Squares	df	Mean Square	F	Sig
.	Residual	1.395	13.000	0.107	10.291	0.000
1	Total	2.503	240.000	0.010		
a Predictors: (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, Interven, PopChange, PopDen, Conserv, MedHhInc, Distance						
b Dependent Variable: SHSUShare						
		Coefficients(a)				
		Unstandardized Coefficients		Standardized	t	Sig
Model		B	Std. Error	Beta		
	(Constant)	0.590	0.096		6.135	0.000
	Population	0.000	0.000	0.100	1.280	0.202
	PopChange	0.001	0.001	0.153	1.841	0.067
	White	-0.003	0.001	-0.222	-3.382	0.001
	Hispanic	-0.001	0.000	-0.101	-1.118	0.265
	HigherEd	-0.002	0.001	-0.115	-1.870	0.063
	MedHhInc	0.000	0.000	-0.129	-1.481	0.140
	PopDen	0.000	0.000	-0.255	-3.105	0.002
	Conserv	0.085	0.089	0.084	0.952	0.342
	Distance	0.000	0.000	-0.300	-2.668	0.008
	Interven	0.000	0.000	-0.158	-1.945	0.053
	AgPct	-0.244	0.060	-0.287	-4.074	0.000
	CottonPct	-0.225	0.164	-0.090	-1.365	0.173
1	CountyAge	0.000	0.000	0.093	1.002	0.317
a Dependent Variable: SHSUShare						
** Significant at the 0.01 level						
* Significant at the 0.05 level						

Intervening opportunities just missed significance at the 0.05 level, with a significance of 0.053. Sam Houston State also draws well from a relatively large area, especially considering the proximity of Houston and Texas A&M. In the future, Sam Houston State may be enjoying the same recruitment victories Texas State is currently enjoying. The three variables providing the least explanation are conservatism, county age, both with positive relationships, and percent Hispanic, with a negative relationship. Negative relationships for both percent White and Hispanic clearly indicate the presence of another race or ethnicity at Sam Houston State.

The independent variables provided the least amount of explanation for Baylor University than for any of the other universities, with an r square of 0.177 (Table 18), by

far the lowest of the universities in this study. Distance and intervening opportunities have the greatest effect on Baylor's dependent variable, with the usual negative and positive associations. Percent White also has a negative association, and with percent Hispanic also having a negative, although insignificant, relationship, another race or ethnicity must be at work.

Model		R	R Square	Model Summary		Std. Error of the Est	
1		0.420	0.177	Adjusted R Square	0.132	0.053	
a Predictors. (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, PopChange, Interven, PopDen, Conserv, MedHhInc, Distance							
Model		Sum of Squares		ANOVA(b)		F	Sig
	Regression	0.147	13.000	df	Mean Square	3.961	0.000
	Residual	0.686	240.000		0.011		
1	Total	0.833	253.000		0.003		
a Predictors (Constant), CountyAge, White, HigherEd, Population, CottonPct, AgPct, Hispanic, PopChange, Interven, PopDen, Conserv, MedHhInc, Distance							
b. Dependent Variable. BUShare							
Model		Unstandardized Coefficients		Standardized		t	Sig
	(Constant)	B	Std. Error	Beta			
	Population	0.000	0.000	-0.028		3.728	0.000
	PopChange	0.000	0.000	0.030		-0.326	0.745
	White	-0.001	0.000	-0.155		0.318	0.751
	Hispanic	0.000	0.000	-0.141		-2.089	0.038
	HigherEd	0.000	0.001	0.008		-1.359	0.175
	MedHhInc	0.000	0.000	0.000		0.113	0.910
	PopDen	0.000	0.000	0.033		-0.002	0.998
	Conserv	-0.017	0.046	-0.036		0.349	0.727
	Distance	0.000	0.000	-0.425		-0.369	0.713
	Interven	0.000	0.000	0.344		-4.052	0.000
	AgPct	-0.038	0.031	-0.098		3.747	0.000
	CottonPct	0.087	0.086	0.075		-1.245	0.214
1	CountyAge	0.000	0.000	0.016		1.007	0.315
a Dependent Variable. BUShare							
** Significant at the 0.01 level							
* Significant at the 0.05 level							

The three variables with the least influence on the dependent variable of Baylor are median household income, percent over 25 with a college degree, and county age.

As expected, distance between county and school is the most influential independent variable, having a negative relationship at the 0.01 level for all universities. Distance to intervening opportunities also has a significant positive association with six of the schools. Most of the other variables have varying degrees of explanatory power, but those that proved significant reached the 0.01 level with at least one school.

Only two variables were not of significance to any of the universities. 2000 population did not affect any of the schools, perhaps indicating universities are drawing well from both highly urbanized counties and from those with low population. As a

result, drawing power of the universities does not appear to be influenced by sparsely populated areas that appear isolated. Percent over 25 with a college degree also was not significant, perhaps also demonstrating the effort by all universities to enroll students who are the first among their families to attend college.

On some of the regression analyses, the r square was lower than anticipated. One possible method that could raise the levels of explanation is the backwards multiple stepwise regression. As opposed to the “kitchen sink” approach, backward multiple stepwise regression involves removing variables one by one according to which ones appear to account for the least explanatory power. Despite the fact that r square will always decrease when removing variables, if the decrease is small proportionally, then the overall model will be more effective.

Another possible method to increase explanation would be to evaluate the results from each university and hypothesize what other independent variables could be causing variance in the dependent variable. As a result, each analysis would be “tailor made,” with some having different variables. Such a method would probably increase the r square for each school, but lack of uniformity among the analyses could render comparisons difficult.

CHAPTER VII

CONCLUSIONS AND APPLICATIONS

Several conclusions arise by studying the dynamics of the spatial patterns of universities in Texas. The history regarding the origins of the state's largest universities demonstrates the ability of some relatively new universities to achieve high enrollment numbers while older, private institutions of higher education have long since leveled off. Some of these private schools maintain high admissions standards and prestige, asserting that the largest universities are not necessarily offering the highest quality higher education available in the state.

The innovation of the Southwest Conference and its subsequent dominance in the state altered the typical life cycle expressed by Brown (1981) for colleges and universities in Texas. For the most part, the schools of the SWC eventually found themselves in a perpetual state of maturity, keeping them in position to excel in recruiting and to expand their drawing power geographically across the state and beyond. These universities have successfully avoided, or at least delayed, reaching the final "decline" stage of the life cycle that other colleges and universities of comparable age have seen.

However, the recent rise of newer universities will cause the establishment and diminishing of various university reputations, which could eventually alter the entire higher educational structure in the state.

The component universities of the University of Texas and Texas A&M Systems appear to be having the most success in increasing student participation to meet the growth goals outlined in the Closing the Gaps initiative (THECB 2000). However, widespread alliances to a few systems may lead to less student pride and consequently, less statewide recognition among the system schools.

Based on enrollment by county, each of the major universities controls a distinct geographic hinterland, a concept of recruitment territory that raises many questions. Why do certain universities not draw well from counties closer to the campus, while drawing well from distant areas? Several examples, such as the University of Texas' failure to outdraw Texas State and Texas A&M in the counties contiguous to Travis, can be explained by identifying the cultural, historical, and demographic attributes of each county and determining which attributes certain universities attract.

By examining the diffusion process of Texas State's hinterland from 1983-2005, it is clear that all hinterlands are dynamic, constantly expanding and contracting. In the case of Texas State, the hinterland is expanding rapidly into East and Northeast Texas, while receding in the South. These dynamics are reflected in part due to population growth, but to an even greater extent by the geographic range of the diffusion of a universities drawing power as set forth by recruiting agencies and other external forces. As a result, if a university can identify desirable geographic regions in which to establish its drawing power, it can determine the demographic, cultural, and economic attributes of that

particular region and market to the potential students in the counties of that region accordingly.

The multivariate analyses established distance and intervening opportunities as the strongest explanatory independent variables for each of the major universities. Other variables proved effective with only a few schools, with only population and percent over 25 with a college degree the only variables not significant for any of the schools. Overall, the r square value varied among the schools studied, indicating the analyses might be tweaked in various ways, including either employing backwards multiple stepwise regression, or devising additional independent variables that may explain more of the variation of the dependent variable for some of the universities.

Median household income was a significant variable for Houston, North Texas, and Texas State. These are the three universities located in or near expanding metropolitan areas, suggesting median household income is positively associated with enrollments at universities catering to suburban populations.

The University of Texas is the only university negatively associated with conservatism by county. As a result, its enrollment could be considered the most liberal of the major universities. Although none of the other universities displayed a positive significant relationship, Texas Tech had the strongest association, suggesting its enrollment comes from the most conservative counties.

Other universities have relationships with variables counterintuitive to what was expected. Therefore, alternate explanations worthy of future research exist, and should be explored.

As the State of Texas continues its emphasis on increasing the proportion of the state's population enrolled at its universities, some institutions will take advantage of the opportunity to recruit in larger and more distant geographic areas, clearly setting up the potential for more competition between the major universities, as well as the component schools of the University of Texas and Texas A&M Systems. Based on the dynamic nature of university hinterlands, and the viability of universities themselves, institutions of higher education will continue to make a more significant impact of the human landscape of Texas in the near future, necessitating more study on the spatial properties of these universities and their hinterlands.

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