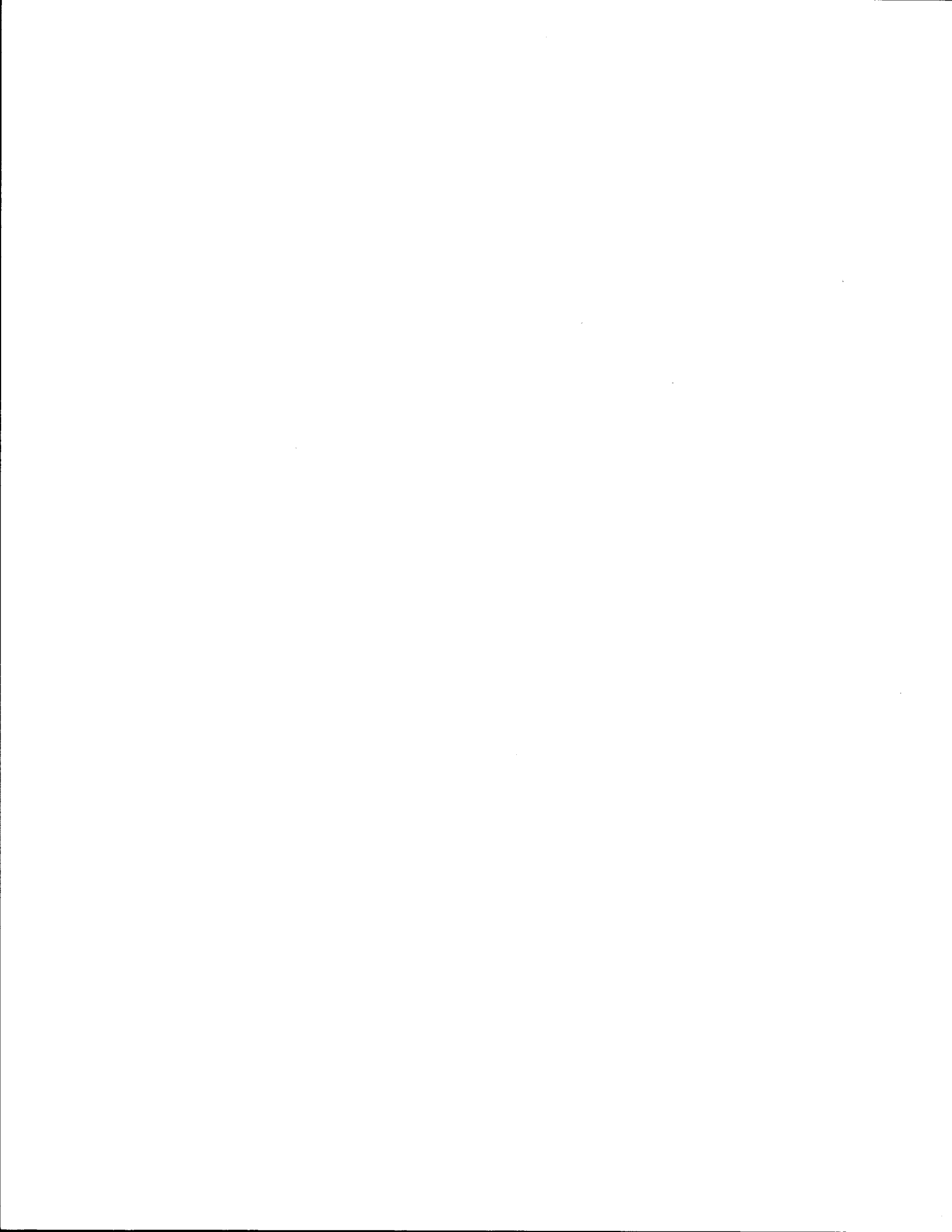


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16. Abstract The years from 1950 to 1980 represented a period of extremely rapid growth in Texas. The trends documented in this report illustrate the impact of three main themes on the amount of commuter traffic that was handled by the roadway system in Texas metropolitan areas. The increase in suburban commuting, commuting by private automobiles and the increase in the number of people in the labor force were the three main themes of "Commuting in America," a report prepared by Alan Pisarski for the Eno Foundation for Transportation. This report used that document as a basis for analyzing the commuting patterns in Texas. In general, Texas urban areas also exhibited these trends. Between 1960 and 1980 the population of Texas metropolitan areas increased 63 percent while employment increased 149 percent. Similar trends were noted for all three metropolitan area sizes defined in this study. A major cause of the significantly greater increase in employment than in population was the rise in female participation in the labor force from a rate of 36 percent of working age women in 1960 to 56 percent in 1980. The increasing availability of automobiles and the movement of employment locations to the suburbs combined to increase private vehicle commuting by 93 percent from 1960 to 1980, while public transit commuting declined 23 percent. The dramatic increase in freeway and street traffic volume in Texas cities was accentuated by this increase.			
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**An Analysis of Commuting Patterns
in Texas Urban Areas**

By

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Research Report 1193-1F
Volume I

Research Study 2-10-88-1193

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Texas State Department of Highways and Public Transportation
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November 1989

METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
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LENGTH

in	inches	2.54	millimetres	mm
ft	feet	0.3048	metres	m
yd	yards	0.914	metres	m
mi	miles	1.61	kilometres	km

AREA

in ²	square inches	645.2	millimetres squared	mm ²
ft ²	square feet	0.0929	metres squared	m ²
yd ²	square yards	0.836	metres squared	m ²
mi ²	square miles	2.59	kilometres squared	km ²
ac	acres	0.395	hectares	ha

MASS (weight)

oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg

VOLUME

fl oz	fluid ounces	29.57	millilitres	mL
gal	gallons	3.785	litres	L
ft ³	cubic feet	0.0328	metres cubed	m ³
yd ³	cubic yards	0.0765	metres cubed	m ³

NOTE: Volumes greater than 1000 L shall be shown in m³.

TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
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LENGTH

mm	millimetres	0.039	inches	in
m	metres	3.28	feet	ft
m	metres	1.09	yards	yd
km	kilometres	0.621	miles	mi

AREA

mm ²	millimetres squared	0.0016	square inches	in ²
m ²	metres squared	10.764	square feet	ft ²
km ²	kilometres squared	0.39	square miles	mi ²
ha	hectares (10 000 m ²)	2.53	acres	ac

MASS (weight)

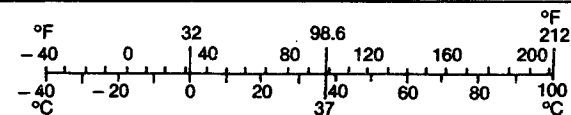
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1 000 kg)	1.103	short tons	T

VOLUME

mL	millilitres	0.034	fluid ounces	fl oz
L	litres	0.264	gallons	gal
m ³	metres cubed	35.315	cubic feet	ft ³
m ³	metres cubed	1.308	cubic yards	yd ³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
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These factors conform to the requirement of FHWA Order 5190.1A.

* SI is the symbol for the International System of Measurements

ABSTRACT

The years from 1950 to 1980 represented a period of extremely rapid growth in Texas. The trends documented in this report illustrate the impact of three main themes on the amount of commuter traffic that was handled by the roadway system in Texas metropolitan areas.

The increase in suburban commuting, commuting by private automobile and the increase in the number of people in the labor force were the three main themes of "Commuting in America," a report prepared by Alan Pisarski for the Eno Foundation for Transportation. This report used that document as a basis for analyzing the commuting patterns in Texas. In general, Texas urban areas also exhibited these trends.

Between 1960 and 1980 the population of Texas metropolitan areas increased 63 percent while employment increased 149 percent. Similar trends were noted for all three metropolitan area sizes defined in this study. A major cause of the significantly greater increase in employment than in population was the rise in female participation in the labor force from a rate of 36 percent of working age women in 1960 to 56 percent in 1980.

The increasing availability of automobiles and the movement of employment locations to the suburbs combined to increase private vehicle commuting by 93 percent from 1960 to 1980, while public transit commuting declined 23 percent. The dramatic increase in freeway and street traffic volume in Texas cities was accentuated by this increase.



IMPLEMENTATION STATEMENT

This report identifies significant demographic and commuting pattern trends for Texas metropolitan areas between 1950 and 1988. Census data from 1950, 1960, 1970 and 1980 were used along with other information for those years, and for 1988 and 1995. Data for individual metropolitan areas are presented in the appendix; summaries of the information are included in the report.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State Department of Highways and Public Transportation. This report does not constitute a standard, specification, or regulation.

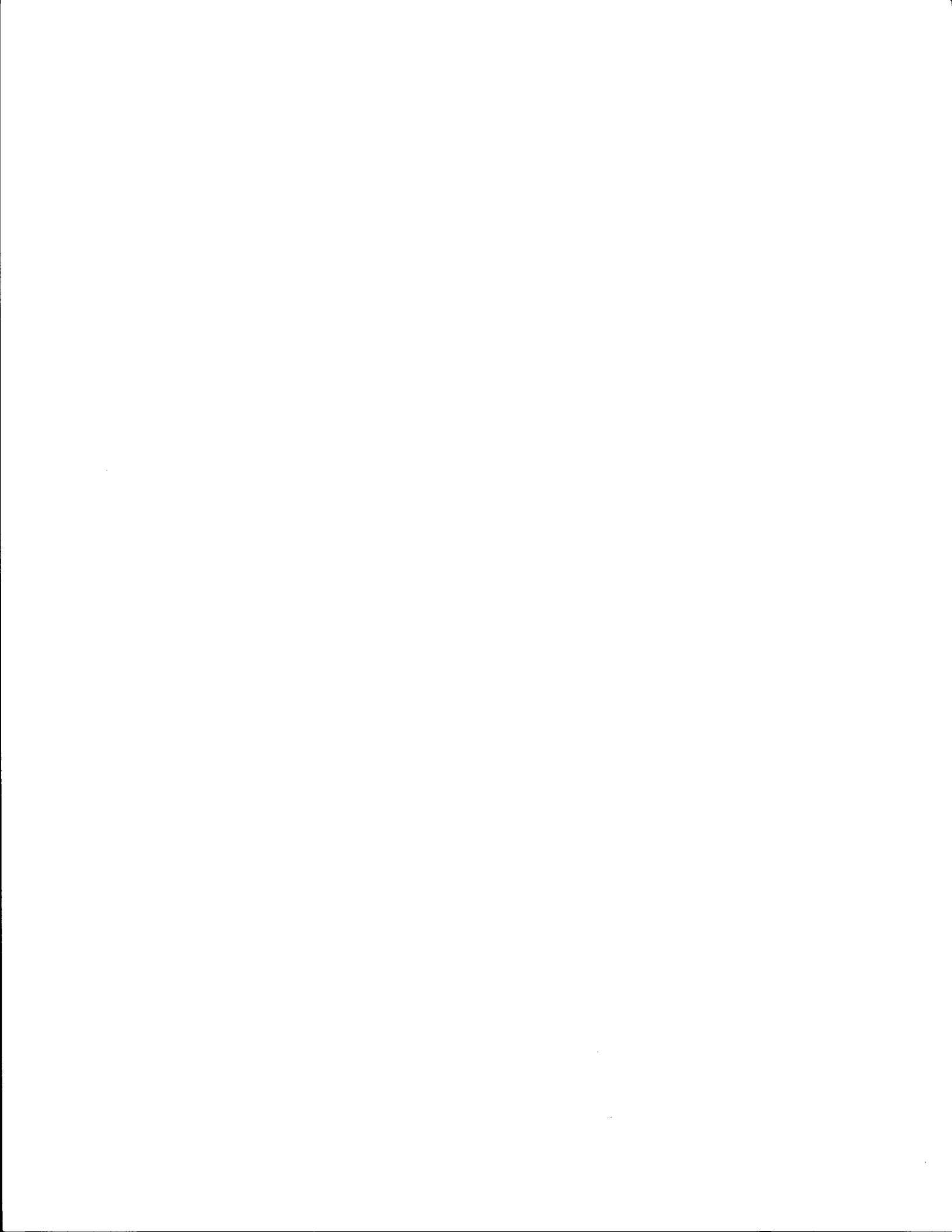


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SUMMARY

This report identifies changes in specific trends that affect urban mobility in Texas metropolitan areas. Statistical trends developed in "Commuting in America", a report that provided insight into the changes in commuting patterns of metropolitan statistical areas (MSAs) throughout the nation, were used as a guide for this study. The national trends developed in this report were compared to corresponding statistical information for MSAs throughout the state of Texas between 1950 and 1980. The data utilized in this study was obtained in part from "Commuting in America", the U.S. Census Bureau, and the Texas Employment Commission. The results and conclusions drawn from this report are intended to assist engineers and planners in understanding the patterns of growth exhibited by Texas cities within the past thirty years. By recognizing changes in these patterns of growth, the design of new facilities and the maintenance of those existing may provide better service for commuters in all forms of transit.

This report examined changing growth patterns for central-city and suburban areas. Changes in commuting modes and in the work force structure of MSAs were also studied. The MSAs studied were grouped into one of three different categories; small MSAs (50,000 to 200,000 population), medium MSAs (200,000 to 1 million population), and large MSAs (greater than 1 million). Statistical analyses were obtained for all Texas MSAs, and each category of MSAs within the state. The results from these analyses were then compared to corresponding national trends.

Growth in the Labor Force

Analysis of the trend in the growth of the labor force showed that, over the last 30 years, the number of jobs has grown at rates up to twice the growth rate of the overall population, both on the national and state levels. This signifies a departure from the traditional relationship between the labor force and the overall population, indicating that the assumptions which have been used for determining population projections may no longer be applicable.

Suburbanization of Residences and Jobs

Differences between national and statewide trends toward the increased number of suburban residences and employment locations were found to exist. "Commuting in America" clearly indicated that larger MSAs across the nation are experiencing the most growth in their suburban areas. Factors that appeared to strongly influence this growth were high land prices and increased congestion that is common to larger cities. Although national and statewide city growth patterns are similar, the rates at which suburbanization is taking place appeared to differ. It is believed that the annexation laws within Texas tend to be more liberal than those in most parts of the country. Because major, incorporated cities are able to annex smaller nonincorporated areas, large Texas MSAs are capable of increasing their population (and therefore decreasing the suburban population) without adding large amounts of people to the MSA. This creates a situation where much of what is considered central-city area in Texas would be classified as suburban area in other parts of the nation. Therefore, the growth experienced by these areas is attributed to the central-city rather than to the suburb.

The trend toward suburbanization within Texas MSAs was found to increase as the MSA population increased. Again, this trend was contributed to the increase in land costs and congestion problems that is associated with the larger MSAs. The data examined in this report indicates that, as city growth occurs, the location of the major traffic generators and private residences change. This relocation results in increased commuter pressure being placed on the arterial systems of the suburbs in the form of higher volumes. Many of these routes are not currently designed to accommodate this change in the trip destination and volume of the traffic.

Household and Vehicle Ownership Trends

Household trend data indicate that the size of the average household is declining. This decline has been accompanied by an increase in vehicle availability per household, with the growth of vehicle availability per person increasing at extremely high rates. As a result, there has been an increase in vehicle availability to members of the labor force.

Increased ownership of private vehicles has resulted in their predominance as the major means of commuting. As the number of vehicles used for commuting has increased, the use of transit has declined nationally.

The use of transit in Texas declined between 1960 and 1980. In 1980, three percent of the work force used public transit in all Texas metropolitan areas, with almost all of that use occurring in the large metropolitan areas.

Many of the changes in the labor force that have begun to affect transportation systems throughout the nation and in the state of Texas can be attributed to changes in society and in the economy within the country and state. Texas has experienced a large growth in the number of households (as well as in the labor force) since 1960. Higher divorce rates and the need for higher family incomes have also reduced the number of people in the average household and enlarged the work force. More women are in the labor force than in previous years. This study indicated that the majority of workers used a private vehicle as their primary source of transportation to work. If these trends in labor force growth and vehicle ownership can be expected to continue, the design of new facilities may have to be based on relationships that will better predict the actual demand that future facilities will experience.

Commuter Travel Patterns

Intra-suburban flow was found to be the dominant commuting flow within larger MSAs of the U.S. This was not the case in Texas, where it was found that the central city-to-central city flow remained the major force in metropolitan trip generation. As mentioned above, however, liberal annexation laws in Texas have allowed established cities to annex unincorporated areas. When the effects of this practice are taken into account, it is believed that much of what is considered intra-central city travel in this report would be represented as a form of suburban travel in most states. This belief is reinforced by the similar percentage of trips whose final destination is the central business district (CBD) in U.S. and Texas MSAs. This would indicate that the change in the typical commuter

patterns in Texas does not drastically deviate from growth patterns exhibited by U.S. metropolitan areas.

As the size of a metropolitan area increases, the CBD begins to lessen in its importance to the areawide employment base. While this trend is not as pronounced in Texas due to the strong central city development in larger cities, it is still observed in the statewide data.

This study indicates that the design of facilities needed to accommodate growth in commuting will require a change in the acceptance of population projections as indicators of commuter demand. The baby boom will continue to affect our overall population for years to come. As this group continues to have children, labor force growth and commuter demands should again escalate the demands on our existing transportation systems. Because the traditional relationship between population and traffic demand no longer appears to exist, other indicators of future travel demand must be recognized. Based on the findings of this report, vehicle availability is expected to be one of the best indicators of future travel demand.

The results of this study also indicate several trends relating to the size and growth of metropolitan areas. This study shows that as MSAs grow, certain changes in travel demand will occur based on the size of the MSA. These shifts in commuter activity caused by the relocation of private residences and jobs to the suburbs appears to be predictable. Therefore, with proper monitoring practices by engineers and planners, the design of transportation systems accommodate changes in the growth of cities.

INTRODUCTION

A study entitled "Commuting in America" (1) analyzed the commuting patterns in major metropolitan areas across the country. U.S. Census Bureau decennial data and periodic results from the Nationwide Personal Transportation Study (NPTS) were combined for the analysis. The main themes of that document were described as: 1) the worker boom, 2) the suburban commuting boom, and 3) the private vehicle boom. The study focused on overall national average trends, with some individual metropolitan area statistics.

Southern and Western cities were compared to the older cities of the Northeast and Midwest. The influence of women entering the work force was indicated in the increase in employment levels in several urban areas that had lost population between 1950 and 1980. This relationship (increasing employment with decreasing population) suggested that estimates of commuting patterns and demands should not be based on population trends.

Employers have also located outside the central city with increasing frequency since the early 1970s; this was indicated in the statistics concerning job location. Just as the total employment growth rate was greater than the percentage change in population, the percentage increase in suburban jobs was greater than the growth rate of jobs in the entire metropolitan area.

The 1980 suburb-to-suburb commuting trips for the metropolitan areas studied in "Commuting in America" were more than twice that of the typical suburb-to-central city commute. Total commuter trips in the 21 metropolitan areas included in the study increased by 20 million between 1960 and 1980; suburb-to-suburb trips comprised 70 percent of that increase. Commuter trips between suburbs were 20 percent greater than those within the central city. In the larger metropolitan areas (population greater than 250,000), the suburb-to-suburb commuter trips comprised a larger percentage of total metropolitan trips than commuter trips within the central city; the percentage of suburb-to-suburb trips increased as the metropolitan area population increased.

Objectives of Analyzing Texas Commuting Trends

This report summarizes the same type of analysis for the 26 major metropolitan areas in the state of Texas from 1950 to 1985, a period of rapid growth in the state. Data were obtained from the U.S. Census Bureau decennial survey concerning changes in population, job location, and the journey-to-work. This information was used to analyze the trends in employment and population.

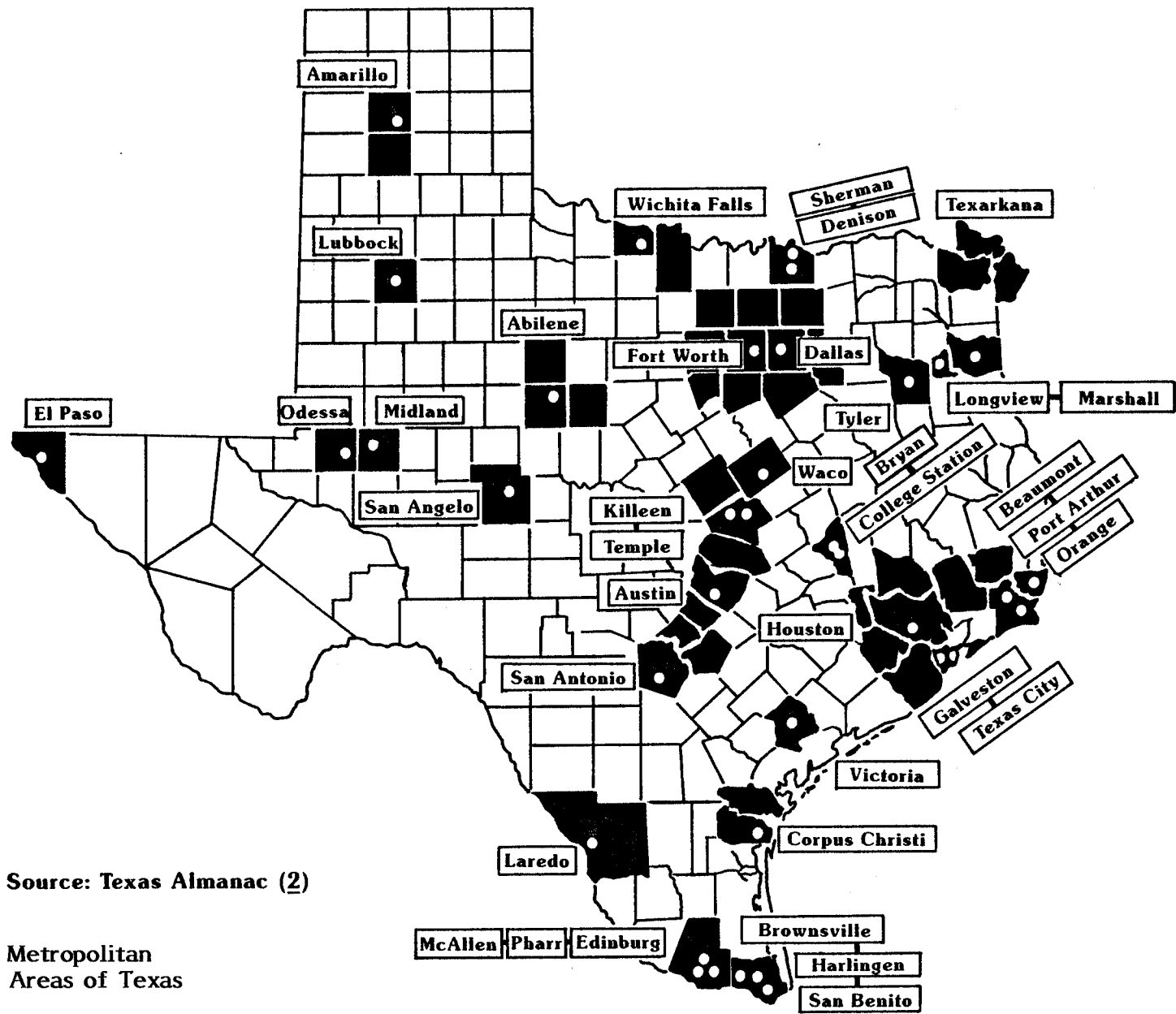
Population and Worker Changes

U.S. Census Bureau decennial population data were obtained from 1950 to 1980 for each of the 26 major metropolitan areas in Texas (Figure 1). Estimates by the U.S. Census Bureau were also obtained for 1988. It should be noted that in 1980 Dallas-Fort Worth was a Consolidated Metropolitan Statistical Area which means that two or more Primary Statistical Areas were integrated. Midland and Odessa, although in adjacent counties, are individual Metropolitan Statistical Areas.

The metropolitan areas were grouped into three categories, depending on their 1980 population. The following categories were used to illustrate the differences in living, working and commuting trends among different sizes of urban areas (Table 1).

- Small -- 50,000 to 200,000
- Medium -- 200,000 to 1 million
- Large -- Over 1 million

Comparisons of various factors were made according to these categories. Each metropolitan area was analyzed according to the age of both the workers and overall population to determine how it has changed during the rapid growth period of the state. The location of residence was also examined to determine where workers lived and how far they were willing to commute. The characteristics of households were also recorded to analyze the changing demographic and living patterns of Texas workers.



Source: Texas Almanac (2)

Figure 1. Metropolitan Statistical Areas of Texas

Table 1. Texas Metropolitan Area Categories,
Component Counties and 1980 Population

Metropolitan Area	Component County(s)	1980 Population (1000)
Small Areas (50,000 to 200,000)		
Abilene	Callahan, Jones, Taylor	139
Amarillo	Potter, Randall	174
Bryan-College Station	Brazos	94
Galveston-Texas City	Galveston	196
Laredo	Webb	99
Longview-Marshall	Gregg, Harrison	152
Midland	Midland	83
Odessa	Ector	115
San Angelo	Tom Green	85
Sherman-Denison	Grayson	90
Texarkana	Bowie (TX), Little River (AR), Miller (AR)	127
Tyler	Smith	128
Victoria	Victoria	69
Waco	McLennan	171
Wichita Falls	Clay, Wichita	131
Medium Areas (200,000 to 1 Million)		
Austin	Hays, Travis, Williamson	537
Beaumont-Port Arthur-Orange	Hardin, Jefferson, Orange	375
Brownsville-Harlingen-San Benito	Cameron	210
Corpus Christi	Nueces, San Patricio	326
El Paso	El Paso	480
Killeen-Temple	Bell, Coryell	215
Lubbock	Lubbock	212
McAllen-Pharr-Edinburg	Hidalgo	283
Large Areas (More than 1 Million)		
Dallas-Fort Worth	Collin, Dallas, Denton, Ellis, Hood, Johnson, Kaufman, Parker, Rockwall, Tarrant, Wise	2,975
Houston	Brazoria, Ft. Bend, Harris, Liberty, Montgomery, Waller	2,904
San Antonio	Bexar, Comal, Guadalupe	1,072

The work force has traditionally been male. Since the 1960s, however, an increasing number of women have joined the work force. The change in the number of female workers was analyzed to determine the effects on worker commuting habits and volume. The commuting patterns of women were compared to those of men in each metropolitan area in the state.

Employment Changes

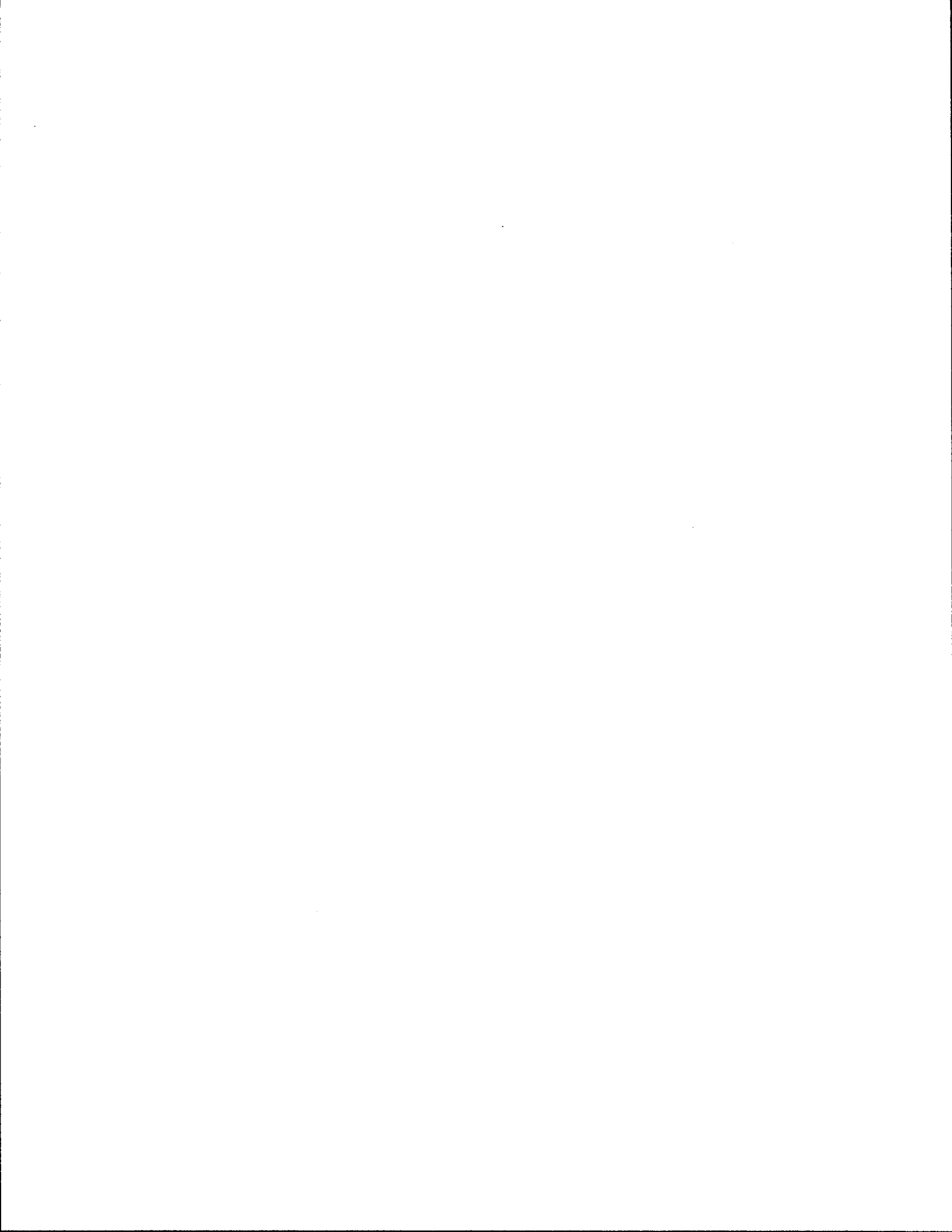
On the national level, many employers were relocating outside the central city between 1960 and 1980. The job location characteristics were analyzed for each of the metropolitan

areas studied to determine if Texas has been following the same trend. The commuting patterns for workers were also examined to see if the state is following the national trend in suburb-to-suburb commuting.

The journey-to-work data available from the U.S. Census Bureau were analyzed to determine the impact of population and employment relocation trends. Mode choice by both occupation and trip origin and destination was examined. This analysis described the reliance on personal automobiles for commuting. Average travel times by origin and destination were also examined. Since the U.S. Census Bureau did not begin collecting travel time data until the 1980 census, a trend analysis could not be conducted.

Study Objectives

It should be noted that this analysis was conducted to estimate the growth patterns of individual Texas cities. This report is intended to provide insight into roadway facility availability in the state of Texas. Analyzing the commuting trends for individual metropolitan areas will yield comparisons between U.S. cities and Texas cities of different sizes. Specific information on the commuting patterns within major metropolitan areas in the state could provide officials and local planners with the data necessary to modify the existing roadway system to meet future traffic demands.



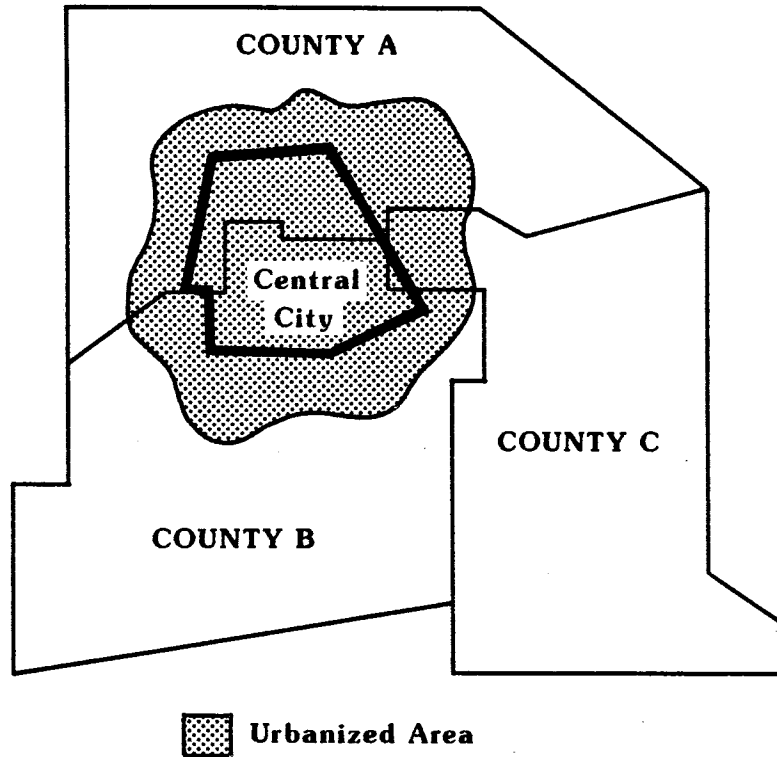
STUDY CHARACTERISTICS

This research effort analyzed the trends summarized in "Commuting in America," with more detail for individual metropolitan areas of Texas. Some methods which were utilized for this study should be noted, primarily the addition of counties to the 1950 through 1980 data. As Texas metropolitan areas expanded, several incorporated additional counties. Since the populations of these additional counties were not included in the earlier counts for the metropolitan area, the indicated growth pattern would be misleading, showing more growth than actually occurred. The new counties were, therefore, added to the metropolitan areas in the earlier decades. The age group and sex distributions were assumed to be the same for the additional counties as for the original counties. The total number of workers in the additional counties, therefore, was obtained, and used to compare the ratio of workers to total population and to working-age population. The additional workers were not used to analyze modal choices or work locations.

Ten of the small Metropolitan Statistical Areas (MSA) and two of the medium MSAs were not classified as metropolitan areas in 1960. Commuter growth patterns, therefore, could not be included for these metropolitan areas because data were unavailable in 1960. Any discussion relating to Texas growth patterns prior to 1980 does not include these 12 metropolitan areas. Still, useful patterns emerged from the 14 MSAs for which comparable data were available.

It should be noted that data for MSAs include the entire county in which an urbanized area is located (Figure 2). Metropolitan areas may be located in more than one county, so the rural areas in all the counties are also included in the data for the MSA. Generally, though, the population in the rural areas is insufficient to affect the trends for the MSA. One of the MSAs in Texarkana, Texas, extends into Arkansas, and the data for Arkansas were included in this study.

Figure 2 represents the typical structure of an MSA which encompasses the entire county in which the urbanized area is located. The urbanized area is defined as the continuously built-up area surrounding the central city, with a typical density of at least



Note: Counties A, B, and C would be included in the MSA although only a relatively small portion of each is urbanized.

Source: Eno Foundation for Transportation, Inc.

Figure 2. Typical Structure of a Metropolitan Statistical Area Surrounding an Urbanized Area

1,000 persons per square mile. An urbanized area is defined without respect to county boundaries. The central city, too, is defined without consideration of county boundaries. It is generally the central, incorporated, densely populated city around which the MSA is structured. More than one central city may be included in MSA statistics.

It is somewhat difficult to compare trends in Texas to those in other states. Texas has fairly liberal annexation laws. An incorporated city in Texas can annex adjacent unincorporated communities, thus enlarging the central city. The central cities for Texas metropolitan areas, therefore, might be larger than those for other cities in the United States. Texas also has large counties (like many states in the South and West), so annexation into neighboring counties can increase the size of the central city and the MSA, with relatively little increase in the number of metropolitan residents. These factors may help explain why the shares of population and workers living in Texas suburbs are smaller than for the overall country.

The U.S. Census Bureau projects certain demographic data between the decennial census years. Where available, these data were included in the discussion to indicate estimated growth during the 1980s and 1990s. It should be noted that any reference to growth during the 1980s is an official estimate of the U.S. Census Bureau. The Texas Employment Commission also projects employment changes in metropolitan areas which were used to estimate growth through the 1990s.



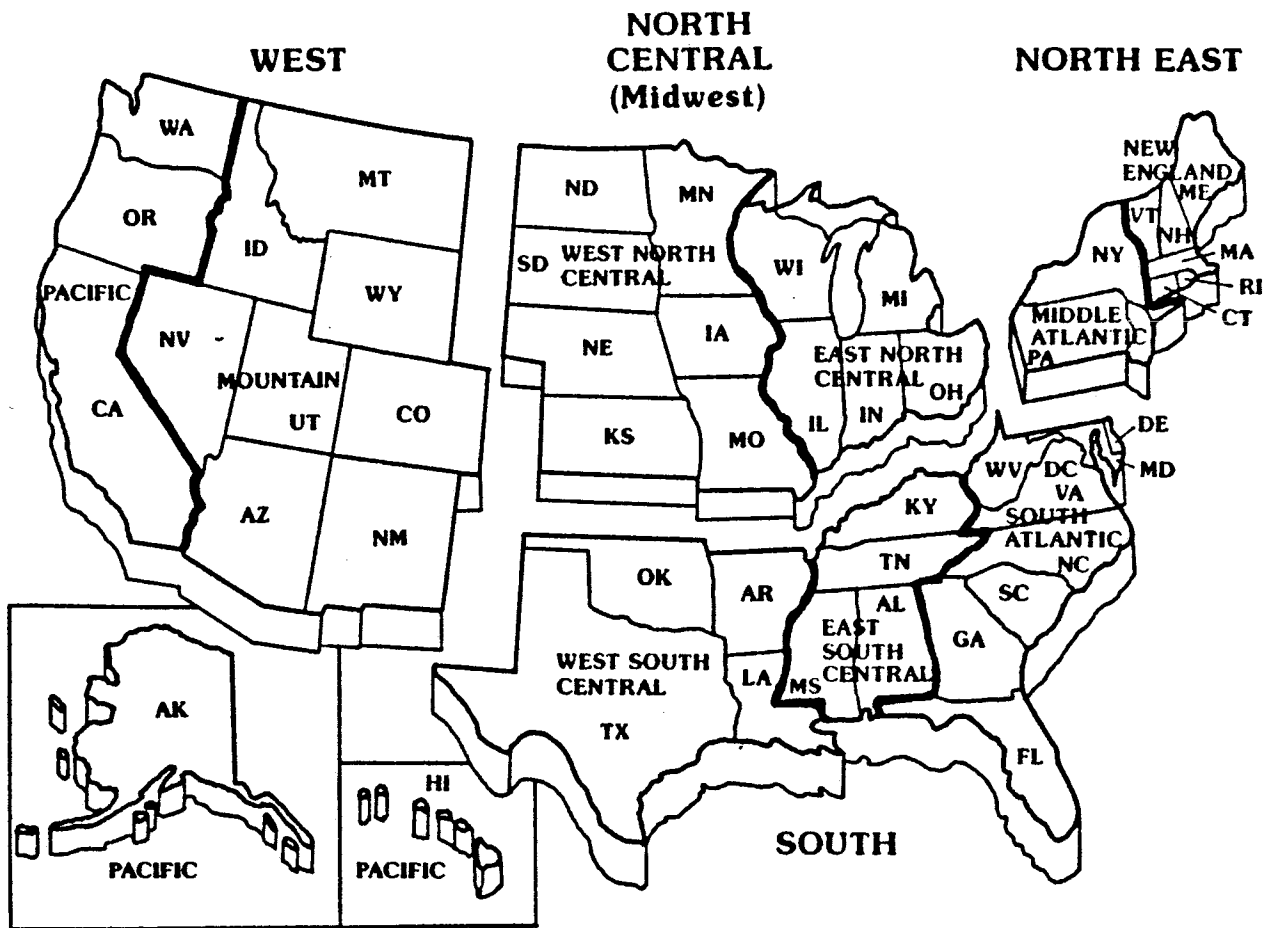
SUMMARY OF "COMMUTING IN AMERICA"

A study of the commuting patterns in the United States was summarized in a report entitled "Commuting in America." That report identified several factors which influenced the commuting patterns in the country, and conducted an analysis of the commuter characteristics and commuting flow trends. The following is a summary of the trends which were observed for the MSAs examined in "Commuting in America."

Three themes were identified as having the greatest effect on the commuting patterns in the MSAs of this country between 1950 and 1985. These included the worker boom, the suburban commuting boom, and the automobile commuting boom. Each will be discussed in detail.

The number of workers has drastically increased since World War II; this was referred to as the worker boom. While the "baby boom" caused the population in the United States to increase by approximately 50 percent since World War II, the worker boom caused the number of workers to increase by more than 65 percent.

A factor which has affected the country as a whole is the shift in the population growth to the South and West (Figure 3). During the 1960s, the growth rate of the population slowed; this continued through the 1980s. As overall population growth rates declined, the change in growth was distributed unequally throughout the country. While growth rates declined throughout the South and West, they remained at high levels. The Northeast and Midwest, however, began a rapid decline in growth as many residents moved to other parts of the country. The Northeast and Midwest sections both grew at a level two to four percentage points below the national average during the 1960s, and approximately eight percent below the national rate in the 1970s (Table 2). The South and West, however, grew at rates two to 11 percent above the national average in the 1960s, and at least nine percent above the national rate in the 1970s.



Source: Eno Foundation for Transportation, Inc.

Figure 3. Census Regions and Divisions

Table 2. Regional Population Growth Rates

Region	Population Growth Rates (%)		
	1950-1960	1960-1970	1970-1980
Northeast	14	11	1
North Central (Midwest)	15	9	4
South	16	15	20
West	38	24	23
National	18	13	11

Source: Eno Foundation for Transportation, Inc.

Worker Boom

Since 1970, the national population growth rate has tapered off to approximately one percent per year. Employment growth accelerated through the 1970s and 1980s, and is now growing at approximately twice that of the population. This is predominantly because of the entrance of the "baby boomers," and the increase in the number of women in the work force. In 1950, about one-third of the working-age women were in the work force; by 1985 that number had increased to almost two-thirds.

Suburban Commuting Boom

The suburban commuting boom indicates that the jobs in the MSAs have been moving from the central cities to the suburbs, following the population shift. This has caused an increase in the suburb-to-suburb commuting trips, and a decrease in the percentage of traditional trips from the suburb to the central business district (CBD). Approximately one-third of all metropolitan commuting was between suburbs in 1980.

Between 1960 and 1980, the suburbs received about two-thirds of the metropolitan job growth. It should be noted, however, that the metropolitan and suburban growth trends vary with the size of the MSA. In the larger MSAs, the suburb-to-suburb commuting patterns are more dominant, while in the smaller metropolitan areas the suburb-to-central city and intra-central city trips are more dominant. The main reason for this difference is that suburban communities are not extensive in small urban areas. Growth in small urban areas usually occurs within the city limits, with few residential communities outside. Two other possible explanations are that small areas have not created enough congestion to justify leaving the central cities, and that land prices in the central cities have not become high enough to drive people to the suburbs.

Travel between metropolitan areas is also becoming more prevalent as the MSA suburbs overlap. Metropolitan areas in the country exchanged approximately 3.7 million workers each day in 1980 (four percent of the total work force), and about 55 percent of those workers had their destinations in a suburb.

Travel between urban and exurban areas also grew. Approximately 2 million commuters entered metropolitan areas, and about 1 million left metropolitan areas each day to go to work in 1980. All of these trips must traverse the suburbs to reach their destinations. Suburban commuting has, therefore, become a dominant force in the overall commuting patterns.

Automobile Commuting Boom

The auto commuting boom was described as the increasing use of the private vehicle as the means of travel to work. With commuting in the suburbs increasing, the use of private automobiles has also been increasing. The percentage of trips made by auto increased its share of total travel from about 70 percent in 1960 to over 85 percent in 1980, while all other modes declined. Between 1960 and 1980, vehicle availability in the nation increased from 1.03 vehicles per household to 1.61. Now that households are smaller and have more vehicles available, each individual has much more access to a private automobile than in previous decades. Because the number of households has increased and the size of households has decreased, the full impact of the private vehicle increase is moderated.

Several changes in automobile ownership occurred between 1960 and 1980. A majority of U.S. households now have two or more vehicles. The number of zero-vehicle households decreased, lowering the share of households without vehicles from 22 percent to 13 percent. Two-vehicle households grew by 172 percent, while three-vehicle households grew by almost 1000 percent. The number of vehicles available per worker grew from 0.85 in 1960 to 1.34 in 1980. In every household size category (as measured by workers per household), the majority of households had more vehicles than workers.

Another finding of "Commuting in America" was that households without vehicles also tend to be households without workers. Two-thirds of households without vehicles also had no workers, and another 28 percent had only one worker. Households without any vehicles also tend to be very small and are usually located in larger central cities, such as New York City.

TEXAS COMMUTER CHARACTERISTICS

The post-war history of commuting in Texas has been shaped by the baby boom, dramatic increases in car ownership, suburbanization of the population and jobs, and the sharp increase of women in the work force. The ultimate determinant of the size and character of commuting, though, is jobs.

While the location of jobs is the ultimate determinant of the character of commuting, it has not been highly publicized. Since 1950, suburbanization of the population and the post-World War II population boom have been much more publicized demographic trends in Texas. This section documents the impact of these trends on commuting, and compares local to national trends. It also examines other demographic trends which have been less publicized and appreciated than the baby boom.

The Worker Boom

The dominant factor in shaping commuting since World War II has been the great increase in jobs created by the growing Texas economy. These jobs were filled by the "baby boomers" as they became old enough to work, by the population shifting to the region from the Northeast and Midwest, and by the influx of women to the work force. These demographic trends produced an unprecedented increase in commuters.

Jobs and Commuters

A boom in the number of workers, rather than a population increase, caused much of the socioeconomic change which occurred after World War II. Table 3 shows that the labor force in the United States grew more than 48 percent between 1960 and 1980, while the population grew by about 26 percent. By the end of the 1960s, the rate of the population increase in the United States had peaked and begun a steady decline, but job growth continued to increase through the 1970s and early 1980s. The proportion of the adult population in the work force in the country grew from 55 percent in 1960 to over 60 percent in the 1980s. Since 1980, jobs at the national level have been increasing approximately two percent per year, about twice the rate of the population increase. Today there are nearly 110 million commuters in the country.

Table 3. Growth in Workers Versus Growth in Population

Classification	Total Employment (Thousand)	Employment Increase For Decade (Thousand)	Employment Increase For Decade (Percent)	Population Increase For Decade (Percent)
United States				
1960	65,800	----	----	----
1970	78,600	12,800	19	13
1980	97,300	18,700	24	11
Overall Change 1960-1980	----	31,500	48	26
Texas Metropolitan				
1960	2,098	----	----	----
1970	2,991	893	43	25
1980	5,231	2,240	75	31
Overall Change 1960-1980	----	3,133	149	63
Small Texas MSAs				
1960	265	----	----	----
1970	311	46	17	6
1980	802	491	158	22
Overall Change 1960-1980	----	537	203	29
Medium Texas MSAs				
1960	474	----	----	----
1970	621	146	31	16
1980	1,092	472	76	31
Overall Change 1960-1980	----	618	130	51
Large Texas MSAs				
1960	1,360	----	----	----
1970	2,060	700	51	36
1980	3,337	1,277	62	33
Overall Change 1960-1980	----	1,977	145	81

Note: Texas populations include additional counties in 1960 and 1970, as discussed in Study Characteristics.

Texas has also experienced a growth in jobs exceeding the growth of the population, as indicated in Table 3. The population in the metropolitan areas of Texas grew 63 percent between 1960 and 1980, while the metropolitan work force grew 149 percent. Since 1980, the metropolitan population in Texas grew an estimated 19 percent to 13.9 million in 1988. As already indicated, Texas was in one of the fastest growing regions in the nation. It is not surprising, therefore, that the Texas increase was greater than the national increase.

The share of the Texas metropolitan area working-age population that is in the work force grew from 58 percent in 1960 to 68 percent in 1980. It should be noted that this percentage includes high school and college students who did not work while attending school. The share of the national working-age population in the work force increased from 55 percent in 1960 to over 58 percent in 1980. The Texas working-age population joined the work force at a greater level than the national working-age population, resulting in over 5.2 million commuters in the metropolitan areas of Texas in 1980.

As indicated in Table 4, the small urban areas grew from having a work force containing 63 percent of the working-age population in 1960 to containing over 66 percent in 1980. In 1960, males accounted for 50 percent of the population in small urban areas, and 87 percent of the working-age males were in the work force. Over the 20 year period, the share of working-age males in the labor force decreased to 79 percent. The medium urban areas experienced a growth in their labor force from 56 percent of the working-age population in 1960 to over 63 percent in 1980. The large urban areas had almost 59 percent of the working-age population in the labor force in 1960, and that increased to almost 71 percent in 1980.

The share of the working-age population in the Texas work force showed a steady increase from 58 percent in 1960 to 68 percent in 1980 (Table 4). The share of males in the work force, though, showed no increase during the 20-year time frame. The combination of increasing participation in the state's overall labor force and constant male participation suggests that the share of women joining the labor force has increased. As indicated in Table 4, this is the case. Female participation in the labor force has been increasing in a rapid fashion for the majority of Texas metropolitan areas. The country has experienced the same trend, but the share of males in the labor force decreased slightly (Table 4). This caused the overall share of the working-age population to increase at a lower level than Texas' total share.

The areas which experienced the most growth in their labor forces were primarily the large metropolitan areas (Table 3). The Houston area, with a population of 2.9 million, for instance, had over 53 percent of the working-age population in the labor force in 1960,

and over 72 percent in the labor force in 1980. In Houston, the working-age population grew from over 867,000 in 1960 to almost two million in 1980 (130 percent increase), while the work force grew from over 460,000 in 1960 to over 1.4 million in 1980 (205 percent increase).

Amarillo was classified as one of the small urban areas for this study, with a 1980 population of 173,700. It had over 66 percent of the working-age population in the work force in 1960, and over 71 percent in the work force in 1980. Amarillo's working-age population increased from over 93,000 in 1960 to over 115,000 in 1980 (24 percent increase), while the work force grew from over 62,000 in 1960 to over 82,000 in 1980 (33 percent increase).

Table 4. Share of Working-Age Population in the Work Force

Classification	Percent in Work Force		
	Male	Female	Total
United States			
1960	83	38	55
1970	80	43	57
1980	77	48	58
Texas Metropolitan			
1960	81	36	58
1970	80	43	61
1980	81	56	68
Small Texas MSAs			
1960	87	38	63
1970	81	44	62
1980	79	54	66
Medium Texas MSAs			
1960	78	34	56
1970	73	37	55
1980	77	50	63
Large Texas MSAs			
1960	81	37	59
1970	82	45	63
1980	84	58	71

As evidenced by the wide difference between the population and work force growth in large and small to medium urban areas, it appears that many of the working-age population are moving to the large urban areas from the smaller areas.

Population Change

As evidenced in Figure 4, the national population growth trend was characterized by a peaking in the 1950s followed by a slow tapering off of growth during the 1960s and 1970s.

The Texas population growth trend was characterized by a large growth in the 1950s and 1970s, with less growth in the 1960s. The sharp increase in population during the 1950s was primarily a result of the post-World War II population increase, while the sharp rise during the 1970s was a result of the expanding Texas economy.

The national metropolitan population increased almost 20 percent during the 1950s and 1970s, with a smaller increase during the 1960s. The Texas metropolitan population followed the metropolitan growth trend of the country, but at a higher rate. The pattern for Texas metropolitan areas is at a level approximately twice that of the national growth pattern.

The non-metropolitan population at the national level increased at a level near ten percent during the 1950s and 1970s, and near 15 percent during the 1960s. The Texas trend has not followed the national non-metropolitan trend during the 35-year time frame. The Texas non-metropolitan population decreased at rates around ten percent per decade through the 1950s and 1960s, but then increased by around 15 percent during the 1970s. The decline during the 1950s and 1960s could have been the result of people migrating to the cities. The sudden increase during the 1970s could be traced to the expanding Texas economy.

Small Texas urban areas grew with a different pattern than the overall Texas rate. Growth was high through the 1950s, dropped to near zero during the 1960s, and went above the overall average Texas rate during the 1970s. The low growth during the 1960s could have been the result of a population migration to larger urban areas. Medium urban areas followed the growth trend for the State of Texas, but at a rate approximately ten percent higher. Large urban areas followed the national growth trend, but at a level much higher.

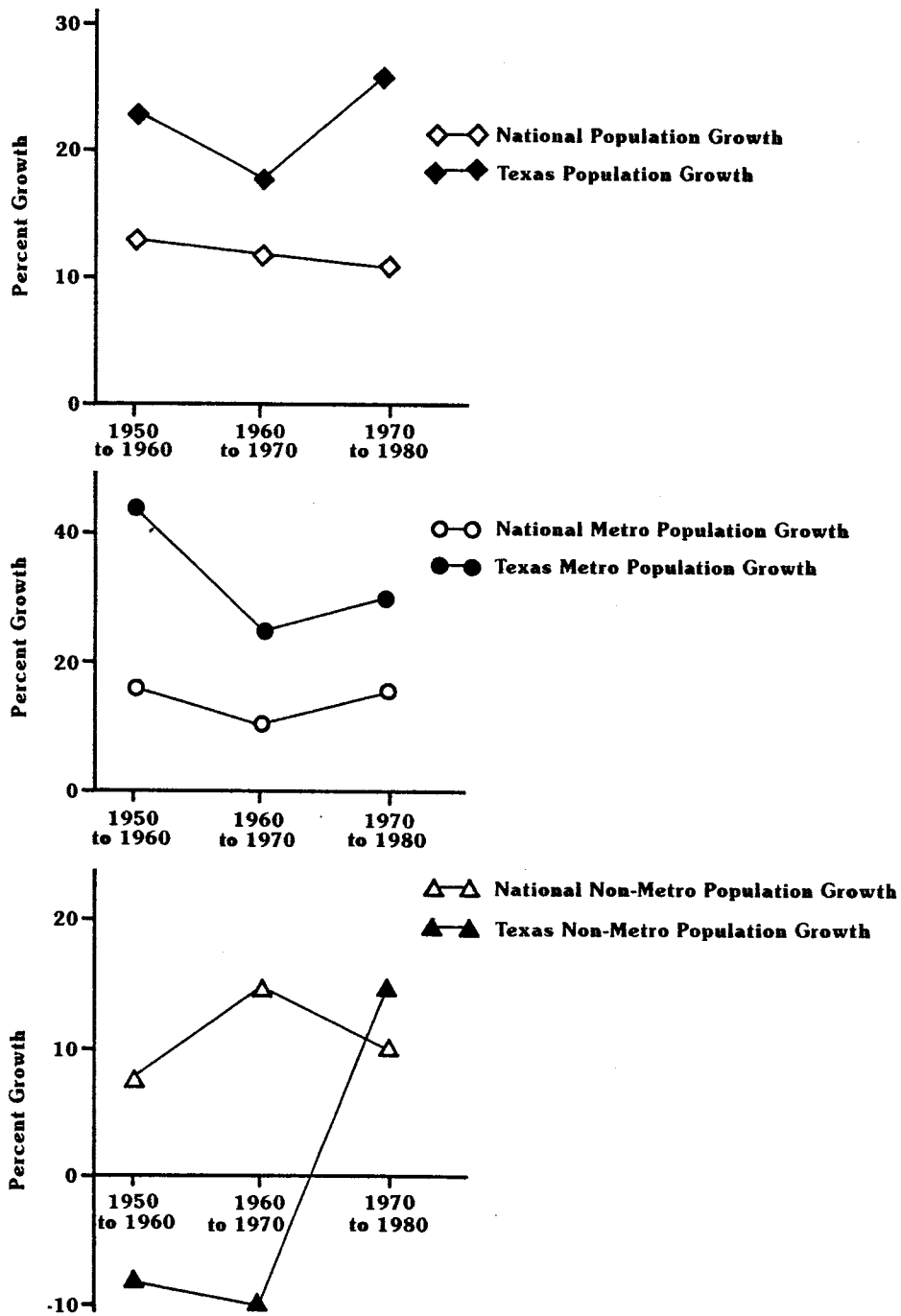


Figure 4. National And Texas Population Growth Trends

At the national level, the population growth within metropolitan areas was more erratic, with central city growth rates declining steadily to near zero growth in the 1970s (Table 5). Growth in suburban areas peaked in the 1960s, followed by a somewhat lower rate through the 1970s.

Growth within Texas metropolitan areas has taken place at a much greater rate than at the national level. While the national growth in central city population declined to near zero during the 1970s, growth in Texas central cities increased 17 percent during the 1960s and 19 percent during the 1970s (Table 5). Growth in Texas suburban areas occurred at an even higher rate than in the central cities, with 40 percent growth during the 1960s and 49 percent growth in the 1970s.

Table 5. Population Growth Rates Within Texas Metropolitan Areas

Classification	Percent Growth	
	1960-1970	1970-1980
United States Metropolitan		
Central Cities	6	1
Suburbs	27	19
Texas Metropolitan		
Central Cities	17	19
Suburbs	40	49
Small MSAs		
Central Cities	1	14
Suburbs	8	31
Medium MSAs		
Central Cities	17	26
Suburbs	12	42
Large MSAs		
Central Cities	23	18
Suburbs	61	54

Small Texas metropolitan areas experienced near zero growth in their central cities during the 1960s, but growth of almost 15 percent during the 1970s. Growth in the suburbs was also minimal during the 1960s, at a rate below ten percent. Suburban areas around small Texas metropolitan areas grew at a much higher rate of 31 percent during the 1970s.

Medium urban areas in Texas had growth rates higher than the small urban areas. The central cities of the medium areas grew 17 percent in the 1960s, and 26 percent in the

1970s. The suburbs in medium urban areas did not grow rapidly until the 1970s. The suburbs grew slower than the central cities in the 1960s (12 percent), then grew at a much higher rate of 42 percent during the 1970s.

Population growth in large Texas metropolitan areas followed a pattern similar to the U.S. metropolitan areas in the 1960s and 1970s. The rate of growth for both the central cities and suburbs was slower in percentage terms during the 1970s than in the 1960s. Growth occurred in the central cities at a rate of 23 percent during the 1960s, and only 18 percent during the 1970s. Similarly, the suburbs grew 61 percent during the 1960s, and 54 percent during the 1970s. Large Texas urban areas, though, still grew at the fastest rate of the three metropolitan classifications and significantly faster than the average U.S. metropolitan area.

Changes in the Labor Force

The post-World War II population boom was, in the long term, not the most significant change in demographics, as mentioned in "Commuting in America" (1). The primary increase occurred in jobs, and in the workers to fill those jobs. What the post-war population increase did was to create a large worker cohort that has affected demographic patterns ever since. This was accompanied by the dramatic increase in female participation in the labor force, and by the migration to Texas from other states. The combination of these factors filled the growing number of jobs in Texas.

The baby boom generation currently ages between about 30 and 45. They are now a critical factor in the size and composition of the work force. The population increase due to the expanding economy in Texas has also created an increase in the work force since 1950. This large set of new members in the work force has become a central part of the demand for housing, automobiles, and road space. The Texas economy, until the decline of the oil industry in the early 1980s, was able to provide jobs for those new adults. Those levels of employment, however, have generated some problems for the state, including those related to commuting.

The United States as a whole, like Texas, has had to deal with the growing commuting problems caused by the large number of new workers. The baby boom generation joined the work force in largest numbers during the 1970s. As indicated in Table 6, the entire population of the United States grew by a little more than 11 percent during the decade, while the population of the working-age group increased approximately 19 percent. The younger segment of the national working population, those from 16 to 34, grew by more than 32 percent between 1970 and 1980. The older segment of the working-age group in the United States, those 35 to 64, grew more slowly, at a rate of less than ten percent. Many of this age group were born during the Depression and war era when the United States experienced the lowest growth rate in its history.

Table 6. Population Changes During the 1970s

Classification	Population Growth By Age Category in the 1970s (Percent)				
	All Ages	Under 15	15-34	35-64	Over 64
United States	11	-4	32	8	26
Texas Metropolitan	31	7	54	25	46
Small Texas MSAs	22	1	46	13	40
Medium Texas MSAs	31	10	52	24	54
Large Texas MSAs	33	7	57	30	45

Texas followed a growth trend very similar to the United States in the 1970s, but at a higher level. Texas metropolitan growth rates were approximately 15 to 20 percent higher than national growth rates for each of the age groups. The metropolitan population in Texas increased 31 percent during the 1970s, while the population of the working-age groups grew by approximately 40 percent. The younger segment of the working population (aged 16 to 34) grew by 54 percent during the decade, while the older segment increased at less than half that rate.

Figure 5 indicates the change in the share of metropolitan area age groups since 1950. The metropolitan population of the state grew by almost 6.8 million (approximately 140 percent) between the years of 1950 and 1980. The age group under 15 grew 76 percent through the 1950s, increasing by 1 million, then slowed to a growth rate of 15 percent during the 1960s and seven percent during the 1970s. The under 15 age group comprised almost 28 percent of the metropolitan population in 1950, but had decreased slightly to under 25 percent in 1980.

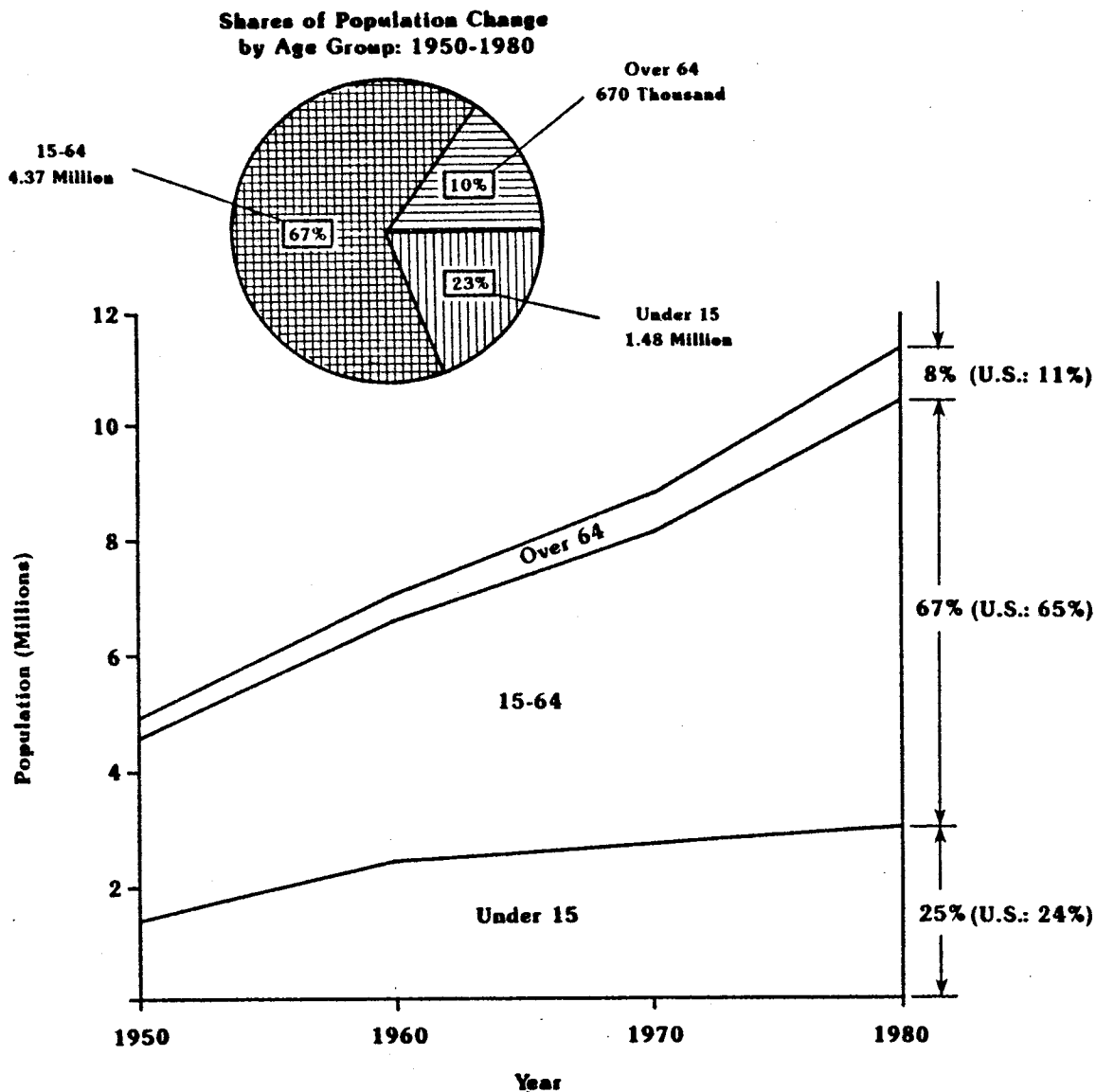


Figure 5. Total Texas Metropolitan Population and Population Change by Age Group, 1950 to 1980.

The aging of the baby boom generation in Texas was characterized by a 141 percent increase in the age 15 to 64 population between 1950 and 1980. The older segment (35 to 64) experienced a slight decline in its percentage of the total Texas metropolitan area population (from over 32 percent in 1950 to over 28 percent in 1980), while the younger segment grew from over 34 percent of the total metropolitan population in 1950 to 38 percent in 1980. The overall percentage of the working-age group in the metropolitan area population has remained relatively constant since 1950.

The largest growth of the work force in Texas occurred between 1970 and 1980, when many "baby boomers" joined the work force. Figure 6 indicates that the Texas metropolitan areas grew approximately 30 percent during the decade, while the age group between 15 and 34 grew almost 55 percent. Like the United States pattern, the age group in Texas between 35 and 64 grew at a rate less than the average. The growth trends in Texas were similar to those of the United States during the 1970s, but at a much higher level. While the Texas metropolitan areas grew about 30 percent during the 1970s, the non-metropolitan areas grew at a rate much closer to the national average. The exurban areas in Texas grew only 15 percent between 1970 and 1980, and the population of the United States grew by 11 percent.

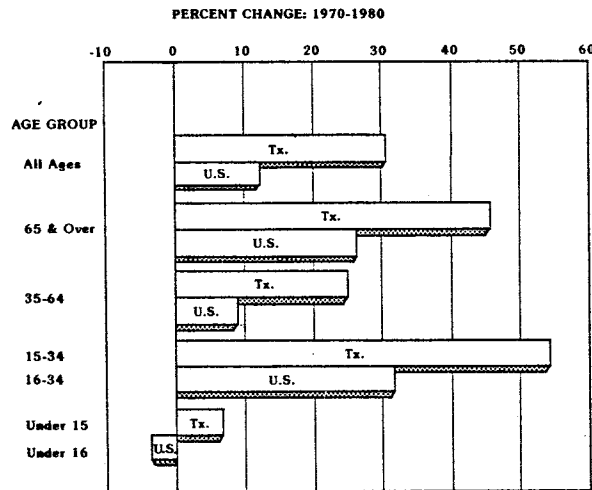


Figure 6. Population Growth Rates by Age Group, 1970-1980

Those over 65 years of age have also been growing rapidly, in percentage terms, in Texas metropolitan areas recently. The older generation increased 259 percent, from over 260,000 to over 940,000, between 1950 and 1980. This age group comprised over eight percent of the metropolitan area population in 1980, but only 5.5 percent in 1950.

Summary -- Labor Force Changes

In summary, the Texas metropolitan areas experienced a population growth rate of about 30 percent during the 1970s, a rate almost triple that of the United States. The working-age group in the metropolitan areas grew approximately 40 percent. The younger

segment of the working population (aged 15 to 34) grew at a rate almost twice that of the Texas metropolitan area population. This suggests two conclusions: Texas had a major influx of working-age people; and most working-age people moved to metropolitan areas.

The Baby Boomers

The age group from 15 to 64 is the one from which the labor force is drawn, with some additional workers drawn from the age group over 64. Rapid expansion of this age group would have expanded the labor force under normal circumstances. As shown in the inset in Figure 5, from 1950 to 1980 this age group in Texas metropolitan areas grew by 4.4 million. According to historical trends in the United States, approximately two-thirds of that number, almost three million, would be expected to enter the work force.

Between the years of 1960 and 1980 (data were not available for 1950), over 3.13 million workers joined the labor force. Historical trends in the United States indicate that almost three million workers would be expected to enter the labor force during the 30-year time period beginning in 1950. Since over three million workers joined the labor force since 1960, the historical trends would obviously underestimate the increase in the number of workers.

Since 1950, the United States has followed the same pattern as Texas metropolitan areas, with the work force increasing faster than the population. The number of persons in the age group from 16 to 65 grew by 50.5 million in the United States between 1950 and 1980. Based on historical trends, two-thirds of that number would have been expected to join the work force. The work force actually increased by 53 million workers, a number greater than the total increase in the working-age population.

The small metropolitan areas in Texas also had an increase in workers greater than the increase in the population during the 1970s. The population in small urban areas during the 1970s increased approximately 273,000, and the work force increased by about 491,000. The small urban areas during the 1950s, like the medium and large urban areas during the entire study period, followed the pattern of the overall state; the number of workers increased only slightly less than the working-age group population.

Figures 7 and 8 help explain the change in relationships for Texas, and the metropolitan area groups. The traditional relationship between total population and the working-age population, and between the working-age population and the labor force has been broken. As shown in Figure 7, the working-age population in metropolitan Texas comprised the great majority of the increase in the overall metropolitan population since 1970. This is primarily a result of the migration to Texas from other states and "baby boomers" coming of working age. The most significant change, though, is in the labor force, with growth rates after 1960 clearly unconnected with the growth rate of the metropolitan population or working-age population. As a result, the state has reached unprecedented levels of employment with over 68 percent employment among the Texas population over 15 in 1980, compared to 50 percent in 1960. This is a 151 percent increase in the labor force between 1960 and 1980, compared to the 63 percent increase in the population and the 82 percent increase in the working-age population.

More Women in the Labor Force

The explanation for the extraordinary growth in the labor force is clear when growth rates are disaggregated into males and females. Figure 9 indicates the growth rates of the working-age population, the labor force, male workers, and female workers. Total labor force growth rates have diverged from traditional patterns because more women have joined the labor force. The percentage of working-age women who participate in the national labor force has grown from about one-third in 1950 to about 60 percent in 1980. Male labor force growth at the national level has followed the growth in the population since the 1940s, declining slightly as a percentage of the male working-age population. One reason for the stability of the male participation rates is the fact that most men of working age were already in the labor force.

Almost 30 million women have joined the work force in the United States since 1950, compared to fewer than 20 million men. Women now comprise 42 percent of the work force, while they constituted only 28 percent in 1950, a large 50 percent increase in 30 years.



Figure 7. Trends in Texas Metropolitan Population and Labor Force Growth

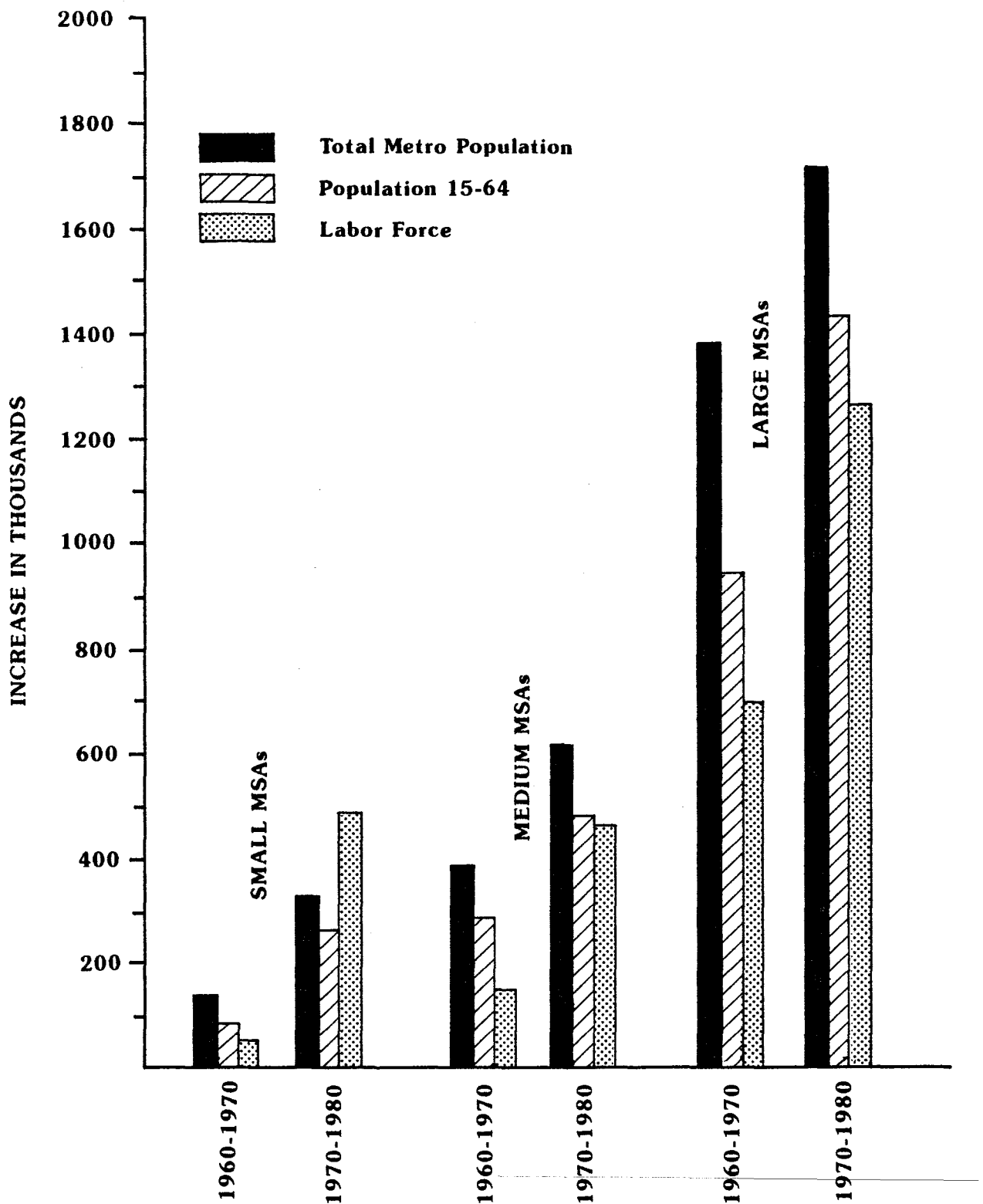


Figure 8. Trends in Population and Labor Force Growth for Small, Medium and Large Metropolitan Areas in Texas.

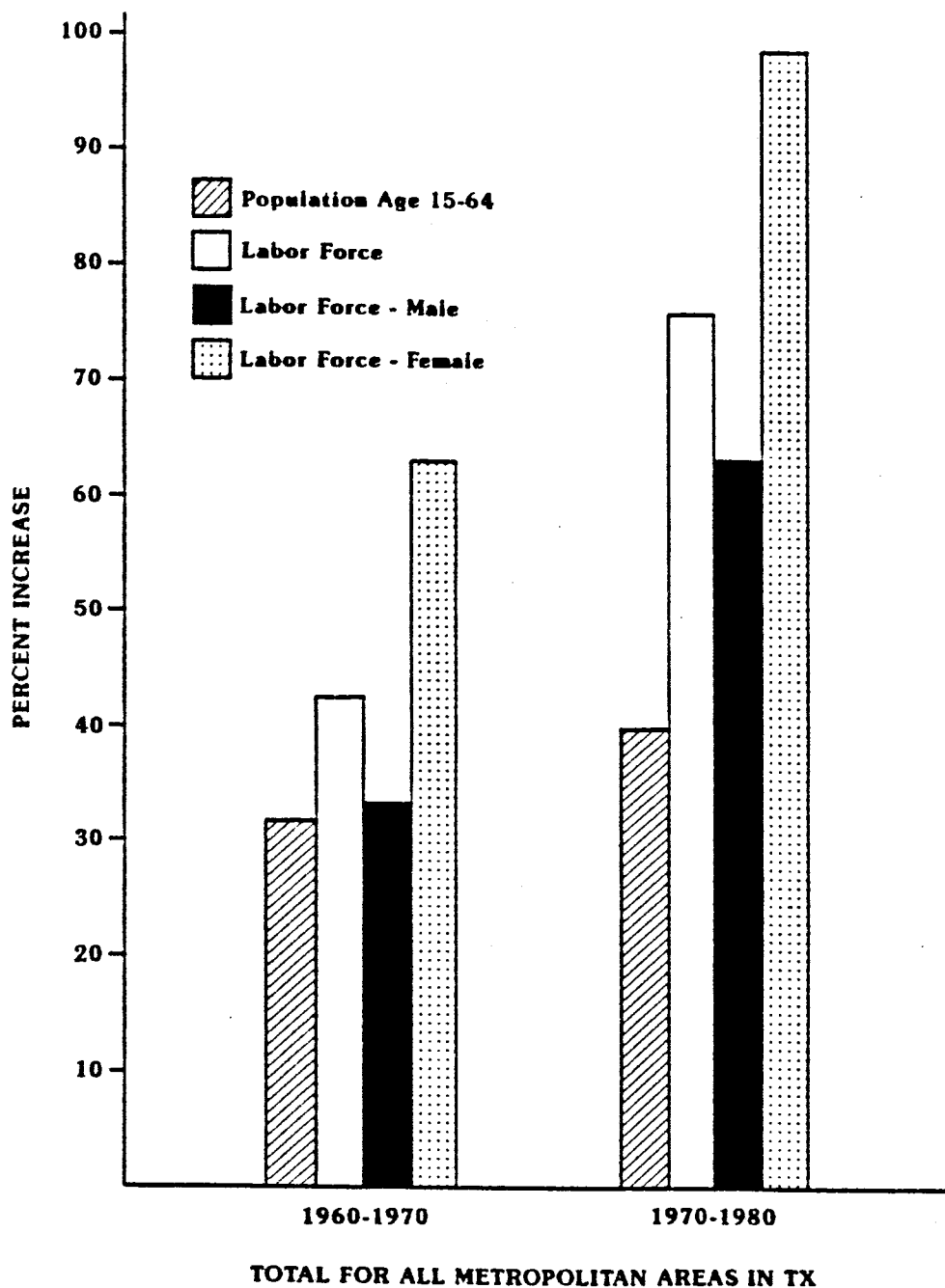


Figure 9. Male and Female Components of the Texas Metropolitan Labor Force Growth

The growth in the number of women in the labor force in Texas has followed the trend at the national level. The share of working-age women in the work force has grown from 32 percent in 1960 to 56 percent in 1980 (Table 4). Similar to the national trends, the growth in the male labor force has followed the growth in the population. The percentage of working-age men in the labor force has increased slightly between 1960 and 1980, from 71 percent to 81 percent.

Almost 1.5 million women have joined the labor force in Texas since 1960, compared to almost 1.7 million men. Women now constitute 41 percent of the labor force in Texas, as compared to only 32 percent in 1960. The trend of male and female workers in the labor force is indicated in Figure 10.

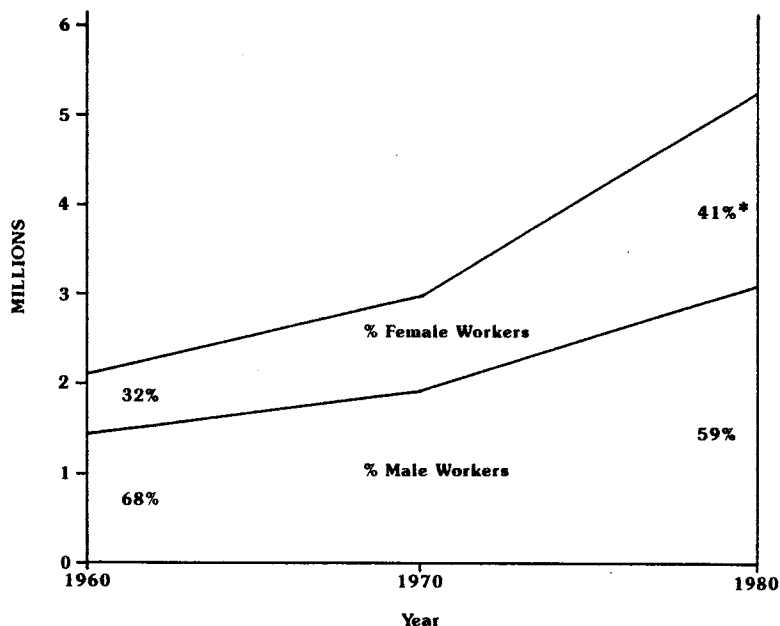
Small urban areas have shown a growth pattern for women in the work force similar to the Texas trend. In 1960, 38 percent of the eligible women were in the labor force, compared to 32 percent for the state. By 1980, 54 percent of the working-age women were part of the labor force. The composition of the labor force was comparable to the Texas trend, at about one-third women in 1960, and 41 percent women in 1980.

The share of working-age women in the work force in medium urban areas also followed the Texas trend, with 34 percent in 1960 and 50 percent in 1980. The increase of women in the labor force in medium urban areas was similar to the small urban areas, with about one-third of the labor force female in 1960, and 40 percent of the work force female in 1980.

The share of working-age women in the labor force in large urban areas was higher than the Texas average in 1960, at 37 percent. By 1980, that statistic had increased to 58 percent. Once again, this value was slightly higher than the state average. This could be due to the higher cost of living in large urban areas, where women may be more often required to work than in smaller metropolitan areas. Composition of the large urban area work force was similar to the other urban area groups.

New Residential and Job Patterns

The numbers of jobs and workers have grown and redistributed themselves both within metropolitan areas and across the country. The most predominant characteristic of national location patterns since World War II has been the suburbanization of workers and jobs. Location patterns in Texas have also followed the national trend.



* Note: Women comprised approximately 40% of the labor force in all three metropolitan classifications in 1980.

Figure 10. Trend in Gender Share of the Texas Labor Force

Growth Centered in Large Metropolitan Areas

Population growth has been centered in larger metropolitan areas during the post-war era. At the national level, metropolitan areas below 500,000 have held a nearly constant share of national population, those between 500,000 and one million have gained slightly in share, and those over one million have gained substantially in share of national population. It should be noted that holding a constant share of a rapidly growing population means substantial growth in itself.

In 1950, there were only 14 areas in the country which had a population over one million; they contained 29 percent of the population. By 1980, 35 areas contained over one million people (totaling 108 million people), and represented about half of the total population. Areas over 2.5 million contained almost one-third of the total population in 1980, indicating that America has become increasingly suburban and large metropolitan area oriented.

The growth trend in urban areas of Texas has mirrored the growth trend of metropolitan areas in the country. Figure 11 indicates the share of the total Texas

population for small, medium, and large metropolitan areas in the state. The share in small urban areas, as at the national level, remained relatively constant over the 30 year period beginning in 1950. The medium urban areas showed slight increases in their share of the population. It was the large urban areas, though, which gained substantially in the share of the Texas population. They comprised 37 percent of the Texas population in 1950; that share increased to almost 50 percent by 1980.

Recent growth patterns in Texas have seen the metropolitan area rates exceed the state average while non-metropolitan rates have dropped off. Metropolitan areas grew from a population of 4.9 million in 1950 to a population of 11.4 million in 1980, an overall increase of 133 percent. Non-metropolitan areas, on the other hand, remained constant at 2.79 million residents. This state, which was almost 40 percent non-metropolitan in 1950, was only 20 percent non-metropolitan by 1980. This indicates that many rural residents migrated to the metropolitan areas.

Suburban Growth

Different rates of growth between central city and suburban areas have dramatically changed the distribution of the population within the urbanized areas. Nationally, most of the population growth, over 86 percent of it since 1950, occurred in suburban areas. The remainder occurred in the central cities of metropolitan areas, while non-metropolitan areas actually lost population. At the national level, the share of population within central cities remained relatively constant at about one-third, while suburban and rural areas reversed their shares since 1950. Suburban areas now contain 44 percent of the population, while rural areas contain 23 percent.

Figure 12 indicates the distribution of the population within the suburbs and central cities of Texas and the exurban areas of the state from 1960 to 1980. As evidenced by the pattern between 1960 and 1980, the growth in the metropolitan areas share of population may continue to increase.

The United States population was predominantly urban by 1950 with a majority of its population in cities; today it is predominantly metropolitan with more than 75 percent of the population in such areas. Within the metropolitan areas of the country, 44 percent of the population lived in the suburbs in 1980.

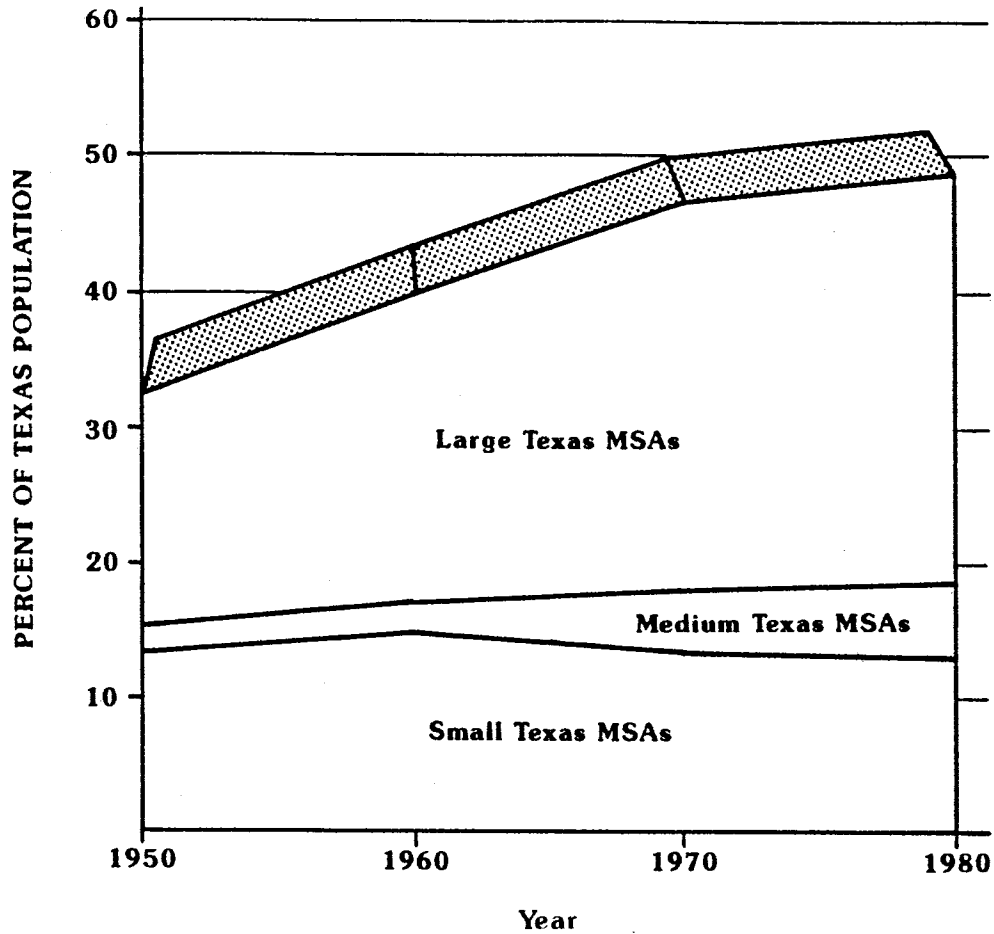


Figure 11. Share of Total Texas Population in Small, Medium, and Large Metro Areas

Texas has followed the same trend as the country. Metropolitan areas accounted for 80 percent of the population of Texas in 1980. Within the metropolitan areas 42 percent of the population lived in the suburbs in 1980, which is comparable to the 44 percent of the population living in the suburbs in the United States. The Texas suburban population in 1980 was an increase from the 32 percent living in the suburbs in 1960 (Table 7).

The small urban areas did not show the same dramatic increase in the share of suburban population that the state trend indicated. In 1960, the suburbs accounted for 27 percent of the population in small metropolitan areas. This statistic had increased to only 31 percent in 1980. The main reason for this minimal suburban growth could be that small urban areas do not have large suburban communities. Growth in small urban areas usually occurs within, or slightly outside of, the city limit; very few residential communities exist outside the city limits. Two other possible explanations are that small areas have not generated enough congestion or high land prices to justify moving out of the central cities.

Medium urban areas experienced slightly less growth in suburban population than the small urban areas. In 1960, the suburbs contained 33 percent of the medium metropolitan area population. This basically remained constant at 32 percent in 1970 and 35 percent in 1980. These constant values may also be the result of the small amount of congestion in the central cities, and stable land prices.

Large urban areas experienced a significant amount of growth in the suburbs. In 1960, the suburbs accounted for 34 percent of the metropolitan population. That statistic had increased to 47 percent by 1980. This is consistent with the national trend of continued population growth in the suburbs.

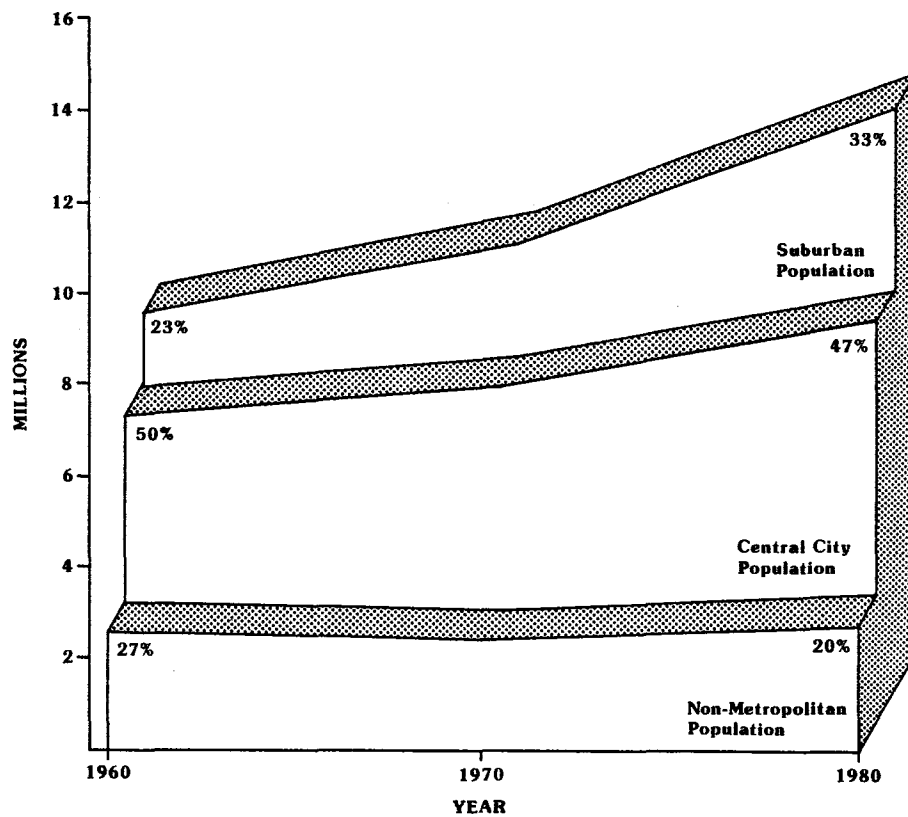


Figure 12. Texas Population Distribution, 1960-1980

Distribution of Labor Force

Between 1960 and 1980, over 30 million workers were added to the United States labor force. The geographical distribution of the growth in the labor force has been predominantly in the South and West, and has generally paralleled the overall population distribution. Differences exist where women have entered the labor force at varying rates. In general, all areas across the nation with a population above 1 million have similar shares of female workers, ranging between 40 percent and 46 percent, and averaging 43 percent.

The number of workers in Texas metropolitan areas increased by 3.1 million between 1960 and 1980. A large percentage of that increase occurred in large urban areas, with the majority occurring in the suburbs. Between 1960 and 1980, almost two million workers joined the labor force in large metropolitan areas; these workers accounted for 63 percent of the increase in the total labor force in Texas metropolitan areas. Of the two million additional workers in large urban areas, 1.2 million (63 percent) lived in the suburbs. By 1980, large urban areas accounted for 58 percent of all the metropolitan area workers in

Texas (Table 8), and 72 percent of all metropolitan workers who live in the suburbs. This indicates that the majority of workers in Texas metropolitan areas are living in the suburbs of large urban areas.

Table 7. Share of Metropolitan Population in the Suburbs

Classification	Share of Population in Suburbs (Percent)		
	1960	1970	1980
United States	49	54	58
Texas	32	37	42
Small MSAs	27	28	31
Medium MSAs	33	32	35
Large MSAs	34	41	47

Medium urban areas experienced 20 percent of the growth in the metropolitan work force in Texas between 1960 and 1980. The labor force in medium urban areas grew by over 600,000 during the 20-year period. Unlike the large metropolitan areas, most of the new workers in medium urban areas lived in the central cities. As already indicated with the population trend, this growth pattern could be the result of relatively low land prices and low congestion in the central cities. Almost 24 percent of all metropolitan Texas workers lived in medium urban areas, while only 17 percent of suburban metropolitan workers lived in this city size.

The small urban areas accounted for 17 percent of the total metropolitan labor force growth in Texas between 1960 and 1980. During the 20-year period, the labor force in small metropolitan areas grew by almost 540,000. Of these additional workers, only 34 percent moved to the suburbs in the small urban areas. Just 18 percent of all Texas metropolitan workers lived in small urban areas in 1980, and only 11 percent of metropolitan area workers in the state lived in the suburbs of cities this size. As in the medium urban areas, the small amount of suburban growth could be the result of relatively low land prices and congestion within the central cities. The small growth in small urban areas could also be caused by the lack of suburban communities; most growth occurs within the city limits, with few residential communities outside.

Table 8. 1980 Shares of Workers in Texas Metropolitan Areas and Their Suburbs

Classification	Share of All Metro Area Workers	Share of All Suburban Dwelling Workers
Small MSAs	18.4	11.0
Medium MSAs	23.9	16.7
Large MSAs	57.7	72.3 ¹
Total Texas Metro	100.0	100.0

¹Indicates that the majority of metropolitan workers who lived in the suburbs in Texas, lived in the suburbs of large urban areas.

As shown in Table 9, more workers at the national level lived in the suburbs than workers at the state level in 1980. This could be due to the difference in municipal annexation policies of Texas compared to those of the West and Northeast. The greater tendency for suburban living in large metropolitan areas in Texas is indicated by the share of metropolitan workers living in the suburbs. Large metropolitan areas had 47 percent of their workers living in suburban areas in 1980, while small metropolitan areas had only 30 percent of the workers residing in the suburbs.

Table 9. 1980 Distribution of Workers Within Metropolitan Areas

Classification	Percent of Metro Workers in Suburbs	Difference from Texas ¹
United States	61	+19
Texas Metropolitan	42	N/A
Small Texas MSAs	30	-12
Medium Texas MSAs	33	- 9
Large Texas MSAs	47	+ 5

¹Relative to Texas Metropolitan average

Residence by Occupation

Employees in Texas used to reside close to their jobs, which were primarily located in the central cities of urban areas. As Texas has grown rapidly, more workers have begun to migrate to suburban areas. While this migration has not been as significant in Texas as the movement at the national level, it has increased within the last decade. Table 10

indicates place of residence in 1980 according to occupation for each metropolitan classification in Texas.

Table 10. Place of Residence Based on Occupation, 1980

Occupation	Live in Central City		Live in Suburbs	
	Male (%)	Female (%)	Male (%)	Female (%)
Small Texas MSAs				
Professional, Technical Managers, Officials, Proprietors	41,900 (12)	39,700 (17)	15,000 (10)	14,600 (16)
Sales Workers	39,000 (12)	16,100 (7)	13,900 (9)	6,500 (7)
Clerical	33,800 (10)	30,200 (13)	12,600 (9)	12,400 (13)
Armed Forces	19,200 (6)	72,900 (31)	6,800 (5)	30,300 (32)
Farming	13,000 (4)	2,200 (1)	800 (1)	100 (0)
Others	5,200 (2)	700 (0)	8,100 (6)	1,000 (1)
Total	176,100 (54)	71,600 (31)	88,400 (60)	29,500 (31)
Total	328,200 (100)	233,400 (100)	145,600 (100)	94,400 (100)
Medium Texas MSAs				
Professional, Technical Managers, Officials, Proprietors	61,700 (14)	58,100 (19)	21,100 (9)	20,800 (11)
Sales Workers	50,300 (12)	23,600 (8)	19,000 (8)	70,500 (38)
Clerical	46,400 (11)	37,900 (12)	16,000 (7)	15,600 (8)
Armed Forces	28,200 (7)	93,600 (31)	9,200 (4)	38,100 (20)
Farming	24,800 (6)	2,500 (1)	43,000 (18)	2,500 (1)
Others	7,000 (2)	1,400 (0)	16,500 (7)	2,600 (1)
Total	203,200 (48)	90,200 (29)	110,900 (47)	38,400 (21)
Total	421,600 (100)	307,300 (100)	235,700 (100)	188,500 (100)
Large Texas MSAs				
Professional, Technical Managers, Officials, Proprietors	146,300 (15)	125,400 (17)	137,100 (14)	102,200 (16)
Sales Workers	133,300 (13)	65,300 (9)	139,900 (15)	54,900 (9)
Clerical	105,300 (10)	89,700 (12)	101,800 (11)	82,300 (13)
Armed Forces	76,800 (8)	261,200 (34)	58,800 (6)	232,300 (37)
Farming	18,000 (2)	3,800 (1)	25,200 (3)	4,800 (1)
Others	9,700 (1)	1,900 (0)	16,900 (2)	3,300 (1)
Total	517,400 (51)	204,600 (27)	471,200 (49)	148,000 (23)
Total	1,006,800 (100)	751,900 (100)	950,900 (100)	627,800 (100)
Texas Metropolitan				
Professional, Technical Managers, Officials, Proprietors	249,900 (14)	223,100 (17)	173,200 (13)	137,600 (15)
Sales Workers	222,600 (13)	105,100 (8)	172,900 (13)	130,100 (14)
Clerical	185,500 (11)	157,700 (12)	130,300 (10)	110,300 (12)
Armed Forces	124,300 (7)	427,700 (33)	74,800 (6)	300,700 (33)
Farming	55,700 (3)	8,500 (1)	68,900 (5)	7,400 (1)
Others	22,000 (1)	3,900 (0)	41,500 (3)	7,000 (1)
Total	896,700 (51)	366,300 (29)	670,400 (50)	215,900 (24)
Total	1,756,700 (100)	1,292,300 (100)	1,332,000 (100)	909,000 (100)

In general, a slightly larger share of women than men in each occupational classification lived in the central city in 1980. The occupation itself, however, does not significantly impact choice of residence location. Between 56 and 62 of percent the workers in all the occupations, except the armed forces and farming, lived in the central city. Not surprisingly, only 35 percent of workers in the farming industry lived in central cities in Texas in 1980. The majority of males in the armed forces (65 percent) lived in the suburbs in 1980, while 47 percent of women in the armed forces lived in the suburbs. The residence

pattern of women in the armed forces was more comparable to the other occupations than the men.

Small metropolitan areas in Texas exemplified characteristics similar to the overall state, but at a higher level. The majority of workers in all the occupations, except armed forces and farming, lived in the central city in 1980. The share was much greater than the state level, though, ranging between 67 and 74 percent in the central city. The share of workers in the farming industry that lived in the central city of small metropolitan areas (40 percent) was slightly higher than the state average in 1980. Nearly all of the workers in the Armed Forces (95 percent) lived in central cities in 1980. This uncommonly high value could be explained by the annexation laws in Texas, which minimize the amount of suburban communities around small metropolitan areas.

Medium metropolitan areas in Texas followed the same pattern as the small metropolitan areas with approximately 70 percent of the workers in each occupation, except armed forces and farming, living in the central city in 1980. The place of residence for farmers followed the Texas pattern, with approximately 35 percent living in the central city. The number of workers in the armed forces living in the central city was slightly lower than the overall share in Texas, with 37 percent of the men and 50 percent of the women.

The residence pattern in large metropolitan areas in Texas most closely resembled the pattern in the overall state. Between 49 and 57 percent of the workers in the majority of the occupations resided in the central city in 1980. Once again, the armed forces and farming classifications were slightly different than the rest of the occupations. Only 36 percent of workers in the farming industry lived in the central cities in 1980, while approximately 43 percent of members of the armed forces resided within the central city.

Household-Related Trends

Household composition and size have changed dramatically since 1950. Households have become smaller, with older residents. Rapid expansion of ownership and access to private vehicles has resulted in households with more mobility than in previous years.

Household Size and Number of Workers

The average household size has been decreasing for several decades. At the national level, household sizes declined from 3.37 people in 1950 to 2.75 in 1980. Some of the demographic factors, such as "baby boomers" joining the labor force, and the increased participation in the labor force by women, tend to produce new households. Other factors, including higher divorce rates, and older persons living longer and separately from their children, also contributed to the increase of new, smaller households.

Changes in household size and composition have important implications for transportation. Households, rather than individuals, tend to be the primary units shaping transportation demand. Automobile availability tends to be a shared attribute of a household. Many trips are also generated according to the needs of the household, not the individual. Vehicle occupancy rates are strongly affected by family size and, as a secondary factor, by household income.

The number of households and workers in the country grew substantially after World War II. The growth in the number of workers and new households in the United States was approximately even during the 1970s. While the growth of the country's population seemed to be tapering off, household and labor force growth continued at an increasing pace.

Unlike the tapering off of the population growth in the United States, the growth of the Texas metropolitan population has continued to increase. As indicated in Figure 13, the labor force in Texas is growing at high rates, with an addition of over 2.2 million workers in metropolitan areas during the 1970s, a 75 percent increase. These growth rates, however, occurred before the oil crash of the early 1980s. Since the slump in the Texas economy, metropolitan areas have continued to grow, but at a lower rate. The number of households in Texas metropolitan areas increased at a level similar to the number of workers. The number of households increased by 1.6 million during the 1970s, or by 69 percent.

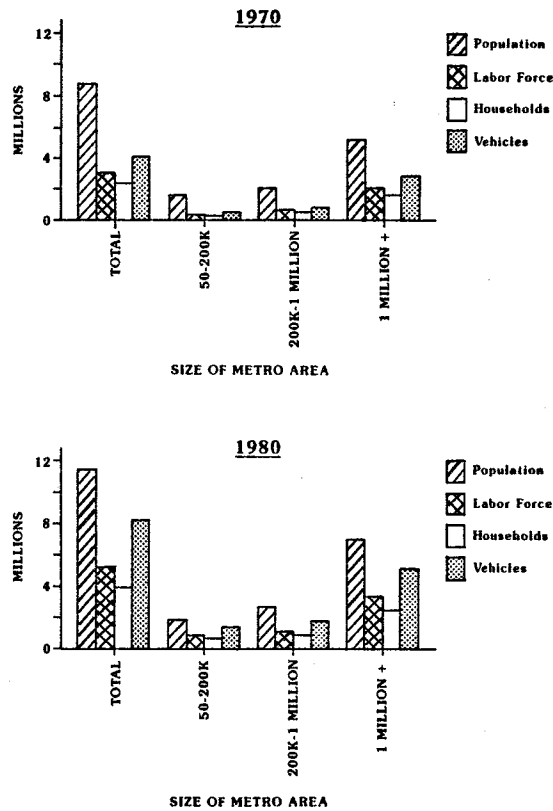


Figure 13. Total Population, Labor Force, Households, and Vehicles for Small, Medium, and Large Texas Metropolitan Areas

Small Texas urban areas experienced similar growth trends for workers and new households. Each grew approximately 155 percent during the 1970s.

Medium Texas metropolitan areas also encountered similar growth trends for workers and new households. The labor force grew approximately 75 percent between 1970 and 1980, while the number of households increased 71 percent.

The growth trends for workers and new households were slightly different in large Texas urban areas. The number of workers increased by 62 percent during the 1970s, while the number of households increased by 54 percent. A large influx of workers from other states joined the Texas work force during the 1970s when the economy was expanding so rapidly, with the greatest increase in numbers in large Texas urban areas. This large increase could have caused the difference in growth rates between workers and households in large urban areas.

Number of Households

The rapid increase in households occurred much faster than the population increase at the national level, resulting in declining household sizes. At the national level, the number of households increased by 85 percent between 1950 and 1980, from about 44 million to 81 million, while the population increased by only 50 percent. The growth in households was rapid during the 1970s, with an increase in households of 26 percent. This was more than twice the population increase during that time.

In Texas, a similar trend in household and population growth occurred. Between 1950 and 1980 the number of households in Texas metropolitan areas increased 280 percent, from around one million to almost four million, while the population increased 132 percent. During the 1970s, the number of households increased 69 percent; this was the highest growth during a single decade in the study period (beginning in 1950). The growth in the number of households during the 1970s was more than triple the population growth of 22 percent. As indicated in Figure 13, the increase in the number of households was comparable to, but slightly less than, the increase in the labor force during the 1970s.

The large urban areas accounted for the majority of the increase in households in metropolitan Texas, with an increase of almost 1.8 million households between 1950 and 1980. This represents an increase in households of nearly 267 percent during the 30-year study period, while the population in large Texas urban areas increased by about 175 percent. During the 1970s, the number of households increased 54 percent, a rate approximately 1.5 times higher than the growth rate in the population at the same time.

Three medium and several small urban areas had no household data in 1950, so a growth rate summary of these metropolitan area classifications would seem inappropriate. Since the majority of the growth occurred in large metropolitan areas, the unavailable data should not significantly affect the results for the entire state.

The population in the United States increased by 23 million between 1970 and 1980, while the number of households increased by 17 million. This suggests an average ratio of new persons to new households of 1.35 during the ten-year period. Household size has

been on a continuous decline since at least 1950. From 1950 to 1960, the average national household size declined slightly from 3.37 persons to 3.33. The rate of change has accelerated since 1960, dropping to 3.14 persons in 1970 and 2.75 in 1980 (Table 11).

A similar decline in household size has occurred in Texas. In 1950, the average metropolitan household had 3.35 persons. The metropolitan areas experienced a slight increase in household size in 1960, when the average became 3.38 persons per household. The average household size in Texas metropolitan areas then dropped to 3.22 persons in 1970, and 2.82 in 1980. The average ratio of new persons to new households from 1970 to 1980 was 2.25, indicating that the average household size in the United States is decreasing at a faster rate than in Texas metropolitan areas.

Table 11. Average Household Sizes in Texas and the United States

Classification	Average Household Size (Persons/Household)			
	1950	1960	1970	1980
United States	3.37	3.33	3.14	2.75
Texas Metropolitan	3.35	3.38	3.22	2.82
Small MSAs	3.39	3.22	3.01	2.75
Medium MSAs	3.49	3.61	3.44	3.01
Large MSAs	3.29	3.33	3.19	2.79

Small metropolitan areas did not experience an increase in household size between 1950 and 1960. The average household contained 3.39 persons in 1950, dropping to 3.22 in 1960. The rate of decline increased during the 1960s, with an average size of 3.01 persons per household in 1970. The average household size was down to 2.75 persons by 1980.

Medium urban areas, like the general Texas trend, had an increase in the average household size between 1950 and 1960. The average size increased from 3.49 persons in 1950 to 3.61 in 1960. The rate of decline, however, has accelerated since 1960, dropping to 3.44 persons per household in 1970 and 3.01 in 1980.

The trend in the household size of large urban areas leads the pattern of the state. Household sizes in large metropolitan areas averaged 3.29 persons in 1950, then increased to 3.33 in 1960. The average 1960 household size in large Texas metropolitan areas was the same as the national average. The size of national households, though, decreased slightly more than large Texas urban area households through 1980. The average number of persons per household in large Texas urban areas dropped to 3.19 in 1970 and 2.79 in 1980.

Summary -- Household Trends

The trend in household size indicates that the preponderance of large households is diminishing across both the country and the state, and small households are becoming more dominant. There were more than 43 million households in the country with only one or two persons in 1980, representing 53 percent of all households and 30 percent of the population. This size of household numbered only 21 million in 1960. Small households are prevalent in central cities of metropolitan areas in the nation, where they represented almost 60 percent of all central city households in 1980.

One or two person households numbered over two million in Texas metropolitan areas in 1980, representing 52 percent of the households and around 30 percent of the population. One or two person households numbered fewer than 600,000, or 40 percent of households, in 1960. Small households represented almost 60 percent of all central city households in Texas metropolitan areas in 1980, compared to 40 percent in both 1950 and 1960.

Vehicle Ownership Trends

The availability and characteristics of private automobile ownership have had large impacts on the nature and scale of commuting. The most significant effect of this growth rate was the increased availability of automobiles to workers. Workers nationwide had access to 0.85 vehicles in 1960, increasing to 1.34 vehicles per worker by 1980. Vehicle availability in the U.S. increased from 1.03 vehicles per household in 1960 to 1.61 in 1980. This trend, although significant, is somewhat hidden by the increased number of households. Vehicles per capita almost doubled in the United States between 1960 and 1980.

Vehicle availability at the state level was similar to the national level, increasing from 1.5 vehicles per household in 1970 to 1.8 vehicles per household in 1980 (data were unavailable in 1960). In Texas, the number of vehicles available to each worker also increased from 1.19 vehicles per worker in 1970 to 1.35 in 1980. These statistics, when compared to the data for the United States, indicate that a large increase in vehicle ownership occurred during the 1960s, continuing at a somewhat slower rate during the 1970s.

Distribution of the vehicle fleet among households has changed even more substantially than the overall vehicle availability. Table 12 indicates the change in vehicle ownership in Texas from 1970 to 1980. The number of households with two or more vehicles grew 124 percent during this time period, as compared to a growth of only 31 percent for one vehicle households. A majority of households (almost 60 percent) now have two or more vehicles, while the number of households with no cars, or with only one car, declined in percentage terms.

Table 12. Vehicle Availability by Household in Texas

Households With:	1970		1980		% Change 1970-1980
	(1000)	%	(1000)	%	
0 Vehicles	276.8	11.8	300.0	7.6	8.4
1 Vehicle	1,044.6	44.6	1,368.1	34.6	31.0
2 or More Vehicle	1,018.9	43.6	2,283.9	57.8	124.2
Thousands of Vehicles	3,561.3	N/A	7,078.0	N/A	100.4

Zero-Vehicle Households

The proportion of households without vehicles has been declining steadily. At the national level, zero-vehicle households declined from around 22 percent in 1960, to below 13 percent in 1980, dropping from 11.4 million to 10.4 million households.

In Texas, zero-vehicle households comprised 12 percent of all metropolitan households in 1970, and 7.6 percent in 1980. While the overall proportion decreased, the number of zero-vehicle households increased slightly between 1970 and 1980. The small, medium, and large urban areas did not vary significantly from the state average.

Not surprisingly, zero-vehicle households are heavily oriented toward central cities. Nationally, 55 percent of all households and 70 percent of metropolitan households without a vehicle in 1980 were located in central cities.

Texas central cities contained a higher proportion of zero-vehicle households than central cities in the average U.S. metropolitan area. In 1980, over 80 percent of the households without vehicles were in central cities of Texas, as opposed to 70 percent nationally. The Texas level was up from 73 percent in the central cities in 1970, suggesting that the private vehicle is becoming more important and necessary in the suburbs.



COMMUTING FLOW CHARACTERISTICS IN TEXAS

This section of the report compares commuting flows of Texas metropolitan area workers to those of the average American worker from the perspective of the workers' residence location and destination. Table 13 shows the distribution of workers by residence in 1980 for both Texas and the United States. Approximately 90 percent of the workers reported their workplace location, and are available for flows analysis.

Limitations of the Database

Census Respondents

Not all respondents provided work location descriptions which allowed explicit identification. Of the more than 96.5 million workers reporting nationwide in the 1980 census, over eight million provided workplace information which was inadequate for tabulation.

Approximately the same share of Texas workers also provided inadequate workplace information. Over 0.5 million of the 5.2 million workers reporting in the 1980 census in Texas metropolitan areas did not provide enough information concerning workplace location. This is an increase from the four percent who reported incompletely in 1960.

Ratio of Central City and Suburban Population

As discussed previously, the Census defines Metropolitan Statistical Areas along county boundaries. Small urbanized portions of a county adjacent to a major population center may cause that county, and all of the population within its borders, to be included in the metropolitan area. Metropolitan area designations, then, result in a relatively inexact fit between MSA boundaries and urbanized area. Variations in county size can also have a significant effect on this fit.

Table 13. Workers by Residence Location, 1980

	Total Workers (Thousands)	No Workplace Reported (Thousands)	Available for Flows Analysis (Thousands)
United States			
Inside Metropolitan Areas	74,400	6,500	67,900
In Central Cities	29,000	2,800	26,300
In Suburbs	45,400	3,700	41,600
Texas			
Inside Metropolitan Areas	5,231	536	4,696
In Central Cities	3,049	323	2,726
In Suburbs	2,182	213	1,969
In Small Texas MSA's	802	87	715
In Central Cities	562	61	501
In Suburbs	240	26	214
In Medium Texas MSA's	1,092	107	986
In Central Cities	729	70	659
In Suburbs	363	37	327
In Large Texas MSA's	3,337	342	2,995
In Central Cities	1,759	192	1,567
In Suburbs	1,579	150	1,429

Within the MSA, the population is subdivided as central city or suburban, with the city population being that which resides within the municipal limits of the large city or cities within the MSA. State or local policies regarding annexation, thus, have an effect on the percentage of central city population within an MSA.

The relatively liberal Texas annexation policies allow large cities to annex adjacent unincorporated communities without a vote by those residents. Data developed by the census do not emphasize the impact of this type of difference in local ordinance. This is particularly important, however, in analyzing commuting trends related to the increase in population, employment and commuting in suburban areas.

Table 14 illustrates the difference in percentage of population in central cities of Texas and U.S. metropolitan areas. The amount of population in central cities increases as the MSA population decreases in both Texas and U.S. areas, but the Texas concentration within the central city is 20 percent greater than the U.S. value for each category. The general conclusion of the "Commuting in America" report regarding increasing suburbanization of housing and jobs, then, may not appear to apply to Texas. The difference in city

boundaries, however, probably indicates that development that would have been classified as suburban in some states, has been included in central city statistics in Texas.

The study conclusions attempt to reflect consideration of the difference in central city/suburban designation, but any quantitative determination of this would require analyses of census tract, rather than metropolitan area, data.

Table 14. Central City Population as a Percentage of MSA Population

Category	Percent of MSA Population in Central City	
	Texas ¹	Other U.S. ²
Small Area (50,000 to 200,000)	70	50
Medium Area (200,000 to 1 Million)	64	45
Large Area (More than 1 Million)	58	40

¹Includes 15 small areas, 8 medium and 3 large (see Table 1)
²Sample of 25 metropolitan areas in each category

Commuting Within Metropolitan Areas

In these analyses, four basic flows will be considered: those completely within the central city; those completely within the suburbs; and those in either direction between the central city and suburbs. The 1980 levels of these basic flows are indicated in Table 15. The share of flow does not add up to 100 percent; workers leaving their home MSA are included in the totals, but not in the basic flows.

While this separation into four basic commuter flows is simplistic, it indicates a clear pattern of the current commuting flows. The "traditional" commuter flow in the country has been the suburb-to-central city pattern; this is no longer the most typical movement. Nationally, the suburb-to-central city flow is ranked third in size among the flows, with 12.7 million commuters. The dominant flow at the national level is now the suburb-to-suburb flow, at 25.3 million.

The flow pattern in Texas does not follow the same trend as the general pattern for the United States. While the traditional suburb-to-central city flow is the third largest in size (like the United States), the largest flow is commuting within central cities. The liberal annexation rules in Texas has allowed the central cities to become larger than those in other states.

As indicated in Table 15, small MSAs in Texas followed a different commuting pattern than the other MSA sizes in the State. The traditional suburb-to-central city flow is more predominant in small Texas urban areas than in larger MSAs; it is the second largest commuting flow in small metropolitan areas. The share of the traditional suburb-to-central city flow in small urban areas, though, is smaller than in large urban areas. Like the overall trend in Texas, the largest commuting flow in small urban areas is within central cities. Commuting within central cities is significantly larger than any of the other flows in small MSAs because of the tendency for development in this city size to occur within the city limits. The location of the development is a combination of the annexation laws and the characteristics of small cities.

The commuting flow in medium MSAs followed a pattern similar to that of the large Texas MSAs, with commuting within central cities as the largest flow followed by commuting within suburbs. Like the small MSAs, commuting within central cities is significantly larger than the other commuting flows. Once again, this is probably a result of liberal annexation laws in the State of Texas. With the amount of suburbanization increasing in medium urban areas, the commuting flow between suburbs is growing at a rapid pace. Flow between suburbs increased by 125 percent during the 1970s, while flow within the central cities increased by 59 percent. If growth rates continue at that level, the flow between suburbs will be larger than the flow within the central city by the year 2020.

Large MSAs defined the same basic pattern as the state. The commute within the central cities was almost twice that of the second largest flow - commuting within the suburbs. The commuting flow between suburbs, though, increased at a much faster rate than the commuting flow within the central city. Flow within central cities in large MSAs grew at a rate of 36 percent from 1970 to 1980, while the flow between suburbs increased by

97 percent during the same time period. At these rates, the commuting flow between suburbs will bypass the flow within the central city by the year 2000.

Table 15. Basic Commuter Flows, 1980

Type and Area	Flow (Thousands)	Share of Flow (%)
United States		
Total Workers Living in Central City		
Commuting:	26,300	39
Within Central City	20,900	31
To Suburbs	4,200	6
Total Workers Living in Suburbs		
Commuting:	41,600	61
To Central City	12,700	19
Within Suburbs	25,300	37
Texas Metropolitan		
Total Workers Living in Central City		
Commuting:	3,049	58
Within Central City	2,379	45
To Suburbs	282	5
Total Workers Living in Suburbs		
Commuting:	2,182	42
To Central City	910	17
Within Suburbs	977	19
Small Texas MSAs		
Total Workers Living in Central City		
Commuting:	562	70
Within Central City	424	53
To Suburbs	49	6
Total Workers Living in Suburbs		
Commuting:	240	30
To Central City	107	13
Within Suburbs	76	9
Medium Texas MSAs		
Total Workers Living in Central City		
Commuting:	729	67
Within Central City	586	54
To Suburbs	53	5
Total Workers Living in Suburbs		
Commuting:	363	33
To Central City	140	13
Within Suburbs	168	15
Large Texas MSAs		
Total Workers Living in Central City		
Commuting:	1,759	53
Within Central City	1,368	41
To Suburbs	180	5
Total Workers Living in Suburbs		
Commuting:	1,579	47
To Central City	663	20
Within Suburbs	733	22

Note: Total Workers includes workers leaving their home MSA.

Suburbs cover large land areas around the central city; suburb-to-suburb movements could, therefore, include very long or short trips. Unfortunately, the census data do not indicate direction of flow or whether the central city is traversed during the trip. While primarily circumferential in nature, the suburban trips might have a strong "in-bound" character, adding to the congestion caused by the suburb-to-central city flow. The intra-central city flows might also exhibit a strong "in-bound" tendency. More information is clearly desirable to further detail the commuter flows, and is present in planning models such as those created by the metropolitan planning organizations. This report is only an overview.

It should also be noted that the sub-parts identifying the commute in Table 15 do not add to the total number of workers living in each location; commuting flows that leave the metropolitan boundary for other metropolitan or exurban areas are not included. At the national level, 4.8 million metropolitan workers, about 1.2 million from central cities and 3.6 million from the suburbs, left their metropolitan area each day in 1980 (Table 16).

Small Texas metropolitan areas had a higher level of departure for work than did medium or large Texas MSAs. This could be a result of several factors. Small MSAs tend to be more agricultural in nature so many workers leave the city to farm. Many small MSAs are also located near larger MSAs, which have a strong attractive force for smaller cities. Large MSAs may also have fewer workers leaving because the available job market is more diversified.

Table 16. Commuters Leaving Their Home Metropolitan Area, 1980

Classification	Total Leaving (Thousands)			Share of Total Commuters (%)
	From Central City	From Suburbs	Total	
United States Metropolitan	1,200	3,600	4,800	7
Texas Metropolitan	66	83	149	3
Small Texas MSAs	27	32	59	7
Medium Texas MSAs	20	18	38	3
Large Texas MSAs	19	33	52	2

If the data are disaggregated into commuter flow patterns as indicated in Table 17, a number of interesting patterns emerge. Most notable at the national level is that while

suburb-to-suburb trips are predominant, they become less significant as the population of the metropolitan area decreases. In areas with a population between 250,000 and 0.5 million, the volume of intra-suburb and intra-central city trips are the same; cities with a population less than 250,000 experienced a predominance in intra-central city commutes.

In the largest metropolitan areas the suburbs are dominant, while the central city becomes more dominant as the MSA size decreases. The central city in the smaller areas is relatively more attractive than the central city in larger areas where significant transportation and economic development infrastructure has been focused. This is partially explained by the relative ease of access to small cities, making them more dominating in regional development. Congested travel corridors in large areas could also be responsible for diverting development to smaller, more attractive satellite centers.

Medium and small Texas cities follow the same basic commuting pattern as urban areas of comparable size in the country. As indicated in Table 17, the central city is the primary destination in the work trip, with the central city also as the primary trip producer. As in urban areas with under 500,000 residents at the national level, the central city in Texas is a dominant force in regional development. Approximately 60 percent of the commuting flow was intra-central city for small and medium Texas MSAs.

Large metropolitan areas in Texas did not follow the same trip pattern as urban areas of similar size in the country. The large Texas metropolitan areas, in fact, followed the same basic pattern as national urban areas with populations between 500,000 and one million. The intra-suburban commute was only slightly more dominant than the traditional suburb-to-central city commute, in marked contrast to the national pattern. The average large U.S. metropolitan area had one-fourth to one-third of commuting in the intra-central city market, while the Dallas-Fort Worth, Houston and San Antonio metropolitan areas, with strong cities at their core, recorded almost half of the commute within central cities. Annexation laws and the central city focus of development (although not necessarily central business district) would appear to be the cause of the apparent "lag" in commuting trend shifts in Texas relative to other U.S. areas.

Table 17. Commuting Flows From Central City and Suburbs by Metropolitan Size, 1980

Classification	Total Workers (1000s)	Central City to Central City (1000s)	Central City to Suburbs (1000s)	Central City to Out ¹ (1000s)	Suburbs to Central City (1000s)	Suburbs to Suburbs (1000s)	Suburbs to Out ¹ (1000s)
United States Population (Millions)							
>3	15,500 (100%) ²	5,400 (35%)	900 (6%)	200 (1%)	2,000 (13%)	6,500 (42%)	500 (3%)
1-3	22,100 (100%)	5,400 (24%)	1,400 (6%)	200 (1%)	4,300 (20%)	9,600 (43%)	1,200 (6%)
0.5-1	11,300 (100%)	3,500 (31%)	700 (6%)	200 (2%)	2,500 (22%)	3,800 (34%)	700 (5%)
0.25-0.5	9,600 (100%)	3,100 (32%)	700 (7%)	200 (2%)	2,000 (21%)	3,100 (32%)	600 (6%)
0.1-0.25	8,400 (100%)	3,000 (36%)	500 (6%)	300 (4%)	1,700 (20%)	2,300 (27%)	700 (7%)
<0.1	1,000 (100%)	500 (50%)	100 (10%)	100 (10%)	200 (20%)	100 (10%)	0 (0%)
All	68,000 (100%)	20,900 (31%)	4,200 (6%)	1,200 (2%)	12,700 (19%)	25,300 (37%)	3,700 (5%)
Texas Metropolitan Population (Millions)							
>1	2,990 (100%)	1,370 (46%)	180 (6%)	20 (1%)	660 (22%)	730 (24%)	30 (1%)
0.2-1	990 (100%)	590 (60%)	50 (5%)	20 (2%)	140 (14%)	170 (17%)	20 (2%)
<0.2	720 (100%)	420 (58%)	50 (7%)	30 (4%)	110 (15%)	80 (11%)	30 (5%)
All	4,760 (100%)	2,380 (50%)	280 (6%)	70 (2%)	910 (19%)	980 (21%)	80 (2%)

¹Out refers to all trips departing the MSA of residence

²Percentage values refer to totals of each row

The commuting flows indicated in Table 17 allow for a comparison between the different city sizes and commuter markets. For instance, suburb-to-suburb flows in metropolitan areas of one to three million were the largest commuter market at the national level in 1980, accounting for 42 percent of the commuting flow in that size classification. Table 18 ranks the top ten commuter markets for the entire United States and for Texas. At the national level, the intra-suburban commute trip is the same size or larger than the intra-central city volume for the same size metropolitan area for all but the smallest area group. The opposite relationship is evident for the Texas areas; four of the top six commuting flows begin in the central city.

Table 18. Top Ten United States and Texas Commuter Markets, 1980

Rank	Market		Market Size (Thousands of Commuters)
	Flow	MSA Size	
United States			
1	Suburb to Suburb	>1 Million	16,100
2	Central City to Central City	>1 Million	10,800
3	Suburb to Central City	>1 Million	6,300
4	Suburb to Suburb	0.5-1 Million	3,800
5	Central City to Central City	0.5-1 Million	3,500
6	Central City to Central City	0.25-0.5 Million	3,100
7	Suburb to Suburb	0.25-0.5 Million	3,100
8	Central City to Central City	0.1-0.25 Million	3,000
9	Suburb to Central City	0.5-1 Million	2,500
10	Suburb to Suburb	0.1-0.25 Million	2,300
Texas			
1	Central City to Central City	>1 Million	1,370
2	Suburb to Suburb	>1 Million	730
3	Suburb to Central City	>1 Million	660
4	Central City to Central City	0.2-1 Million	590
5	Central City to Central City	<0.2 Million	420
6	Central City to Suburb	>1 Million	180
7	Suburb to Suburb	0.2-1 Million	170
8	Suburb to Central City	0.2-1 Million	140
9	Suburb to Central City	<0.2 Million	110
10	Suburb to Suburb	<0.2 Million	80

When the flows in Table 17 are examined as shares of total regional flows, they indicate some underlying patterns in the data. Figure 14 illustrates the following patterns for 1980.

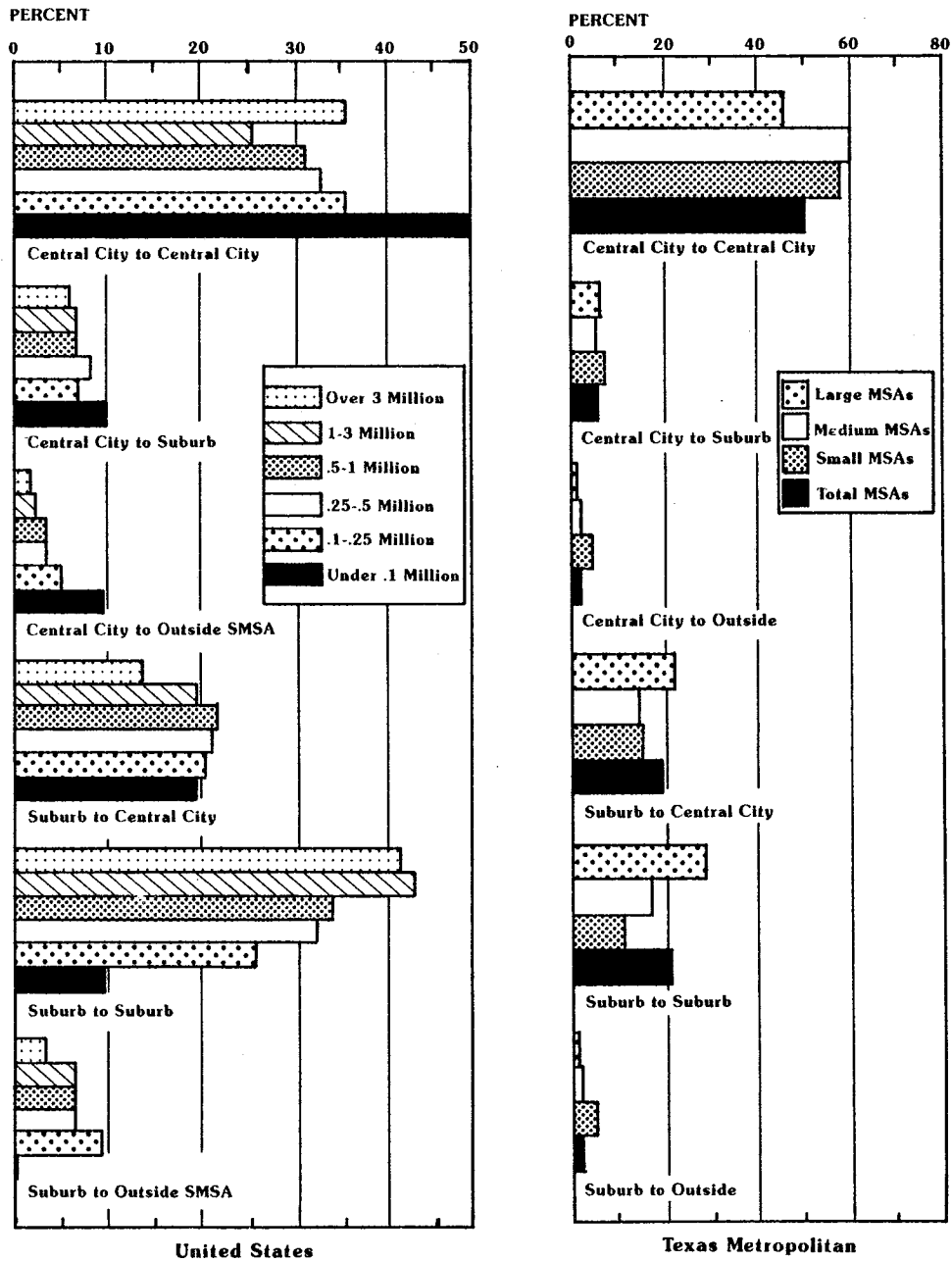


Figure 14. Shares of Central City and Suburban Commuters by Travel Market, 1980

- Central city-to-central city commuting flows across the nation generally increase in the share of total commuting as the metropolitan size decreases; this excludes the relatively high share in the largest metropolitan areas in the country. The percentages vary from 25 to 50 percent, with a national average of 31 percent of all flows. The central city-to-central city commuting flows in Texas range from 46 to 60 percent, with a state average of 50 percent. This is the largest flow in all the Texas metropolitan area groups.
- The commuting flows from central cities to all other locations are minor compared to the central city-to-central city flow. They do, however, increase as the size of the metropolitan area decreases. The shares range from seven to 20 percent, with a national average of eight percent of all flows. Likewise, the flows in Texas from central cities to other locations (suburbs and outside) are significantly smaller than the central city-to-central city flow. The shares range from seven to 11 percent, with a state average of eight percent. These statistics are the same for both the country and state.
- Suburb-to-central city commutes comprise approximately 20 percent of all the flows in almost every U.S. metropolitan size classification with a national average of 19 percent. This flow in the over three million population group is an exception, at only 13 percent. The overall average for this flow in Texas is also 19 percent, with shares ranging from 14 to 22 percent. The largest share for suburb-to-central city commutes is in large MSAs.
- Suburb-to-suburb trips, with a national average share of 37 percent of all flows, show a decreasing share of flows as the size of the metropolitan area decreases. This is the opposite of the central city-to-central city trend. The share of suburb-to-suburb commutes in Texas also decreases as the size of the metropolitan area decreases. The average share is 21 percent of all flows in Texas.

- Except for the intra-central city and intra-suburb flows, Texas commuting is almost identical to the national commuting flows. This difference could be explained by the differences in annexation laws. Texas statutes allow cities to incorporate adjacent communities without approval by vote. This allows the central cities of Texas MSAs to become quite large when compared to other areas in the country. An intra-central city commute in Texas MSAs might be an intra-suburban commute in most other locations.

Commuting Pattern Trends

The Bureau of the Census has collected decennial data since 1960 concerning the commuter flows in the country. The 1960 data are weaker in detail, but still provide a historical perspective of the flow patterns in Texas. The graphs in Figure 15 indicate that almost all the flow volumes increased dramatically during the 20-year time period. The only flows which did not show rapid growth were those destined for locations outside the MSA of residence. Nationally, flows to outside the MSA increased their share from four to seven percent. This flow remained a constant three percent of the total flow for Texas MSAs between 1960 and 1980.

Central City Origins

The growth patterns of the individual flows are indicated in Figure 16 for both the United States and the State of Texas. Figures 15 and 16 indicate several interesting patterns of growth. Nationally, intra-central city movements have grown from around 18 million in 1960 to 21 million in 1980. The share in total flows, though, dropped from about 46 percent to 30 percent. In Texas, this movement increased dramatically from 1.3 million in 1960 to 2.4 million in 1980. However, it dropped in the share of total flows from 66 percent to 50 percent.

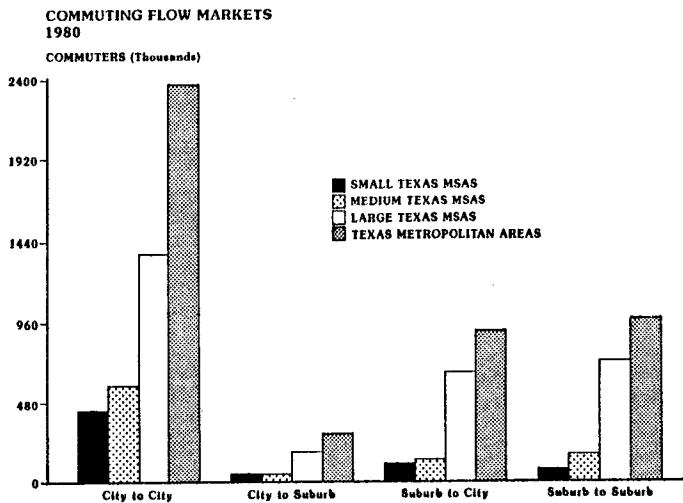
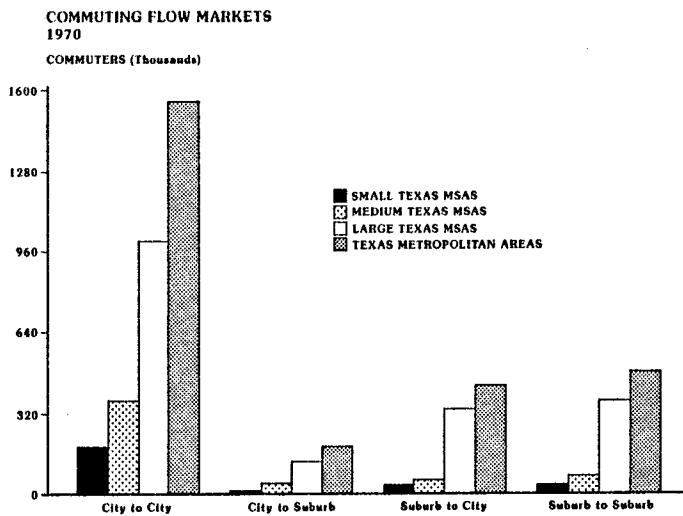
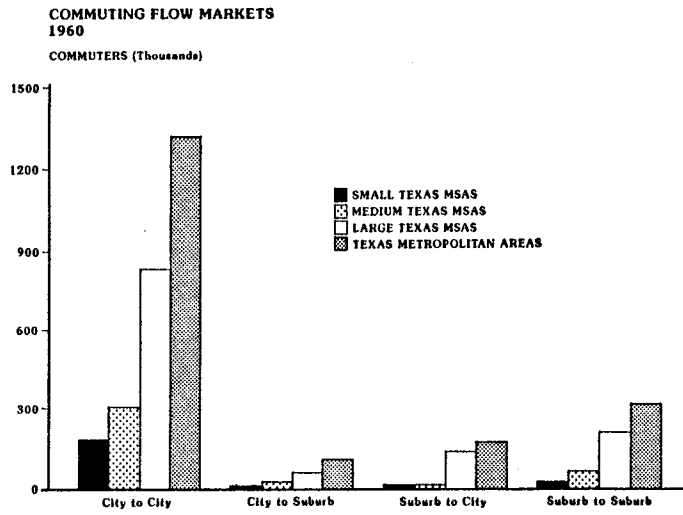


Figure 15. Commuting Flow Markets in Texas -- 1960, 1970 and 1980

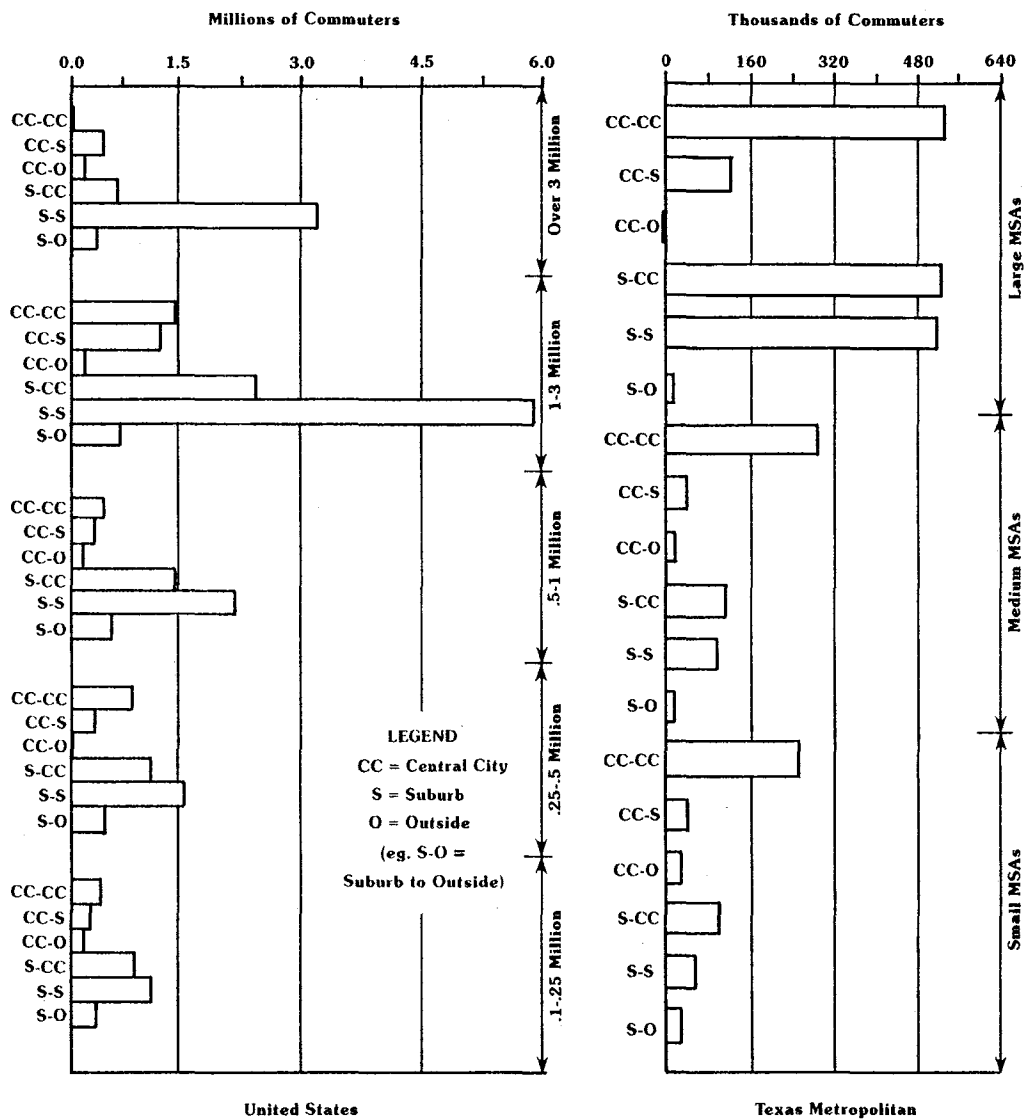


Figure 16. Location of Growth in Commuter Markets, 1960 to 1980

Central Cities as Destinations

Socioeconomic analyses typically use the home location of the population as the basis for statistical analysis. To understand the character of commuting patterns, the information must be re-analyzed from the destination (job) end. Looking at commuting flows from the perspective of the destination, the intra-suburban flow was the most dominant of the four main flows at the national level in 1980. The most dominant flow in Texas in 1980 was central city-to-central city. The central city was the largest single destination of trips in 1980 for both the United States and Texas. This is despite the fact that intra-suburban trips at the national level are now predominant; if all trips with a central city destination are added together they represent a larger share of metropolitan destinations than the suburbs.

Nationally, trips to the central city represent 53 percent of the destinations of all metropolitan-bound trips in 1980 with the suburbs accounting for the other 47 percent. Central cities, therefore, were still the most common destination in metropolitan areas across the country.

In Texas, trips to the central city accounted for 72 percent of the destinations of metropolitan-bound trips in 1980, with the suburbs accounting for the other 28 percent. As the size of Texas metropolitan areas decreased, the share of trips bound for the central city increased. In large Texas MSAs, the central city was the destination of 69 percent of the commuters in 1980. This share was 77 percent for medium Texas MSAs, and 81 percent for small urban areas.

Central business districts have traditionally been major employment centers within central cities. Differentiating between the CBD and the remainder of the central city provides the opportunity to determine if the traditional commute to the CBD has remained the dominant flow.

Large Texas MSAs set the pattern for Texas' commuting pattern trends. In 1960, the intra-central city commute comprised 65 percent of the commute; that share had dropped

to 46 percent in 1980. The share of the intra-central city commute did not drop as rapidly in small and medium Texas MSAs. This flow was 68 percent of the commute in medium MSAs in 1960, and 60 percent in 1980. In small Texas MSAs, the intra-central city commute dropped from 70 percent in 1960 to 58 percent in 1980. For all three size classifications, the number of commuters in the flow increased significantly over the 20-year time period. However, other flows increased at a faster rate.

The "reverse commute" from central cities to suburbs increased between 1960 and 1980 by about two million nationally, doubling in size. This flow, however, remained only five or six percent of the total flows during the 20-year time frame. The reverse commute in Texas also remained approximately six percent of the total flow during the 20-year period.

The share of the reverse commute fluctuated among the metropolitan size classifications. In small MSAs, the central city-to-suburb commute was five percent of the total flow in 1960, and increased to seven percent in 1980. The reverse commute was eight percent of the total flow in medium MSAs in 1960; the share had dropped slightly to five percent in 1980. Large MSAs set the trend for Texas metropolitan areas, with a share of the total flow of five percent in 1960 and six percent in 1980.

Suburban Origins

The traditional suburb-to-central city commute at the national level doubled in size between 1960 and 1980, gaining over six million workers. The share of the total flow increased from 16 percent in 1960 to 19 percent in 1980. In Texas, the traditional commute gained over 700,000 workers between 1960 and 1980. The share of the total Texas flow increased from nine percent in 1960 to 19 percent in 1980.

The share of the total flow in the traditional commute in large Texas MSAs increased from 11 percent in 1960 to 22 percent in 1980; this commute gained 525,000 workers during the 20-year time period. The traditional commute in medium MSAs comprised five percent of the total flow in 1960. This share increased to 14 percent of the total flow in medium urban areas in 1980. The traditional commute in small MSAs increased 435 percent

between 1960 and 1980, indicating a large amount of movement to suburban areas in this metropolitan classification. In 1960, this commute was eight percent of the total flow in small MSAs, and had increased to 15 percent in 1980.

The intra-suburban commute increased from 11 million to over 25 million workers nationally between 1960 and 1980. The share of the market increased from 28 to 38 percent of the flows. In Texas, the intra-suburban commute gained approximately 660,000 workers between 1960 and 1980. The share of the Texas market increased from 16 to 21 percent during the time period.

The large Texas MSAs set the pattern for Texas commuting trends. In 1960, the intra-suburban commute accounted for 16 percent of the total flow in large MSAs. After gaining 523,000 workers, this commute was 24 percent of the total flow in 1980. The intra-suburban commute did not increase as rapidly for medium MSAs, where it went from 16 percent of the total flow in 1960 to 17 percent in 1980. The share of this commuting flow decreased slightly for small MSAs over the 20-year time period. In 1960, the share of the total flow was 13 percent, and it decreased to 11 percent in 1980. Other flows in small Texas MSAs grew at a faster rate than the intra-suburban commute.

Table 19 presents the distribution of the total growth of 2.6 million commuters in Texas between 1960 and 1980 among the main commuter flow markets; this did not include the commute to outside the metropolitan area. Central city commuting growth, equal to about 47 percent of all Texas growth, was not split equally between internal trips and the suburbs. The intra-central city trips experienced much more growth over the 20-year time frame, with 40 percent of all the growth. The growth originating in the suburbs and going to the central cities and suburbs was split approximately equally. Viewed from the destination side, central cities in Texas received about two-thirds of the new trip destinations, with the remaining one-third going to suburban destinations.

Table 19. Shares of the Total Increase in Commuters
by Market, 1960-1980

United States			
From	Central City	To Suburbs	Total
Central City	9%	8%	17%
Suburbs	25%	58%	83%
Total	34%	66%	100%
Texas Metropolitan			
From	Central City	To Suburbs	Total
Central City	40%	7%	47%
Suburbs	28%	25%	53%
Total	68%	32%	100%
Small Texas MSAs			
From	Central City	To Suburbs	Total
Central City	59%	9%	68%
Suburbs	21%	11%	32%
Total	80%	20%	100%
Medium Texas MSAs			
From	Central City	To Suburbs	Total
Central City	55%	4%	59%
Suburbs	23%	18%	41%
Total	78%	22%	100%
Large Texas MSAs			
From	Central City	To Suburbs	Total
Central City	31%	7%	38%
Suburbs	31%	31%	62%
Total	62%	38%	100%

The Texas pattern is completely different from the national trend. When the 24 million additional commuters in the nation were allocated to the main commuter flows, only about 17 percent of the growth originated in the central cities. This flow was evenly split between internal trips and trips to the suburbs. Suburban areas had the remaining 83 percent growth, with 25 percent going to the central cities and 58 percent going to the suburbs. Central cities only received about one-third of the growth in new trip destinations, while the suburbs received the remaining two-thirds.

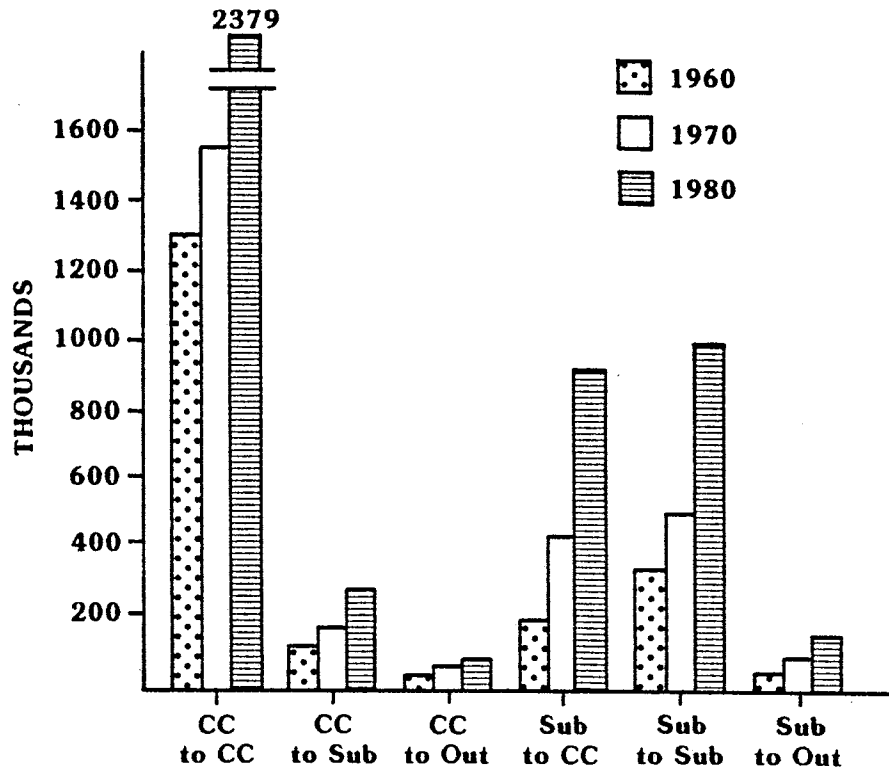
Growth patterns have been far from uniform across metropolitan area size classifications. To look at variations in patterns between area sizes, some allowances must be made for the data because of the limited detail in 1960. Ten of the small and two of the medium Texas MSAs were not metropolitan areas in 1960, so commuter data were not collected. While these 12 MSAs will not be included in the following discussion, useful patterns emerge from analysis of the remaining 14 MSAs. Likewise, metropolitan areas below 100,000 population at the national level are not included in the following discussion. Overall, the statistics indicate that suburbanization of jobs and commuting flows is widespread at the national level, but not at the Texas level. Once again, this could be explained by the difference in annexation laws between Texas and other states.

Variations in growth rates have changed the commuting patterns in all metropolitan area size groups. Figure 16 shows how growth between 1960 and 1980 was distributed by flow category within each urban size classification. The Texas growth characteristics were different from the overall country. As indicated in Figure 16, the suburb-to-suburb flow market had the most growth nationally. As area size decreased, suburb-to-central city, and suburb-to-outside MSA had increasing shares of the overall metropolitan growth. In percentage terms, the largest increases in central city origins at the national level were for outbound movements; for suburban origins, inbound movements had the lowest growth, while intra-suburban growth was the greatest. Smaller areas had relatively balanced growth between inbound and outbound movement from the suburbs.

Figure 17 illustrates the commuting growth patterns for each metropolitan area category from 1960 to 1980. The growth in intra-area and "traditional" commuting patterns is evident in the 1960 to 1980 time comparison.

Table 20 indicates the internal flow patterns within central cities in 1980. As traditionally defined, the CBD no longer dominates the flow within central cities, even among central city residents. In metropolitan areas across the country, the CBD only accounted for 16 percent of trips with a central city destination. When compared to all commuting destinations within the metropolitan area, the CBD only represents about eight percent of the total flow.

TEXAS METROPOLITAN



SMALL MSAs

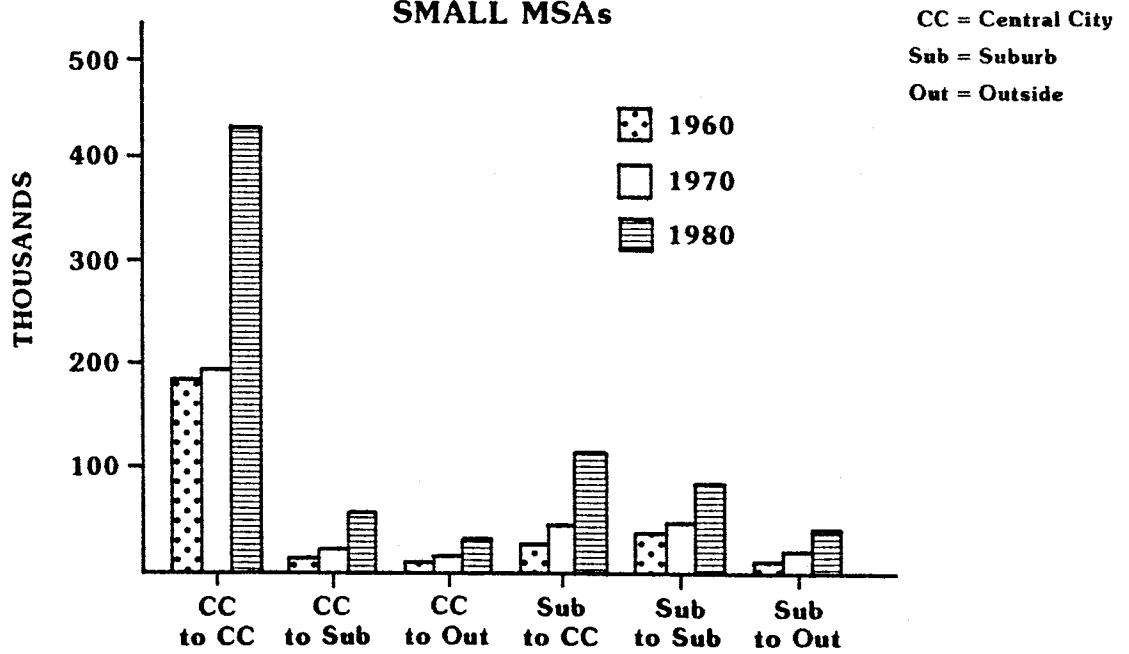


Figure 17. Texas Metropolitan Area Commuting Pattern Volume -- 1960, 1970 and 1980

LARGE MSAs

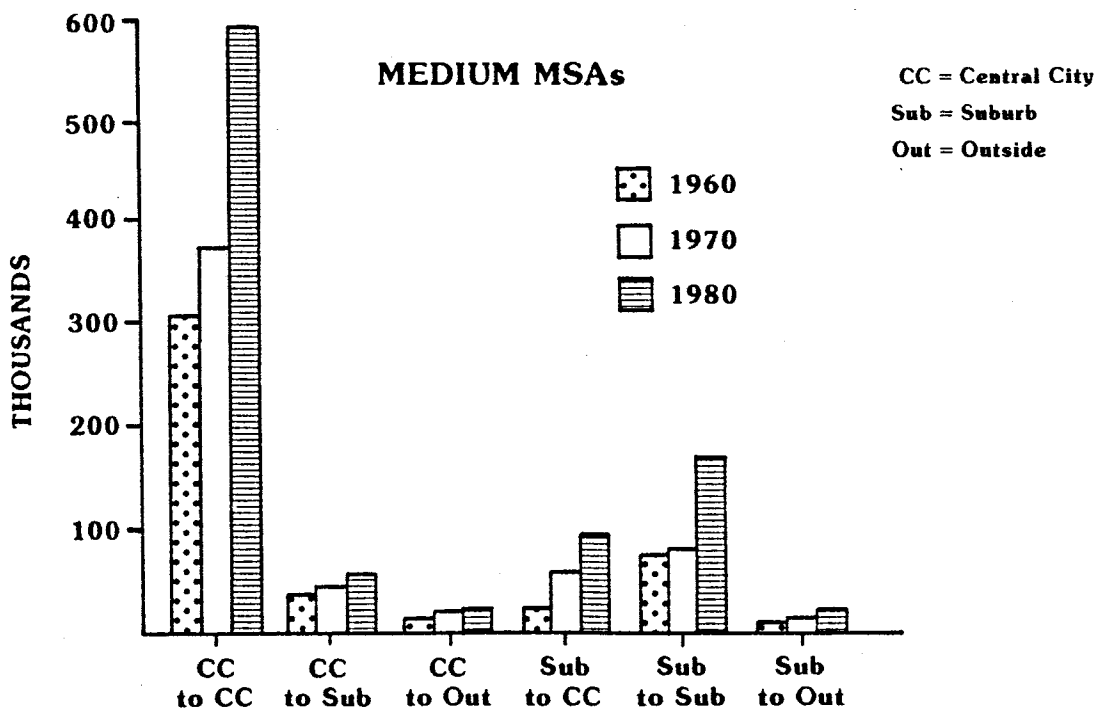
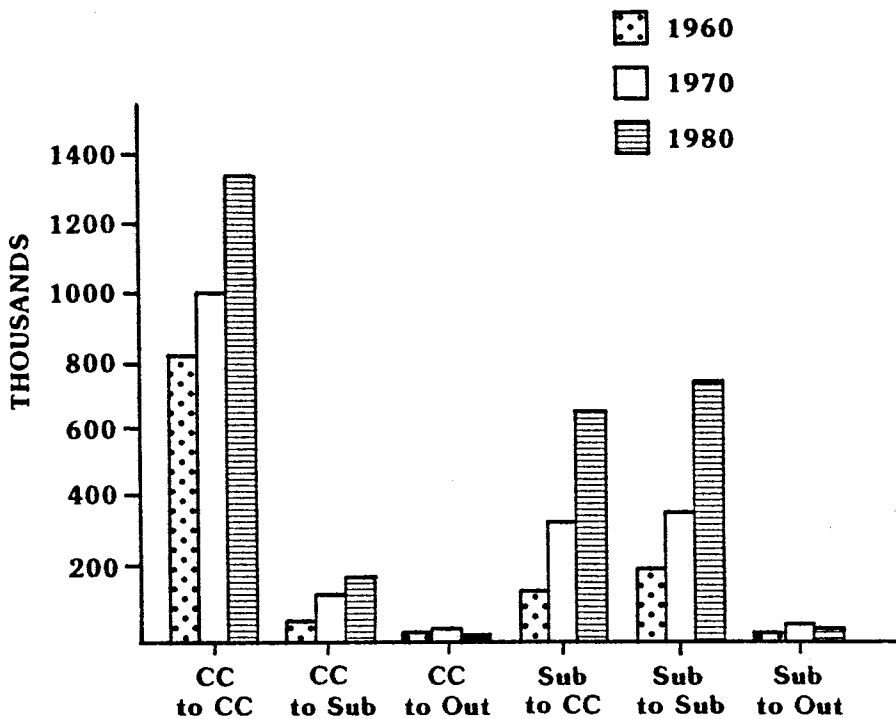


Figure 17. Texas Metropolitan Area Commuting Pattern Volume -- 1960, 1970 and 1980 (cont'd.)

Commuting within central cities of Texas was very similar to the national pattern. Of the trips destined for the central city, only 12 percent had the CBD as the final destination in 1980. This represented only nine percent of all commuting flows within the metropolitan area.

The share of CBD - destined trips was approximately the same for all three of the Texas metropolitan classifications in 1980, with small metropolitan CBDs attracting a slightly higher share (16 percent of central city trips). In small Texas MSAs, however, the CBD still represented only 13 percent of the total flow.

Table 20. Internal Flow Patterns Within Central Cities, 1980

Classification	Destination	
	CBD (1000s of commuters)	Central City Remainder (1000s of commuters)
U.S. Metropolitan		
From Central City	3,100 (9%)	17,700 (53%)
From Suburbs	2,200 (7%)	10,500 (31%)
Total Texas Metropolitan		
From Central City	298 (9%)	2,080 (64%)
From Suburbs	111 (3%)	799 (24%)
Small Texas MSAs		
From Central City	68 (13%)	357 (67%)
From Suburbs	18 (3%)	89 (17%)
Medium Texas MSAs		
From Central City	68 (9%)	518 (71%)
From Suburbs	13 (2%)	127 (18%)
Large Texas MSAs		
From Central City	162 (8%)	1,206 (59%)
From Suburbs	80 (4%)	583 (29%)

Suburbs as Destinations

Suburbs were identified as the destination of 47 percent of metropolitan commuting trips in the nation in 1980, and 28 percent of trips in Texas. Table 21 indicates the origin of metropolitan trips destined for the suburbs.

Nationally, suburban origins are a much larger share of trips to the suburbs than they are in trips to the central city. The "reverse commute" flow from the central city to the

suburbs was a relatively small element of total travel in 1980, and only about one-third the size of the traditional suburb-to-central city commuting flow.

The share of trips to the suburbs in Texas in 1980 was much lower than the share at the national level, with 28 percent of metropolitan trips destined for the suburbs. Suburban origins accounted for 78 percent of the trips to the suburbs (Table 21). The "reverse commute" was a fairly small component of the total travel in 1980, and accounted for the remaining 22 percent of trips destined for the suburbs. The central city-to-suburb commute, like the national pattern, was approximately one-third the size of the suburb-to-central city commute. The Texas pattern is also illustrated in Figure 17.

Table 21. Commuting Trips with a Suburban Destination, 1980

Classification	All Trips to the Suburbs (1000s)		
	Total	From the Central City	From the Suburbs
U.S. Metropolitan	29,500	4,200 (14%)	25,300 (86%)
Texas Metropolitan	1,258	282 (22%)	977 (78%)
Small Texas MSAs	125	49 (39%)	76 (61%)
Medium Texas MSAs	222	53 (24%)	168 (76%)
Large Texas MSAs	912	180 (20%)	733 (80%)

Large Texas metropolitan areas set the suburban commuting pattern for the state in 1980, with 31 percent of the trips destined for the suburbs. Intra-suburban trips accounted for 80 percent of the trips to the suburbs. The "reverse commute" in large Texas MSAs was slightly over one-fourth the size of the traditional commute.

Trips destined for the suburbs accounted for 23 percent of the trips in medium Texas MSAs in 1980. Trips originating in the suburbs were 76 percent of the flow bound for the suburbs. The central city-to-suburb commute, which was 24 percent of the suburban flow, was almost 40 percent the size of the suburb-to-central city commute.

In small Texas MSAs, trips destined for the suburbs were only 19 percent of the total travel in 1980. Of the trips to the suburbs, 61 percent also originated in the suburbs. The

central city-to-suburb commute was almost one-half the size of the suburb-to-central city commute.

The data presented in Table 21 indicate that intra-suburban trips are more predominant in large Texas MSAs than in smaller areas. As the metropolitan size decreases, the commute to the suburbs becomes more closely balanced with the commute to the central city.

Rising Predominance of Private Vehicles

Use of private vehicles for commuting has become increasingly predominant since World War II. Table 22 shows the overall trends in modal choice to work between 1960 and 1980. All modes showed decreasing shares of commuter travel except private vehicle. Private vehicles for this analysis include automobiles, vans, and light trucks. At the national level, declining shares in modes other than private vehicle were caused by actual losses of commuters in each category, not just losses in share to the private vehicle. Nationally, use of alternatives to automobiles dropped by over five million commuters while total workers increased by over 30 million. As indicated in Table 22, national gains in private vehicle use exceeded gains in total workers, almost doubling while the total number of workers grew by approximately 50 percent.

In Texas metropolitan areas, the increase in private vehicle use was even more pronounced between 1960 and 1980 than it was at the national level. Use of alternative methods did not decrease in actual commuters, as was the case for the nation as a whole. Public transportation use decreased by almost 40,000, but use of other modes increased by over 70,000 during the 20-year period. Gains in private vehicle use exceeded gains in total workers, more than doubling while the total number of workers grew by approximately 150 percent.

In large Texas MSAs, the use of public transportation decreased by over 20,000 commuters and use of other modes increased by over 40,000 between 1960 and 1980. The use of private vehicles more than doubled while the total number of workers grew by 147 percent. The use of public transportation decreased by over 11,000 in medium Texas

MSAs, and by over 4,000 in small Texas MSAs. The use of other modes increased by almost 17,000 in medium areas and by 12,000 in small areas. Private vehicle use almost doubled, and the total number of workers increased approximately 134 percent in medium areas. Private vehicle use tripled and the number of workers more than doubled in small areas.

Table 22. Modal Share of Worker Commuting, 1960 to 1980

Classification	Actual Users, 1980 (1000s)	Difference 1960-1980 (1000s)	Percent Change (%)
United States			
Total Workers	96,600	32,000	49
Private Vehicle	83,000	40,000	93
Public Transit	6,000	-1,800	-23
Other	7,600	-3,400	-31
Texas Metropolitan			
Total Workers	5,230	3,145	151
Private Vehicle	4,752	3,214	209
Public Transit	137	-38	-22
Other	341	-31	-8
Small Texas MSAs			
Total Workers	801	536	202
Private Vehicle	736	538	272
Public Transit	6	-4	-40
Other	59	3	5
Medium Texas MSAs			
Total Workers	1,092	625	134
Private Vehicle	974	638	190
Public Transit	20	-11	-35
Other	98	-2	-2
Large Texas MSAs			
Total Workers	3,337	1,984	147
Private Vehicle	3,042	2,038	203
Public Transit	111	-23	-17
Other	184	-32	-15

Vehicle Availability and Use in Commuting

The explosive growth in private vehicles has been a major part of the recent commuting patterns. The primary relationship that was identified was the growth in workers as compared to the increase in vehicle availability. Nationally, workers grew by 50 percent between 1960 and 1980, and vehicle availability grew by 135 percent, increasing the ratio of vehicles per worker from 0.85 to 1.34. In Texas metropolitan areas, vehicle availability increased from 1.19 vehicles per worker in 1970 to 1.35 in 1980. The large

increase in vehicle availability has probably been the major determinant in the mode choice for workers.

The average availability of 1.34 vehicles per worker suggests that, on average, there is a vehicle to take every worker to work. Actual distribution would not perfectly match vehicles and workers; conditions may vary slightly from the average. A high level of private vehicle availability to workers would appear to be significant in the decision process on commuting mode; people own vehicles to use them.

Metropolitan Mode Choice Patterns

The shift in travel mode to work is illustrated for the U.S. metropolitan areas in Figure 18 and for the Texas areas in Figure 19. A summary of the values for 1980 are indicated in Table 23. Not surprisingly, public transit shares are greater in large metropolitan areas than in small ones. In large Texas MSAs, though, the higher transit share appears to be drawn from a decrease in modes other than the private vehicle.

Medium Texas MSAs have the lowest share of private vehicle use for commuting purposes at 89 percent. The share of commuters who drive alone is also the lowest. The use of public transit and other modes was below ten percent for small and large MSAs, and was 11 percent for medium MSAs.

Table 23. Metropolitan Modal Shares, 1980

Classification	Total Workers (1000s)	Private Vehicle			Public Transit	Other
		Total	Drive Alone	Carpool		
U.S. Metropolitan	74,400	85%	65%	20%	8%	7%
Texas Metropolitan	4,696	91	70	21	3	6
Small Texas MSAs	715	92	73	19	1	7
Medium Texas MSAs	986	89	68	21	2	9
Large Texas MSAs	2,995	91	70	21	3	6

Figure 13 indicated that the growth in the number of private vehicles exceeded the growth in the work force for all the metropolitan areas. It becomes apparent that all

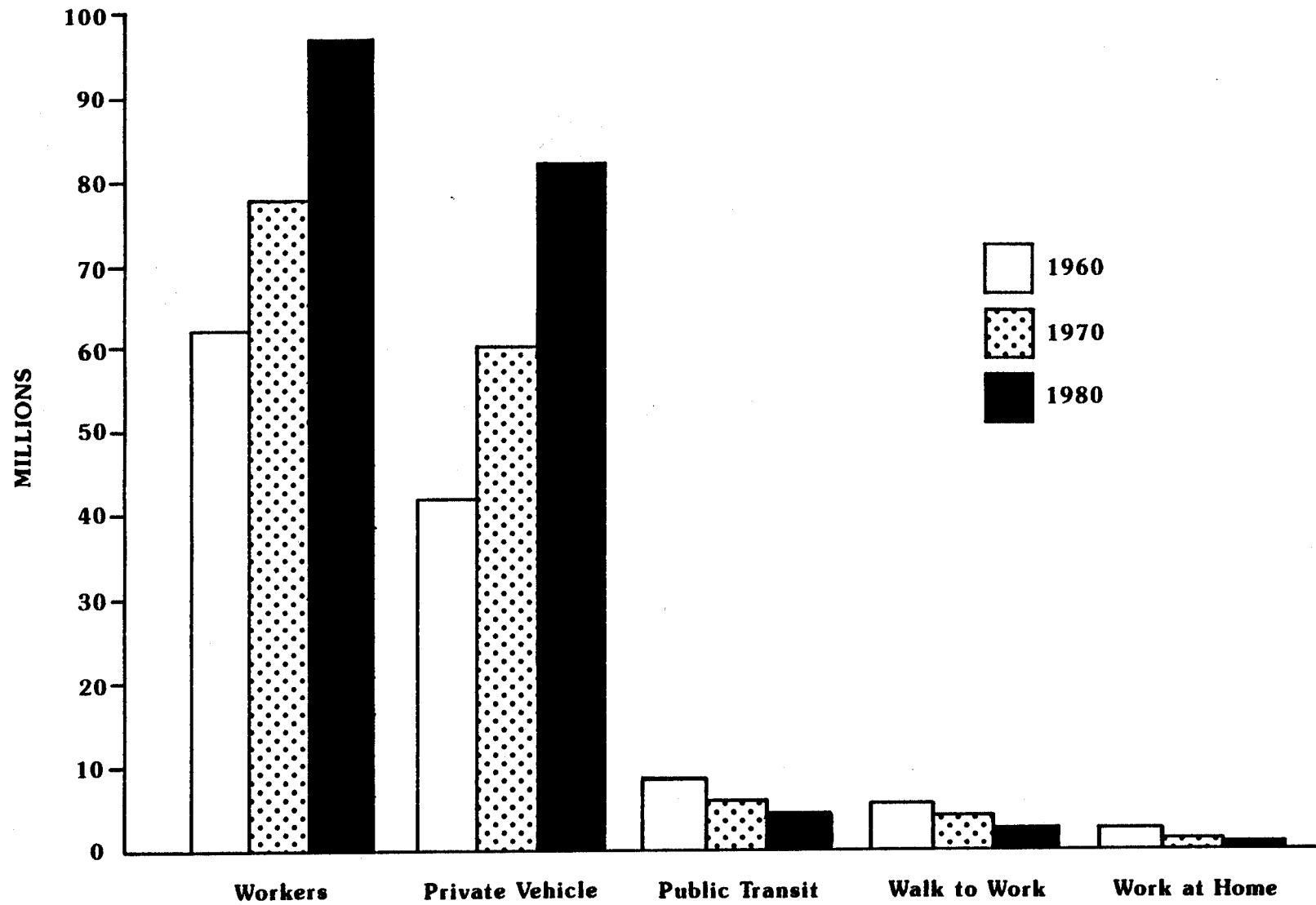
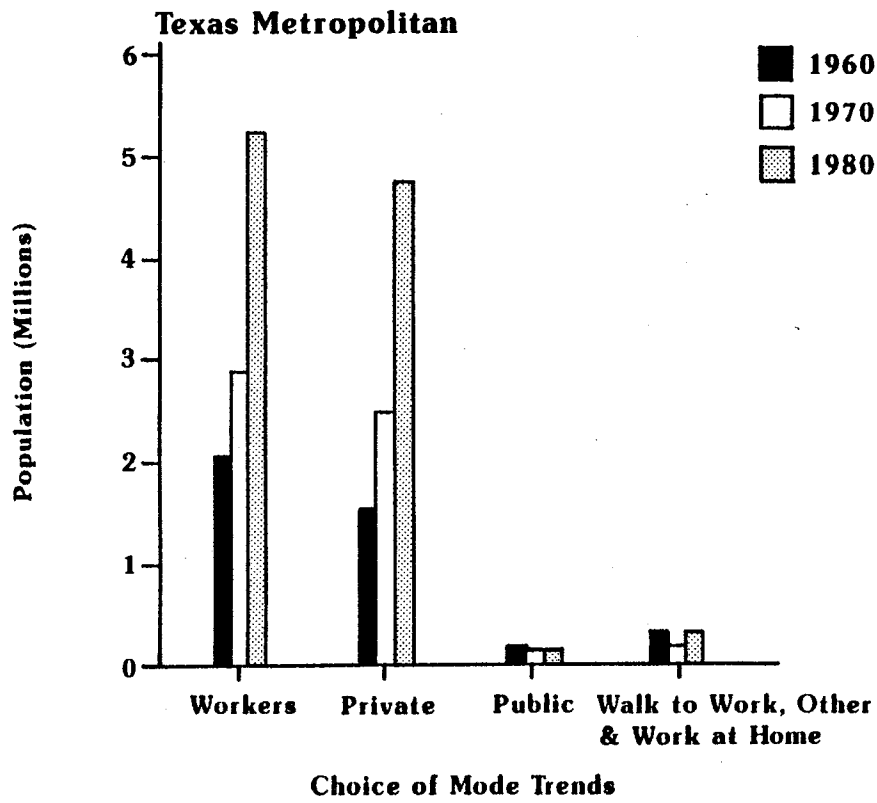
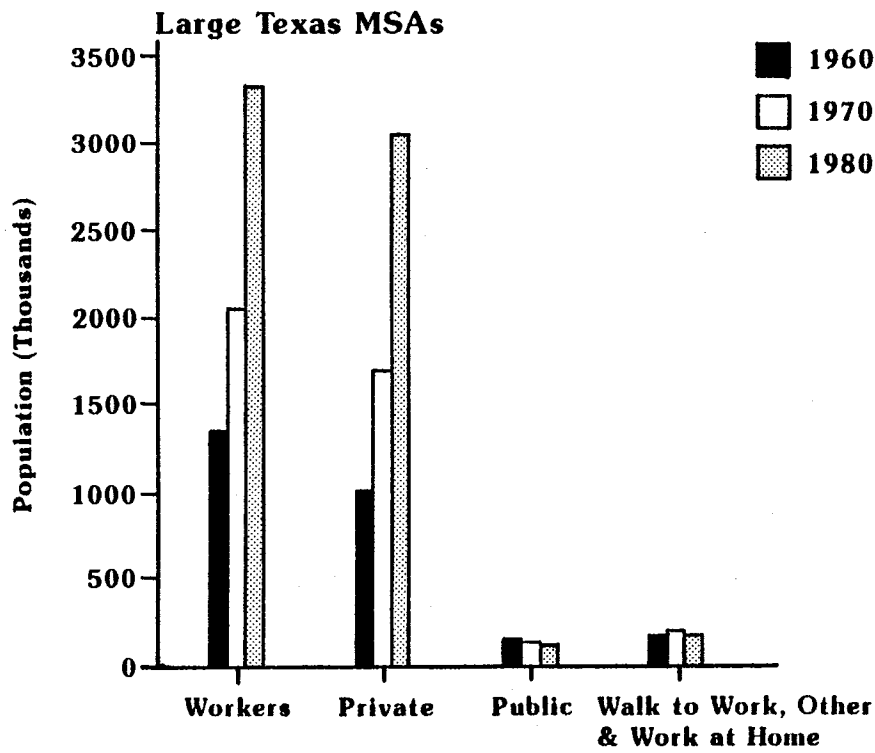


Figure 18. Shift in Commuting Mode for United States Metropolitan Areas



Choice of Mode Trends

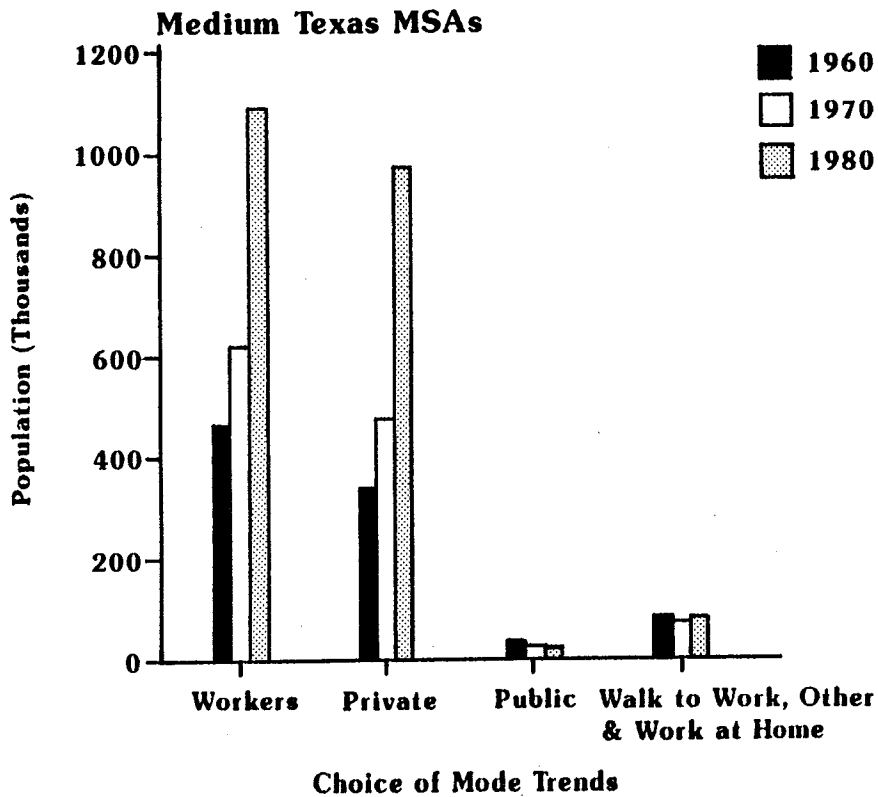
Note: "Walk to Work" Included in "Other" for 1970 and 1980



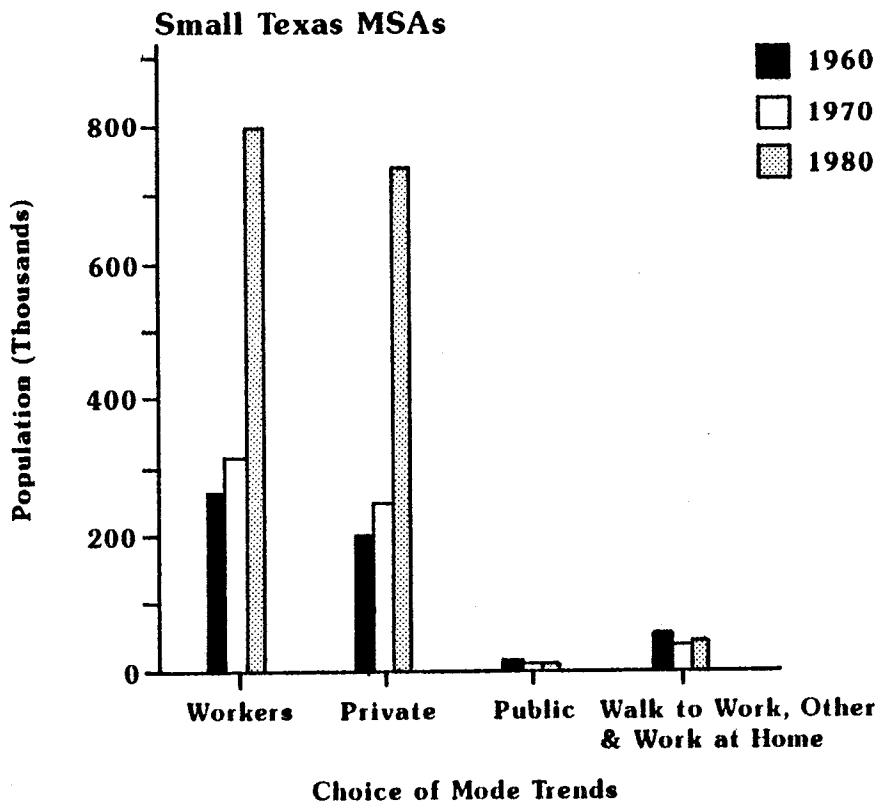
Choice of Mode Trends

Note: "Walk to Work" Included in "Other" for 1970 and 1980

Figure 19. Shift in Commuting Mode for Texas Metropolitan Areas



Note: "Walk to Work" Included in "Other" for 1970 and 1980



Note: "Walk to Work" Included in "Other" for 1970 and 1980

Figure 19. Shift in Commuting Mode for Texas Metropolitan Areas (cont'd.)

metropolitan areas, independent of the population growth, experienced heavy growth in the number of workers and the use of automobiles for commuting.

Carpools and Vanpools

In Texas, almost 3.3 million people drove alone to work every day in 1980 while over 1.1 million commuted in groups of two or more. The share of group ridership in 1980 ranged from 20 percent in small Texas metropolitan areas to 24 percent in large Texas MSAs.

This trend was reversed at the national level, where group ridership declined with increasing area size in 1980. Metropolitan areas with a population over one million experienced a share of only ten percent group ridership in 1980.

The Nationwide Personal Transportation Study (NPTS) shows that vanpools and auto occupancy, in general, tend to increase with an increasing length of work trip. According to the 1983 NPTS data, over 31 percent of carpoolers had trip lengths greater than 15 miles, while only 15 percent of all workers had trips that long.

Table 24 shows the distribution of commuters by the number in the travel group for central city and suburban origins. The pattern does not vary widely between central cities and suburbs for the nation or for Texas. For small and medium Texas MSAs, though, the share of workers driving alone was slightly lower in the suburbs than in the central city.

Table 24. Distribution of Commuters by Number in Travel Group (Percent)

Classification	Central City		Suburbs	
	Drive Alone	2+ Group	Drive Alone	2+ Group
U.S. Metropolitan	77	23	N/A	N/A
Texas Metropolitan	77	23	76	24
Small Texas MSAs	79	21	78	22
Medium Texas MSAs	78	22	74	26
Large Texas MSAs	77	23	77	23

Public Transit Trends

The declining use of public transit for the work trip between 1960 and 1980 appears to be a direct result of vehicle availability. As the number of workers per vehicle has decreased, so has the use of public transit. Other factors which must be considered include the move of workers and jobs away from areas conducive to transit, and changes in transit preference among groups who traditionally used transit heavily.

Transit Trip Locations

In 1980, there were almost 140,000 daily commuting trips taken on transit in Texas. Of these, all but about 30,000 trips occurred in metropolitan areas of over one million. Figure 20 indicates the transit share that each MSA classification holds. Likewise, of the 6.2 million commuting trips taken on transit in the country, about five million occurred in metropolitan areas of over one million population.

Table 25 permits several conclusions regarding use of public transit for the commuting trip. Declines in public transit use were greatest in smaller metropolitan areas -- especially those below one million population. The losses between 1960 and 1980 for small and medium Texas metropolitan areas were approximately the same in percentage terms; these losses were much greater than for large Texas MSAs.

Table 25. Public Transit to Work

Classification	Public Transit Trips to Work (Thousands)				
	1960	1970	1980	Loss (1960 to 1980)	Loss(%)
U.S. Metropolitan (Over 1 million)	6,100	5,600	5,100	1,000	17
Texas Metropolitan	175.2	138.4	137.1	38.0	22
Small Texas MSAs	10.6	7.1	6.3	4.3	40
Medium Texas MSAs	31.0	22.1	19.8	11.2	36
Large Texas MSAs	133.6	109.3	111.0	22.6	17

Nationally, among areas over one million population, the larger areas experienced greater transit ridership losses than the smaller areas. The largest transit market -- New

York -- experienced the greatest losses. These losses were due primarily to shifts in both worker and job locations. Texas metropolitan areas followed the same pattern for areas over one million population. Between 1960 and 1980 Houston (with the greatest population) lost 14 percent of public transit use while Dallas-Fort Worth (the second largest Texas MSA) lost 22 percent. Austin was the only MSA in Texas which gained public transit trips to work.

Transit Use Trends Since 1980

A key to assessing transit is the relationship between transit use and the commuter flow markets where growth is occurring. Table 26 represents the flow markets where transit use is the strongest. The strongest flow for all metropolitan areas is central city-to-central city. If this table is compared to where work travel growth has occurred since 1960 (Figures 15 through 17 and Table 18), the problems for transit are clear.

Table 26. Public Transit Shares of Commuting by Market (Percent), 1980

Classification	Place of Residence	Total Transit Share	Place of Work		
			Central City	Suburbs	Other
U.S. Metropolitan	Central City	14.3	16.1	5.6	7.3
	Suburb	4.1	8.0	1.6	7.6
Texas Metropolitan	Central City	4.1	4.4	1.3	2.2
	Suburbs	0.6	1.0	0.1	1.0
Small Texas MSAs	Central City	1.1	1.0	0.7	1.4
	Suburbs	0.1	0.1	0.0	0.3
Medium Texas MSAs	Central City	2.6	2.7	1.0	3.1
	Suburbs	0.3	0.3	0.2	1.2
Large Texas MSAs	Central City	5.7	6.2	1.5	2.4
	Suburbs	0.7	1.3	0.1	1.6

In large Texas metropolitan areas, which account for 80 percent of transit ridership, 31 percent of the growth occurred in the intra-suburban commute where the transit market is weakest. The intra-central city commute also grew 31 percent, but Texas central cities are so dispersed that this growth may not be conducive to transit use. Many intra-central city trips in Texas might be more comparable to intra-suburban trips in other locations.

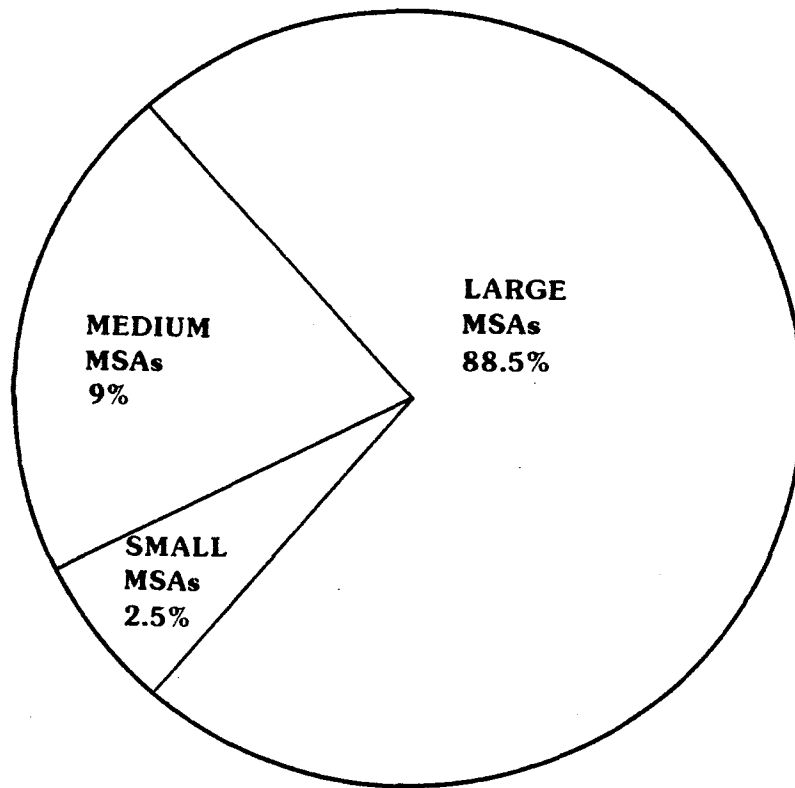


Figure 20. Shares of Transit Trips to Work

Nationally, over 58 percent of the growth in commuting trips from 1960 to 1980 occurred in the suburb-to-suburb commuting market. The strongest market for transit (central city-to-central city) grew only nine percent during the same time period.

The 1983 NPTS transit data were compared to the decennial census data to compare these important trends. The mass transit share of 5.3 percent was well below the decennial rate of 6.7 percent. However, NPTS data tend to show levels of transit use below those found in decennial surveys because of differences in survey design and coverage. General trends, regardless of the size of the difference between NPTS and the decennial census data, indicate a long-term downward trend in transit ridership from 1960.

Working at Home and Walking to Work

Working at home and walking to work represent small components of the commuting environment. As shown in Tables 22 and 23 (included in Other category), this category of workers is declining both in number and percentage of all workers. While they do not need

vehicles or the use of public facilities, their impact would be felt if they began commuting with motorized vehicles.

Commuting Times and Distances

Commuting patterns and modes have been summarized previously. The following discussion addresses work-trip characteristics which heavily influences the quality of the journey to work. These characteristics include travel times, distances, and speeds. Unfortunately, this discussion is hindered by a lack of comprehensive data. In 1980, the decennial census asked questions concerning the travel time to commute to work for the first time. Effective evaluation of the trends in commuting times cannot occur, however, until better information on distances and speeds is collected.

Travel Time and Mode

For Texas metropolitan areas, the decennial census in 1980 found that the mean travel time for all commuters was 22.9 minutes. This was slightly higher than the mean travel time of 21.7 minutes for the entire country. Obviously, the time varies widely by mode used, flow pattern, and area. Small and medium Texas metropolitan areas, for instance, averaged 17.3 and 17.9 minutes, respectively, while large Texas MSAs had an average travel time of 23.8 minutes.

The travel time varies widely by mode used. In the country, public transit trips take, on average, about twice the time of private vehicle trips. Without knowing the length of the trip, however, this information is ambiguous; if transit trips averaged twice the distance in addition to twice the time of private vehicle trips, their speeds would be comparable.

Average travel times for private vehicles were also approximately one-half those for transit in Texas metropolitan areas. The average travel time for private vehicles in Texas MSAs was 21.9 minutes, while the average time for public transit was 40.0 minutes. Again, average distances would make this comparison less ambiguous.

An analysis of small Texas MSAs indicates that the average travel times for private vehicles and transit were closer than in other areas. Private vehicle trips had an average of 17.8 minutes, while public transit trips averaged 29.5 minutes. The average travel times in medium Texas MSAs were 18.5 minutes for private vehicles and 32.8 minutes for transit. Large Texas metropolitan areas averaged 24.0 minutes for private vehicle trips and 41.9 minutes for public transportation. While a difference in distance may cause a difference in average travel times, there is certainly a difference in vehicle operating speed.

Travel Times in Flow Markets

The travel times for commuters vary not only according to mode, but also according to the flow market. Using only private vehicle travel times for each flow category provides the best measure of potential travel times on the highway for different flows. Table 27 shows the 1980 average travel times by flow type.

Table 27. Private Vehicle Travel Times to Work, 1980

Classification	Travel Time to (Minutes):		
	Central City	Suburbs	Outside Suburbs
U.S. Metropolitan			
Central City	17.8	23.5	40.9
Suburbs	25.4	18.3	33.9
All Origins	24.8	20.8	17.7
Texas Metropolitan			
Central City	19.3	24.2	41.9
Suburbs	28.4	16.7	37.9
All Metropolitan	21.8	18.4	39.4
Small Texas MSAs			
Central City	13.3	19.7	43.6
Suburbs	20.9	13.1	36.5
All Metropolitan	14.8	15.7	39.8
Medium Texas MSAs			
Central City	16.1	21.5	41.9
Suburbs	22.8	13.4	36.5
All Metropolitan	17.4	15.4	40.4
Large Texas MSAs			
Central City	22.5	26.2	39.2
Suburbs	30.7	17.8	37.9
All Metropolitan	25.2	19.5	38.4

Travel times alone cannot portray the full character of travel quality without accompanying distance and speed data. It can, however, show a measurement of what

commuters are willing to accept for the time-cost of getting to work. Suburb-to-suburb commuters experience the lowest travel time to work in Texas metropolitan areas. In fact, the intra-suburban trip is almost 12 minutes shorter per direction than the traditional suburb-to-central city commute in Texas MSAs. The exact cause for this shorter travel time is uncertain, but it is probably influencing the shift of job locations to the suburban areas. Overall, trips are shorter in travel time within a single area than trips that traverse the boundary of the area. These patterns are also evident for the average MSA in the U.S.

In Texas metropolitan areas, the intra-suburban trip takes three fewer minutes than the intra-central city trip. The difference in travel times ranges from almost five minutes in large Texas MSAs to almost even in small Texas metropolitan areas. The small amount of congestion in small MSAs could explain the equal travel times for intra-suburban and intra-central city trips.

CONCLUSIONS

The purpose of this study has been to describe the changing characteristics of Texas commuters and, as a result, Texas commuting. Many of the conclusions drawn from this analysis were presented on the national level in the report, "Commuting in America." The demographic data suggest that two factors should be considered in the area of commuting demand: 1) the effect of the identified trends on the total scale and character of current commuting demand in Texas, and 2) the likely persistence of these trends into the future.

Importance of Annexation Laws

Texas has liberal annexation laws which allow a city to annex adjacent unincorporated neighborhoods without a vote of approval from that neighborhood. This allowed Texas' central cities to become larger than those in other areas of the country. Until recently, the primary growth in Texas MSAs has been within the central city. Growth in the suburbs, however, has begun occurring at a very rapid rate, surpassing growth within the central cities.

While Texas MSAs appear to be following a different pattern of central city and suburban growth from the rest of the country, the development is probably very similar. Large MSAs have the most development in the suburbs, which is the same pattern as the country in general. Similarly, the central city is a more dominating factor in smaller MSAs for both Texas and the United States. Medium Texas metropolitan areas illustrate the transition in development from a central city to suburban focus.

Overall Influences on Commuting Demand

The identified trends indicate increased levels of commuting travel beyond the traditional suburb-to-central city trip. Among the key elements of this boom in commuting demand are the following points.

- Population growth in Texas has occurred primarily in the suburbs of large metropolitan areas. The rate of population growth in these areas increased throughout the 1960s and 1970s.
- The "baby boom" caused the working-age population to increase out of proportion to population growth. This has placed a rapidly increasing demand on the commuting system.
- The rate of female participation in the labor force has increased dramatically, resulting in a significant level of unexpected growth in commuting demand.
- Changes in household composition have affected travel demand, including the proportion of time and travel devoted to commuting.

Persistence of Trends

Many of the trends identified in the study appear to be "bubbles," having a one-time, short-duration impact on population characteristics or behavior. In the trends for which this is true, it would be very misleading to assume their continued impact into the future. Therefore, it is desirable to determine which trends will probably have a continued influence and which ones may have already begun to decline as factors of change.

Population and Employment Trends -- 1980 to 1995

While projected statistics are not available for all of the data items presented in this report, some general information has been produced by the Census Bureau (10) and the Texas Employment Commission (11). An analysis similar in scope to this report should be undertaken when the 1990 Census data have been compiled, but some simple projections of population and employment can illustrate the near future trends.

Table 28 presents population and employment values for the current configuration of the metropolitan statistical areas covered in this research report. Of a total Texas

population of 21.5 million in 1995 an estimated 80 percent will live in metropolitan areas, almost identical to the values for 1980 and 1988. This would stop a trend of increasing the share of the Texas population that resides in metropolitan areas. Population growth rate is estimated to be greater as the metropolitan area group size increases, continuing a trend of movement to larger cities (Table 29). Dallas-Fort Worth, Houston and San Antonio are projected to contain 62 percent of the Texas population, an increase over the 50 percent in 1980 and consistent with the trend illustrated in Figure 11.

Table 28. Population and Employment in Texas Metropolitan Areas -- 1980, 1988 and 1995

Metropolitan Area ¹	Population (1000) ²			Total Employment (1000) ³		
	1980	1988	1995	1982	1985	1995
Small Areas						
Abilene	111	120	130	65	59	69
Amarillo	174	203	234	81	82	107
Bryan-College Station	94	107	127	51	54	67
Galveston-Texas City	196	220	242	78	78	92
Laredo	99	132	172	41	37	46
Longview-Marshall	152	185	222	82	74	90
Midland	83	101	121	65	55	61
Odessa	115	141	172	70	56	60
San Angelo	85	97	110	45	42	50
Sherman-Denison	90	95	99	41	41	50
Texarkana	113	124	133	48	49	59
Tyler	128	162	198	68	68	83
Victoria	69	84	100	36	33	40
Waco	171	191	212	83	86	100
Wichita Falls	121	120	119	62	56	65
Total	1,801	2,082	2,391	916	870	1,039
Medium Areas						
Austin	537	704	914	305	391	496
Beaumont-Port Arthur	373	405	435	167	147	164
Brownsville-Harlingen	210	291	387	80	75	88
Corpus Christi	326	365	403	159	149	173
El Paso	480	605	744	183	194	247
Killeen-Temple	215	275	343	68	73	94
Lubbock	212	233	254	105	101	120
McAllen-Edinburg-Mission	283	407	557	105	109	139
Total	2,636	3,285	4,037	1,172	1,239	1,521
Large Areas						
Dallas-Fort Worth	2,931	3,566	4,285	1,707	1,980	2,537
Houston	2,904	3,729	4,924	1,790	1,666	1,910
San Antonio	1,072	1,248	1,426	470	531	698
Total	6,907	8,543	10,635	3,967	4,177	5,145

¹Based on 1988 Census Bureau definition of metropolitan areas

²Source: Census Bureau Estimates (10)

³Source: Texas Employment Commission (11)

The Texas Employment Commission (11) expects the Texas metropolitan labor force to be 45 percent female in 1995, continuing an important trend (Figure 9). The labor force

participation rate, which had grown substantially between 1960 and 1980 (Table 4), is projected to be relatively constant from 1980 to 1995 with an increase from 68 to 69 percent.

Table 29. Population and Employment Growth Trends in Texas Metropolitan Areas -- 1980 to 1995

Metropolitan Area Group	Average Annual Population Growth Rate (%)		Average Annual Employment Growth Rate (%)	
	1980-1988	1988-1995	1982-1985	1985-1995
Small Areas	1.8	2.0	-5.0	1.8
Medium Areas	2.8	3.0	5.7	2.1
Large Areas	2.7	3.2	5.3	2.1

The employment growth rate is projected to be 10 to 35 percent less than the growth rate in population to 1995. This is a substantial change in trend over the period between 1960 and 1980 (Table 3). The difference in time period used in the analysis may have some impact on the conclusions drawn from the table, but the 1960 to 1980 trend of greater increases in employment than population is not projected to continue.

Total employment data were available from the Texas Employment Commission for 1982, 1985 and 1995. The 1985 to 1988 period may have exhibited only slight growth in employment, which would mean that the 1988 to 1995 employment growth rate might be greater than estimated for 1985 to 1995. This consideration would not, however, seem to indicate a trend consistent with the 1960 to 1980 period.

Baby Boom

The "baby boom" was a one-time event. The minimal growth of the population under 15 during the post-1960 period further illustrated the unprecedented nature of the population growth between 1945 and 1960. The members of the post-World War II population increase will continue to be a major factor of the labor force until the end of the century. As the large cohort of baby boomers has begun to have children, the number, if not the rate, of births should increase again. The size of the labor force age group for the remainder of the century is known from recent birth rates; the commuting infrastructure in the next century should be planned to handle this population.

Women in the Labor Force

A major influence on the size of the future labor force is the continued trend of higher participation by women in paid employment. The extraordinary growth in both the number and percentage of women entering the labor force will probably not be a persistent trend, although there is some room for additional growth. Female participation rates have reached a level approximately two-thirds that of men. In 1980, 56 percent of all working-age women were in the labor force in Texas, compared to 81 percent of working-age men. At the current level of growth, female participation rates in the labor force would equal male rates between 2000 and 2010. The Texas Employment Commission, however, does not project a significant increase in female participation in the work force. The declining working-age population after 2000 may result in higher participation rates for both male and female workers.

Continuation of the trend of increased female work force participation will depend on changing social values and economic trends. Texas is currently recovering from an economic slump after the decline of the oil industry in the early 1980s. Economic conditions favor a continuation of the need and desire for women to work. Unlike previous generations, women are now encouraged to attend college and participate in more challenging roles in the work force. It should be noted, also, that women engage in part-time work to a far greater extent than men, providing a substantially greater flexibility in their participation in employment.

Household Changes

The continued present trend in household formation and size is difficult to anticipate. As a factor in work travel, household size is not as crucial as other factors such as residential and job locations or automobile commuting. Changes in the birth rate, increased family size and reduced participation of women in the labor force could, however, affect work commuting if the changes were of sufficient magnitude. Other factors which affect household size, including marriage rates, divorce rates, and life span, are not directly significant to commuting patterns.

Vehicle Availability

Assessing future growth of vehicle ownership and availability seems more possible than assessment of the other demographics. Traditionally, the potential for increase in vehicle availability has been underestimated. There was a time when it was reasonable to assume that each household had a maximum of one vehicle. When that was surpassed without a decrease in the growth trend, one vehicle per worker was the next perceived natural limit. In Texas the number of vehicles available to each worker was greater than one in the 1970s, indicating that this limit has also been surpassed. The next "natural" level is one vehicle per licensed driver. Recent data at the national level indicate that this limit was passed in the mid-1980s.

Demand for vehicles has become a product of the purposes people have for their vehicles. As vehicles are increasingly differentiated by trip purpose, vehicle growth will be a function of incomes rather than natural limits on demand. This suggests that future planning for Texas roadways might be more accurate if based on personal vehicle availability being a given for all commuters.

Implications for the Commuting Infrastructure

The aforementioned demographic trends have changed the character of commuting demand, and will continue to exert some influence on demand for the remainder of this century. The resulting changes in the size and character of work-trip commuting are placing strong demands on the transportation infrastructure. These changes should also influence the planning for future transportation facilities.

The substantial growth in workers and, therefore, commuting and its characteristics, suggests that population growth is no longer a valid indicator of future travel demand. This study has shown that substantial increases in commuting have occurred even in areas of small population growth.

The population in Texas metropolitan areas has predominantly been located in the central city. In recent decades, however, substantial growth has occurred in suburban areas.

The effects of the resultant patterns of commuting flow on the highway system are substantial. The most evident effect is that the tremendous growth in suburban commuting is occurring in areas that are not as well equipped with public facilities, roads, and transit as the traditional central cities. New demands have been placed on a roadway system that is more oriented to radial patterns than circumferential flows. The transportation system currently has inadequate capacity, and the needed coordination between multiple agencies makes it difficult to focus the resources necessary to solve suburban transportation problems.

Opportunities for public transit to substantially increase its contributions to commuting needs in broader markets would appear to be limited in the future. The growing intra-suburban market may represent only a very small, relatively expensive-to-serve market for traditional transit forms. If the suburbs become more dense, or innovative transit service strategies are developed, transit's suburban travel market could grow.

One effect of reduced available capacity on the roadway system is that the Interstate system is used for commuting purposes in the absence of adequate arterial streets. This will eventually require relief either in the form of local street or freeway substitutes for lost interstate capacity, or new interstate facilities to do the job intended for the original system. Present competition between the needs of the local commuter and long-distance interstate traffic will be a critical concern in the future.

The potential for a new "community balance" (referred to in "Commuting in America") between workers and jobs in suburban areas exists, and has promise for more efficient commuting patterns. This improvement in structure, however, will not eliminate the high levels of interdependence between suburban communities, and between them and the central city. Cooperation and communication between the transportation agencies of the metropolitan area can enable the community to combine resources for solutions to transportation problems on a regional basis.



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