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U.S. Commuting Zones and Labor Market Areas

A 1990 Update

Charles M. Tolbert
Molly Sizer

Contact David McGranahan, Economic Research Service, U.S. Dept. of Agriculture, or Charles Tolbert, Louisiana State University for additional information on this report.

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Abstract

This document provides an overview of a research project that identified U.S. commuting zones and labor market areas with journey-to-work data from the 1990 Census. This research replicated a previous delineation of U.S. 1980 commuting zones and labor market areas. County to county flows of commuters were analyzed with a hierarchical cluster algorithm. The results of the cluster analysis were used to identify commuting zones (i.e., groups of counties with strong commuting ties). For 1990, 741 commuting zones were delineated for all U.S. counties and county equivalents. These commuting zones are intended for use as spatial measures of local labor markets when researchers are not concerned with minimum population thresholds. Where necessary, the commuting zones were then aggregated into 394 labor market areas that met the Bureau of the Census' criterion of a 100,000 population minimum. This was done to acquire a special 1990 Census Public Use Microdata Sample (PUMS-L) that identifies labor market areas in which individuals live and work. The commuting zones and labor market areas were also classified according to the population of the largest place within them.

Acknowledgments

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U.S. Commuting Zones and Labor Market Areas: A 1990 Update

Charles M. Tolbert and Molly Sizer[1]

Introduction

This document provides an overview of a research project to delineate U.S. commuting zones and labor market areas with journey-to-work data from the 1990 Census. The project is a replication of a previous analysis based on the 1980 Census (see Tolbert and Killian, 1987; Killian and Tolbert, 1993). In the earlier research, county to county flows of commuters were analyzed with a hierarchical cluster algorithm. The results of the cluster analysis were used to identify commuting zones (i.e., groups of counties with strong commuting ties). These commuting zones are intended for use as measures of local labor markets when researchers are not concerned with minimum population thresholds. Where necessary, the commuting zones were then aggregated into labor market areas that met the Bureau of the Census' criterion of a 100,000 population minimum. This was done to acquire a special 1990 Census Public Use Microdata Sample (PUMS-L) that identified labor market areas in which individuals live and work.

The procedures utilized in the original delineation and the resulting geography greatly assisted research on rural and urban employment issues. The detailed commuting zones and broader labor market areas were principally intended to be statistical units for analysis of nonmetropolitan labor market performance and employment problems (see the variety of applications in Singelmann and Deseran, 1993). The geography and procedures have been adapted to a variety of other issues, however, including research on small business development, health service areas, detailed journey-to-work patterns, and basic demographic processes.

The delineation of commuting zones and labor market areas with 1990 Census journey-to-work data provides researchers with an updated geography that reflects changes in commuting patterns since 1980. Moreover, the development of the new geography permits longitudinal analyses of stability and change in local labor markets across the Nation. Finally, the new labor market geography can be linked to 1990 individual-level Census data in a special public-use file (PUMS-L) similar to the 1980 data.

This document provides information essential to the use of the 1990 commuting zone/labor market area delineation. The sections that immediately follow contain a rationale for the development of the labor market geography and a brief sampling of previous applications of the geography. We then

[1]Tolbert is Professor, Departments of Sociology and Rural Sociology, Louisiana State University, and Senior Research Scientist, Louisiana Population Data Center. Sizer is Research Associate Professor, Department of Agricultural Economics and Rural Sociology, University of Arkansas.

discuss the procedures that were used to replicate our earlier work. Lastly, we explain the methods used to classify nonmetropolitan and metropolitan commuting zones and labor market areas by the size of the largest place within them. Following the main text of this report, readers will find appendices that list the commuting zones and labor market areas and detail their classification by size of largest place.

Rationale

Since the late 1970s, there has been a resurgence of interest in labor markets and their impact on socioeconomic outcomes such as employment, unemployment, earnings determination, income inequality, and poverty (for literature reviews see Beck, Horan, and Tolbert, 1978; Kalleberg and Sorenson, 1979; Falk and Lyson, 1988; Snipp and Bloomquist, 1988; Singelmann and Deseran, 1993). Researchers have focused on a variety of issues, including dual labor markets (Piore, 1975), industrial sectors (Tolbert, Horan, and Beck, 1980), internal labor markets (Althauser, 1989), markets as networks (Granovetter, 1982), and local labor markets (Parcel, 1979; Horan and Killian, 1984; Horan and Tolbert, 1984; Tickamyer and Bokemeier, 1988). The development of a labor market geography is anchored in the latter research tradition: the study of the local labor market. The local labor market is viewed as a set of relationships between employers and workers. These relationships exist in a space bounded by places of work and residence. As such, this spatial conception of labor markets dictates our methods, data sources, and procedures.

A spatial approach to labor markets requires a geographic scheme that can serve as a basis for data collection and statistical reporting. Prior to the earlier delineation of the 1980 labor market geography, U.S. geographic schema were not generally satisfactory for labor market studies. Extant geographies were particularly poor representations of rural labor market areas. Some researchers (e.g., Bowen and Finegan, 1969; Hirsch, 1978; Parcel, 1981) relied exclusively on metropolitan area definitions such as Standard Metropolitan Statistical Areas (SMSAs) and Metropolitan Statistical Areas (MSAs). Studies employing these measures of labor market areas excluded nonmetropolitan places by definition. Berry (1968, 1973) developed an inclusive county group scheme known as the Bureau of Economic Analysis (BEA) areas. Based on central place theory, commuting nodes are identified and surrounding counties are assigned to nodes based on commuting patterns. Because each BEA area tends to have an urban center and tends to be quite large, this scheme also constituted a less than satisfactory measure of rural labor markets. Other candidates for labor market area schemes included the U.S. Bureau of the Census' county group definitions. The main drawback to the use of Census county groups as labor market areas was that the geography is determined independently by administrators and officials in each of the 50 states. Obviously, researchers could not be certain that the same criteria were used to identify county groups in all States. Moreover, most of the Census county group schemes did not cross State lines. At best, restricting labor market areas to State boundaries was unnecessarily arbitrary. At worst, confining areas to single States could seriously distort measures of labor market areas.

For these reasons, we determined that existing geographic schema used to represent labor market areas were unsatisfactory. A plan was developed for a new geographic specification that included all U.S. counties and county equivalents, used uniform criteria for designating labor market areas, employed the most recent journey-to-work data, did not require each area to have an urban center, and could meet prevailing U.S. Census confidentiality standards. These priorities guided the 1980 delineation and the 1990 replication. The 1980 geography and a companion Census data file proved to be very valuable for research on labor market and socioeconomic outcomes in metropolitan and nonmetropolitan areas. As the following discussion suggests, however, inventive applications of the geography have gone beyond the realm of labor market research to a variety of social, economic, and health fields.

Review of Applications

The commuting zone (CZ) and labor market area (LMA) geographies and the underlying methodology have been applied in a number of ways. In this section, we provide a sampling of the variety of uses of the CZ/LMA delineation procedures and results. Though there are many applications, we have chosen this sampling to suggest the breadth and ingenuity of some uses.

A number of researchers have used the geography and the PUMS-D data file to link information about labor market areas to Census records on individual residents (see table 1). The volume of PUMS data makes it possible to generate aggregate LMA characteristics from the information on individuals with more detail than any other published data. For example, Tickamyer and Bokemeier (1988) used PUMS-D to tabulate workers' industries in Kentucky LMAs and then classified areas as mining- or agriculture-based. Similarly, Colclough and Tolbert (1990) used a detailed and specific definition of high-tech industries to identify the top high-tech labor market areas in the South. Sample uses of the geography and 1980 PUMS-D are listed in table 1.

Researchers have also used the CZ/LMA delineation in work that does not employ individual-level Census data. More often than not, this approach uses the commuting zones or labor market areas as basic units of analysis and treats them as meaningful socioeconomic spatial entities. For example, Killian and Hady (1987) classify LMAs as diversified and specialized in a study of areal economic performance. Reynolds and Maki (1990) conceive of the LMAs as economic areas encompassing small business development. Siegel et al. (1993) use the geography as a means of introducing local socioeconomic factors into models of stroke incidence. These and a sample of other uses of the geography are listed in table 2.

Table 1. Sample Uses of 1980 LMA Geography and PUMS-D

Researchers	Topics
Tickamyer and Bokemeier, 1988	Sex Differences in Labor Market Experiences
Lyson, 1989	Growing Divergence of Southern Urban and Rural Areas
Tolbert, 1989	Comparison of Various 1980 Census County Group Schema
Tigges and Tootle, 1990	Men's Underemployment
Colclough and Tolbert, 1990, 1992, 1993	High-Tech Labor Force
Lichter et al., 1991	Marriage Markets and Black and White Women
Lichter et al., 1992	Racial Differences in Marriage Patterns
Deseran et al., 1993	Household Structure and Labor Force Participation
Kodras and Padavic, 1993	Economic Restructuring and Women's Sectoral Employment
McLaughlin et al., 1993	Transitions to First Marriage
Pfeffer, 1993	Black Migration and the Legacy of Plantation Agriculture
Talley and Cotton, 1993	Minority Concentration and Black-White Inequality
Tickamyer and Latimer, 1993	Sources of Income of Poor and Near Poor
Tootle and Tigges, 1993	Black Concentration and Underemployment

Other researchers have applied the CZ/LMA methodology to data other than county-to-county commuter flows (see table 3). Steahr (1990) used the basic methodology to define labor market areas for New England using data on minor civil divisions (MCD). Makuc et al. (1991) employed the same flow measure and similar clustering procedures with data on Medicare patients' travel from home to the hospital. The resulting geography identified health service areas for the United States. Frey and Speare (1992) proposed that the CZ/LMA methodology be applied well below the county level at the place level. The resulting spatial units could replace the current metropolitan area definition employed by the Bureau of the Census.

This sampling of applications underscores the utility of the 1980 CZ/LMA geography and the companion PUMS-D data file. The geography has been adopted widely and extended far beyond the realm of labor market research. By the late 1980s, the level of interest was such that plans were

Table 2. Uses of the 1980 CZ/LMA Geography

Researchers	Topics
Bloomquist, 1990	Sociodemographic Group Differences in Occupational Concentration
Killian and Hady, 1987	Local Economic Performance
Reynolds and Maki, 1990	Small Business Development
Padavic, 1993	Spatial Dynamics of Women's Employment
Siegel et al., 1993	Socioeconomic Correlates of Stroke Mortality
Singelmann et al., 1993	Economic Performance of Labor Market Areas
Whitener and Parker, 1993	Off-Farm Employment of Farmers

Table 3. Extensions of Delineation Methodology

Researchers	Topics
Steahr, 1990	Local Labor Markets in New England
Makuc et al., 1991	Health Service Areas for the United States
Frey and Speare, 1992	Proposal for Census 2000 Geography

made to update the geography and to acquire individual-level data from the 1990 Census. The design of the replication is detailed in the following section.

Replication Design

Discussions about a replication of the delineation began as early as 1989 among social scientists at the Economic Research Service and technical committee members of U.S.D.A. Project S-229. Continuing over a period of two years, the planning for the replication covered a number of issues. These included lengthy discussions on the merits of changing the commuting zone/labor market area geography and an evaluation of the delineation procedures.

Plausible arguments were made for retaining the 1980 geography. Some noted the widespread use of the 1980 CZ/LMA schema and the fact that researchers were well versed with the delineation. Large volumes of data have been structured according to the 1980 geography. Any change in the underlying geography would necessarily require changes in data series to correspond to a new standard. Others noted that individual-level Census data had not been issued with the same geography from one decade to the next. Holding the geography constant meant that researchers would have available both a 1980 and 1990 PUMS with corresponding labor market areas.

These points notwithstanding, most of the discussion centered on how best to replicate the delineation of commuting zones and labor market areas. It was noted that the 1980s were tumultuous social and economic times in which journey-to-work patterns were quite likely to have changed. Moreover, serious questions were raised about the propriety of linking a 1980 geography to 1990 individual-level Census data. Most involved in the decision-making process came to agree that it was best to use the most recently available journey-to-work data in defining local labor markets. Since the only source for such information is the 1990 Census, changes in the originally delineated commuting zones and labor market areas were a distinct possibility. Simply put, a changed geography was deemed preferable to one that had less validity due to the passage of time. Still, those involved in the planning also agreed that the design of the replication should minimize change from 1980 to 1990.

Accordingly, it was further agreed that exactly the same procedures would be followed in the new delineation. Prior to the 1980 delineation, a variety of commuting measures were tested. The results of these tests were reviewed along with newer approaches in the literature (e.g., Slater, 1987). None of the alternative methods was deemed attractive enough to warrant a modification of basic procedures which could introduce even more 1980-1990 change in the CZ/LMA geography. The delineation reported below follows the original procedures as nearly as possible. To summarize the planning discussions, the replication of the commuting zone/labor market area delineation was to:

1) Develop a new geography based on 1990 journey-to-work data; and,

2) Employ the same procedures as were used in the earlier delineation of 1980 commuting zones and labor market areas.

Procedures

In this section, we detail the procedures used to delineate commuting zones and labor market areas. The county-level commuting data source is introduced along with some sample data. Then, we explain steps taken to compute measures of commuter flows across counties. Using sample data, we illustrate the delineation of commuting zones and labor market areas with a hierarchical cluster analysis.

Counties as Units of Analysis. In earlier publications (Tolbert and Killian, 1987; Killian and Tolbert, 1993), we have developed a rationale for the use of counties and county equivalents (boroughs, census areas, parishes, and independent cities) as fundamental building blocks for a labor market geography. Paramount among our reasons is our interest in developing an exhaustive scheme that covers nonmetropolitan as well as metropolitan areas of the United States. The wealth of available county-level social, economic, and political data is another very important justification for the use of counties as units of analysis. Friendly critics (Steahr, 1990; Frey and Speare, 1992) have argued for the use of smaller spatial units such as minor civil divisions (MCDs) and census places (urbanized areas of 2,500 or more persons). Though we are intrigued by the possibility of finer geographic detail, we should note that current statistical practice precludes us from pursuing either strategy. MCDs are not defined for all 50 states, and not all persons live in census places. Thus, our use of subcounty spatial units would prevent us from achieving our objective of an exhaustive geography. Moreover, we would lose geographic comparability with existing county-level data

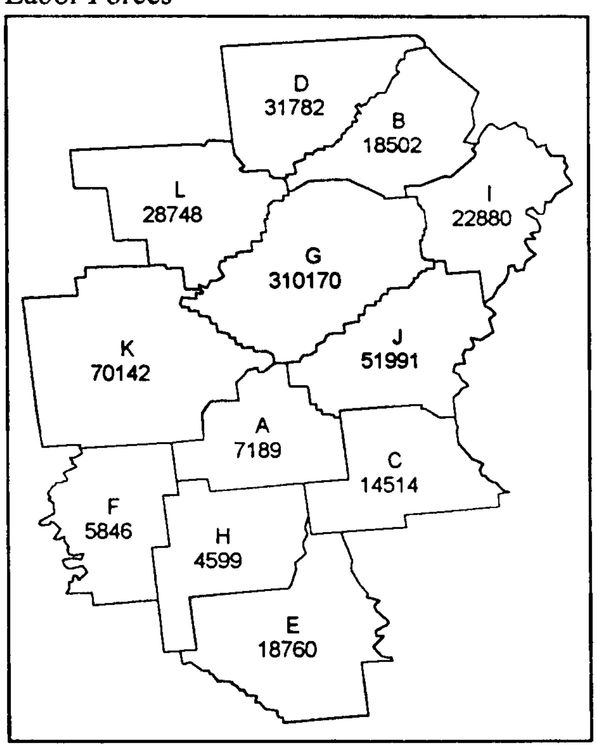
Table 4. Sample 1990 Journey-to-Work Data for Sabine Parish, LA

Place of Work	n	Place of Work	n
Mobile County, AL	16	Vernon Parish, LA	197
Pickens County, AL	2	Washington Parish, LA	6
Shelby County, AL	5	Webster Parish, LA	15
Pulaski County, AR	10	West Baton Rouge Parish, LA	9
Wayne County, GA	5	West Feliciana Parish, LA	7
Ascension Parish, LA	2	Mecklenburg County, NC	9
Beauregard Parish, LA	14	Angelina County, TX	13
Bienville Parish, LA	26	Brazoria County, TX	6
Bossier Parish, LA	7	Calhoun County, TX	2
Caddo Parish, LA	146	Cass County, TX	7
Calcasieu Parish, LA	19	Chambers County, TX	12
Cameron Parish, LA	22	Dallas County, TX	3
De Soto Parish, LA	264	Galveston County, TX	4
East Baton Rouge Parish, LA	17	Gregg County, TX	38
Franklin Parish, LA	7	Harris County, TX	109
Jefferson Parish, LA	22	Henderson County, TX	6
Lafayette Parish, LA	58	Jasper County, TX	9
Lafourche Parish, LA	2	Jefferson County, TX	13
Natchitoches Parish, LA	125	Nacogdoches County, TX	13
Orleans Parish, LA	12	Nueces County, TX	9
Ouachita Parish, LA	2	Panola County, TX	4
Plaquemines Parish, LA	27	Robertson County, TX	11
Rapides Parish, LA	22	Sabine County, TX	61
Red River Parish, LA	16	San Augustine County, TX	12
Sabine Parish, LA	5905	Shelby County, TX	4
St. Mary Parish, LA	22	Tarrant County, TX	7
Terrebonne Parish, LA	22	Wharton County, TX	7
Vermilion Parish, LA	11		

series. Accordingly, we begin our analysis with 3,141 counties (and county equivalents) that follow the 1990 Federal Information Processing Standard (FIPS) (National Institute of Standards and Technology, 1990).

Journey-to-Work Data. The commuting data on which we base our delineation are taken from 1990 Census journey-to-work information contained in Summary Tape File S-5 (U.S. Bureau of the Census, 1992). STFS-5 reports county commuting destinations for origins in all 3,141 U.S. counties and equivalents. Table 4 displays STFS-5 information for Sabine Parish, Louisiana. The data represent the places of work for 7,401 persons. Though there are 55 counties listed as places of work, almost 6,000 Sabine residents live and work in the parish. Four Louisiana parishes--De Soto, Caddo, Vernon, and Natchitoches--are the most likely places of work outside Sabine Parish. Still, counties as far away as Alabama, North Carolina, and Georgia are represented. This is likely due to the wording of the Census item which inquires about the location of work at the time of enumeration. Thus, these geographic outliers may represent persons traveling or on temporary assignments away from home. We control for atypical commuting distances by limiting origins and destinations in our matrices of commuter flows. These measures are described in the following sections.

Figure 1. Sample Counties and Resident Labor Forces



Preliminary Data Processing. In delineating 1990 commuting zones and labor market areas, we used the same preliminary data processing measures as we did for 1980. STFS-5 data for New England MCDs were aggregated to the county level. Similarly, Virginia independent city data were combined with counties in which the cities are located. Commuter flows were then organized in frequency and proportional flow matrices. These procedures are detailed in the following sections.

Frequency Matrices. Using county of residence and county of work data from STFS-5, we constructed frequency matrices of commuting flows. To illustrate, consider the counties and resident labor force (RLF) totals in Figure 1.[2] County G is by far the largest with a resident labor force exceeding 300,000. County K is next largest with roughly 70,000 resident workers. F, H, and A are quite small. We would expect that G would be the nucleus of a regional commuting network and that most other counties would exhibit substantial commuting relationships with G.

Table 5 displays flows of commuters within and between the sample counties. Rows of the matrices indicate origin counties and columns indicate destination counties. Entries in the cells are simply the number of persons residing in an origin county and working in a particular destination county. As is typically the case, the main diagonal of the matrix contains most of the cases. These cells represent those who live and work in the same county. The off-diagonal cells represent those commuting to

Table 5. County of Residence (rows) by County of Work (columns): Sample Data

	A	B	C	D	E	F	G	H	I	J	K	L	RLF
A	3504	24	134	0	39	10	1168	31	6	694	920	12	7189
B	0	7369	0	630	6	0	6911	0	116	139	71	137	18502
C	161	8	7157	10	309	2	1830	5	9	1979	73	9	14514
D	9	365	0	21484	0	0	2691	0	9	68	30	292	31782
E	57	0	97	0	14726	5	75	174	0	16	50	0	18760
F	48	0	0	0	16	3040	24	253	0	20	1346	0	5846
G	86	598	28	312	37	43	266387	6	1131	9748	1567	1418	310170
H	172	0	8	0	536	221	83	2830	7	30	85	0	4599
I	3	247	6	20	2	0	9831	0	8257	641	32	11	22880
J	106	31	190	26	2	0	25295	2	303	21851	173	89	51991
K	279	0	18	0	11	415	2635	57	0	208	59727	63	70142
L	17	149	3	153	2	0	5849	3	15	100	388	17629	28748

[2]Commuting frequencies in a matrix will not necessarily sum to the indicated resident labor force total because residents may work in counties not represented in the frequency matrix.

another county for work. As is evident in the table, the largest county (G) attracts commuters in relatively large numbers from surrounding counties. G is clearly the central node of a metropolitan commuting network. At the same time, it is also apparent that not all of the counties exhibit strong commuting ties with county G. County C, for example, sends more commuters to county J than to G. Similarly, more persons commute from F to K than from F to G. The rightmost column of table 5 contains the total resident labor force for these counties taken from the 1990 Census summary information (U.S. Bureau of the Census, 1991). These labor force totals are employed in computing the proportional flow measures discussed below.

Following our procedures for the 1980 delineation, we constructed large, overlapping frequency matrices for six U.S. regions (see table 6). One reason for our use of regional matrices was to ensure that unusually distant commuting patterns were excluded from the analysis. Each frequency matrix contained data only for origins and destinations within that multi-State region. Another important reason for using regional matrices is the regional variation in county size and population density. The regional frequency matrices ensured that western counties were not analyzed along with smaller and

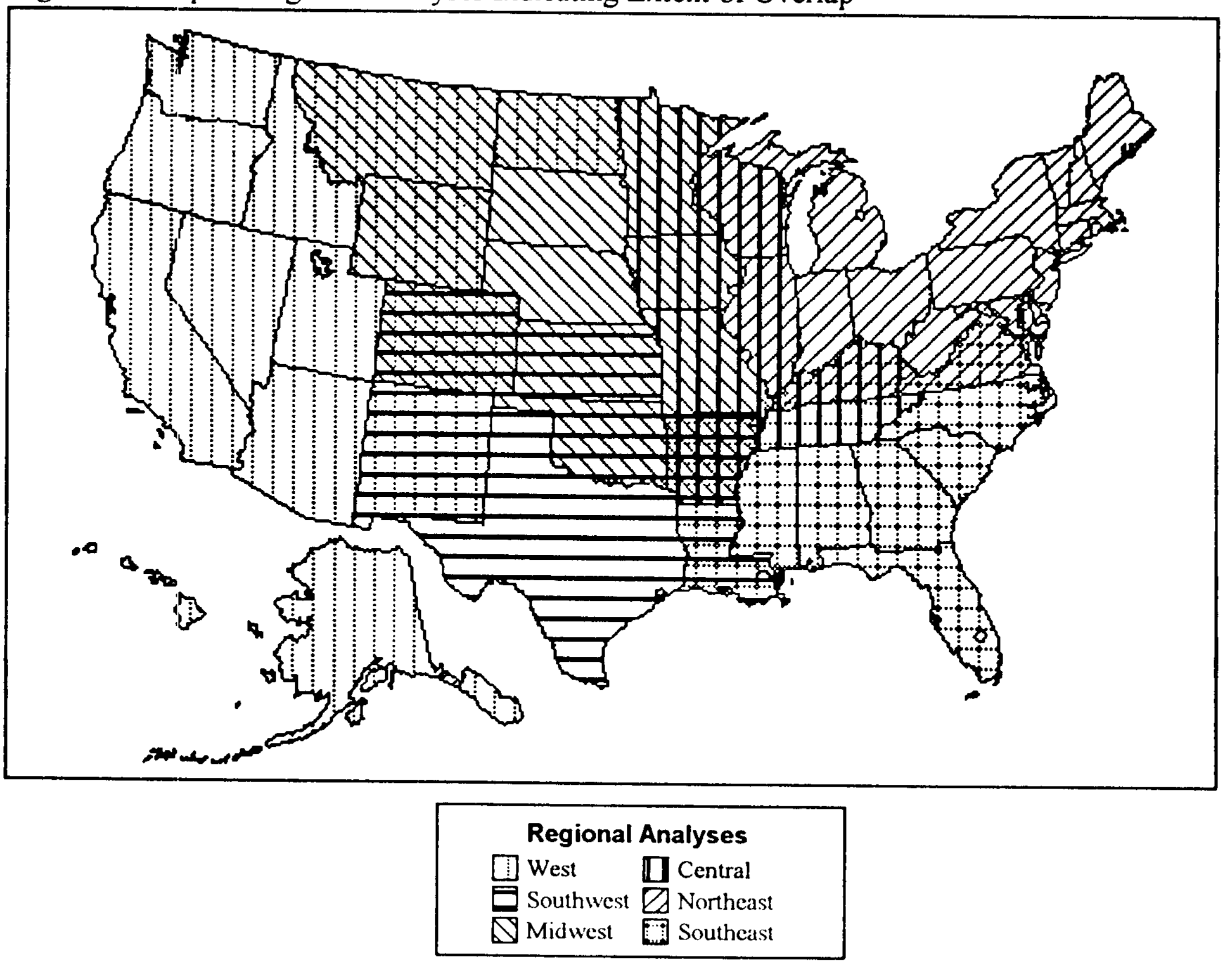
Table 6. States and Counties Included in Regional Frequency Matrices

Region	Number of Counties	States Included
West	494	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, Utah, Washington, Wyoming
Southwest	671	Arkansas, Colorado, Kansas, Louisiana, New Mexico, Oklahoma, Texas
Midwest	913	Arkansas, Colorado, Iowa, Kansas, Minnesota, Montana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, Wyoming
Central	765	Arkansas, Illinois, Iowa, Kentucky, Minnesota, Missouri, Tennessee, Wisconsin
Northeast	955	Connecticut, Delaware, District of Columbia, Illinois, Indiana, Kentucky, Maine, Maryland, Michigan, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, Wisconsin
Southeast	974	Alabama, Arkansas, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia

more populated counties in the east. In the 1980 delineation, we found that the largest commuting matrix we could analyze was 1000 x 1000. Though we were not faced with the same computational limitations in the 1990 analysis, we used regional matrices to ensure that the 1980 procedures were replicated.[3]

In our earlier work, we overlapped the regional matrices by entire States to minimize problems with fringe counties. Figure 2 indicates how the overlap was accomplished for the 1980 and 1990 journey-to-work data. This permitted substantial duplication as matrices containing more than 4,700

Figure 2. Map of Regional Analyses Indicating Extent of Overlap



[3]As we neared the end of the delineation project, our computer specialist, Pete McCool, was able to generate a matrix for the entire United States. The results were very similar to those obtained with the six regional matrices. With our delineation methods automated to this extent, we hope at some point to work with data for 1960 and 1970 to develop some long-term change models.

counties were constructed to place 3,141 counties in commuting zones. In the figure, States in the center of the Nation were typically included in two or more of the regional matrices. This provided us with at least one set of results for each U. S. county in which the county was not on the extreme margin of a region. Moreover, in some instances, we found it instructive to examine the results for a county in more than one matrix.

Flow Matrices. Because there are wide variations in county populations, we converted absolute commuting flows in the frequency matrices to proportional measures. In doing, so we followed precisely the same strategy as we did in our work on the 1980 commuting data. For counties I and j, the proportional flow measure was defined as the sum of shared commuters divided by the smaller of the two resident labor forces:

$$\frac{(\textit{commuters from county } i\,) + (\textit{commuters from county } j\,)}{(\textit{ resident labor force of smaller county }\,)}$$

These measures of association (P_{ij}) were computed for each pair of counties in a frequency matrix using the formula:

$$P_{ij} = P_{ji} = \frac{(\,f_{ij} + f_{ji}\,)}{\min(\,rlf_i\,,\,rlf_j\,)}$$

where f_{ij} = the number of persons commuting from county I to j, f_{ji} = the number of commuters from county j to I, rlf_i = the resident labor force of county I, rlf_j = the resident labor force of county j.[4] The main diagonal of the flow matrices was set to zero ($P_{ij} = P_{ji} = 0$ when $I = j$). We have discussed the merits and shortcomings of this measurement approach elsewhere (Tolbert and Killian, 1987; Killian and Tolbert, 1993). Suffice it to say here that the proportional flow measure depicts the commuting relationship between the counties with respect to the smaller of the counties. We believe the measure is especially useful for the study of nonmetropolitan labor markets.

A symmetric matrix of P_{ij} is characterized as a similarity matrix. The greater the commuting relationship, the higher the value of P_{ij}. Rather than similarity measures, the clustering algorithm employed here requires a matrix of distance coefficients (i.e., a dissimilarity matrix). Thus, we expressed the proportional flow measures as distance measures:

$$D_{ij} = D_{ji} = (\,1 - P_{ij}\,)$$

[4]In most cases, the flow measure P_{ij} can be expressed as a proportion. In the very rare case that the sum of workers commuting between the counties ($f_{ij} + f_{ji}$) is greater than the smaller county's resident labor force, P_{ij} will be greater than 1.0. In this case, P_{ij} was set to 0.999.

Table 7. Symmetric Distance Measure Matrix: County of Residence by County of Work

	A	B	C	D	E	F	G	H	I	J	K	L
A	0.000	0.997	0.959	0.999	0.987	0.990	0.826	0.956	0.999	0.889	0.833	0.996
B	0.997	0.000	0.999	0.946	1.000	1.000	0.594	1.000	0.980	0.991	0.996	0.985
C	0.959	0.999	0.000	0.999	0.972	1.000	0.872	0.997	0.999	0.851	0.994	0.999
D	0.999	0.946	0.999	0.000	1.000	1.000	0.906	1.000	0.999	0.997	0.999	0.985
E	0.987	1.000	0.972	1.000	0.000	0.996	0.994	0.846	1.000	0.999	0.997	1.000
F	0.990	1.000	1.000	1.000	0.996	0.000	0.989	0.897	1.000	0.997	0.699	1.000
G	0.826	0.594	0.872	0.906	0.994	0.989	0.000	0.981	0.521	0.326	0.940	0.747
H	0.956	1.000	0.997	1.000	0.846	0.897	0.981	0.000	0.998	0.993	0.969	0.999
I	0.999	0.980	0.999	0.999	1.000	1.000	0.521	0.998	0.000	0.959	0.999	0.999
J	0.889	0.991	0.851	0.997	0.999	0.997	0.326	0.993	0.959	0.000	0.993	0.993
K	0.833	0.996	0.994	0.999	0.997	0.699	0.940	0.969	0.999	0.993	0.000	0.984
L	0.996	0.985	0.999	0.985	1.000	1.000	0.747	0.999	0.999	0.993	0.984	0.000

Values of D_{ij} approaching zero indicate very strong pairwise commuting relationships between two counties. Those approaching one indicate very weak commuting ties.

Table 7 contains a sample distance matrix that corresponds to the frequency data for counties in table 5. The stronger relationships indicated in table 5 are associated with the large county G. The absolute flows (table 5) show nearly half (25,292) of county J's resident labor force commuting to G. In return, a small fraction (9,748) of G's resident labor force works in J. From the perspective of the small county, however, the result is a distance measure of 0.326 that suggests a very strong association:

$$D_{ij} = 1 - \frac{(f_{ij} + f_{ji})}{\min(rlf_i\ ,\ rlf_j)} = 1 - \frac{(25292 + 9748)}{51991} = 0.326$$

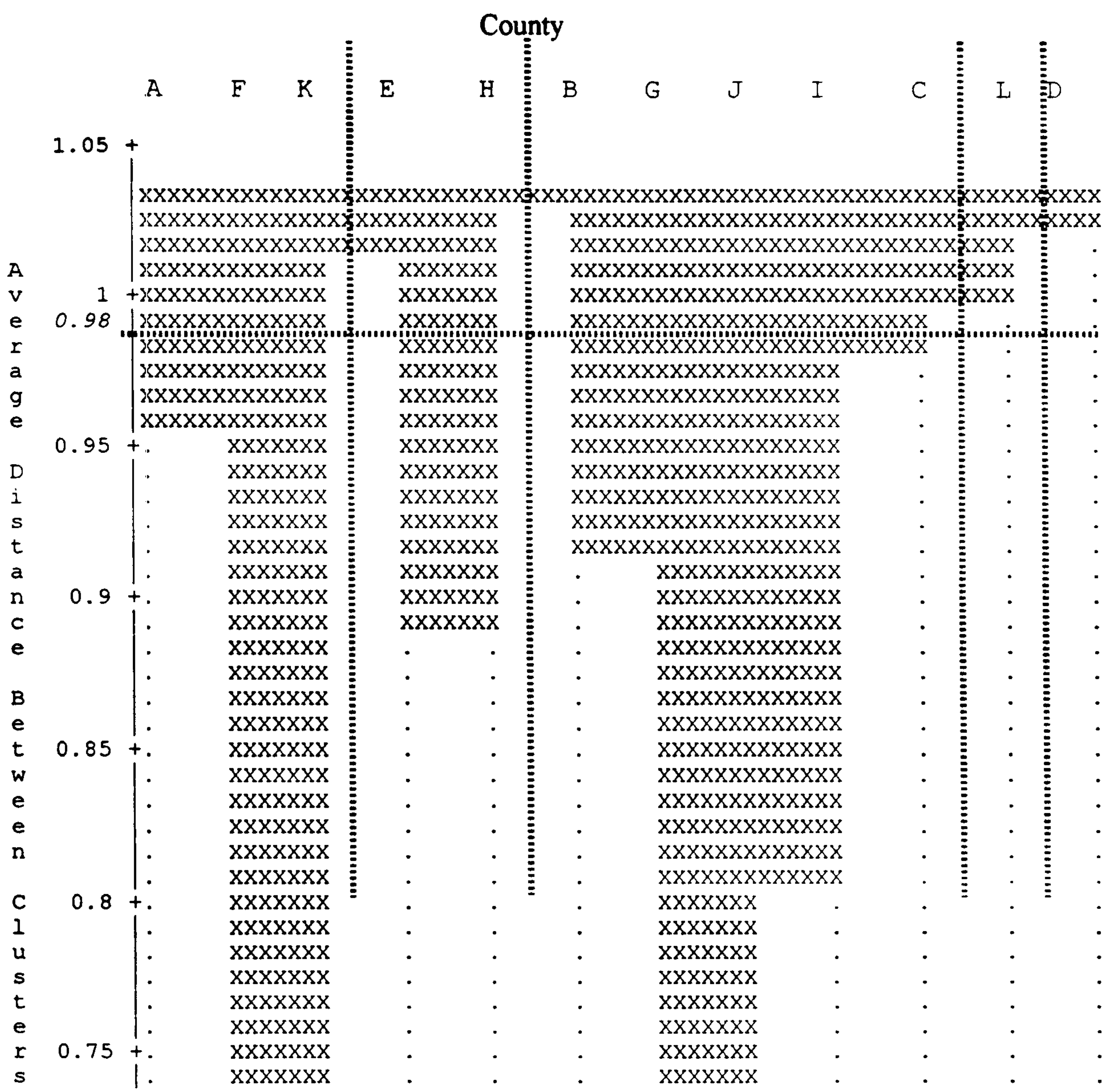
Table 7 shows that counties B and I also have strong links with G. Counties K and F, however, appear to pair by themselves rather than joining the urban network anchored by G. Note also that County D has very high distance coefficients. Its commuting relationship with the other counties in this data sample is very weak.

Hierarchical Cluster Analysis. We analyzed very large distance matrices constructed like the example in table 7 to identify groups of counties with strong commuting ties. We employed a hierarchical cluster analytic technique which indicates the strength of association among combinations of units beginning with the strongest pair and ending with one large cluster of all units. The statistical algorithm--average linkage--is a very common method found in most software packages. We used PROC CLUSTER in SAS (SAS Institute, Inc., 1989). Following our 1980 procedures, we defined clusters of relatively strongly tied counties as groups with average between-cluster distances up to 0.98. Experimental results suggested that this threshold produced reasonable and consistent results across the wide variety of U.S. counties. In our sample data in table 7, then, we would expect county G to cluster earliest with J because the pairwise distance measure is a very low 0.326. G is expected to cluster with several other counties with which it shares low distance coefficients. The average between-cluster distance, however, will increase as more weakly tied counties (e.g., B and C) are included in the cluster anchored by G. Counties K and F may form an independent cluster since they exhibit much stronger relationships between each other than among the balance of the counties. County D may fail to link with any other county. As it turns out, the cluster analysis results for the distance matrix in table 7 do indeed correspond to these expectations.

Analysis of Dendrogram. One way to interpret the results of a cluster analysis is to employ a tree-like diagram known as a dendrogram. We created dendrograms for each of the six regional distance matrices using PROC TREE (SAS Institute, Inc., 1989). A dendrogram generated from the cluster analysis results for our sample data is displayed in figure 3. The dendrogram depicts the between-cluster average distances in a vertical manner, beginning here with a distance of 0.7 and continuing to the maximum. The counties are identified across the top of the figure. The length of the bars beneath them indicates the strength of the relationship between two or more counties. For illustrative purposes, we have superimposed a horizontal dashed line at the 0.98 break point. Clusters that form prior to that criterion exhibit sufficiently strong commuting relationships and should not be divided. Clusters forming at or above the 0.98 level are considered sufficiently distant from one another to warrant separation.

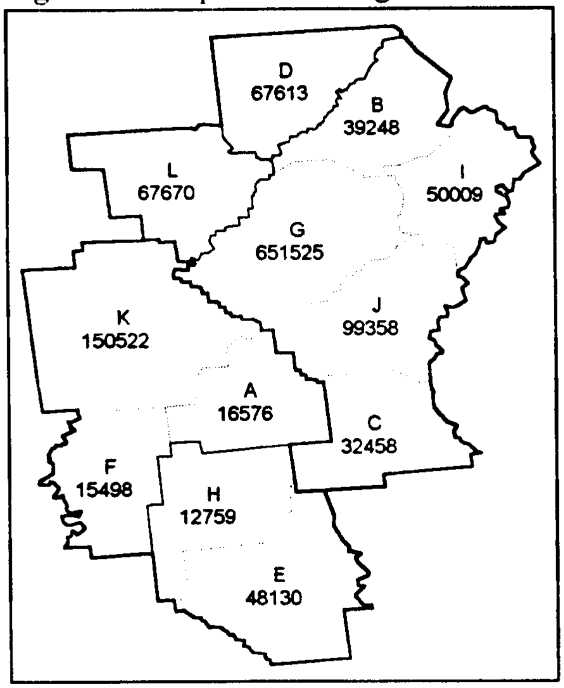
To illustrate this further, we have superimposed four dashed vertical lines on the dendrogram. In each case, these lines separate clusters of counties with commuting ties from those with relatively weaker ties. The results corroborate our interpretation of the distances in table 7. The strongly tied pair of G and J forms first and is joined subsequently by I, B, and, lastly, C. Counties E and H form a separate cluster as do K and F (joined late by A). Counties L and D appear to be isolates; that is, in this example, they do not pair with any other counties before the 0.98 threshold.

Figure 3. Sample Cluster Analysis Dendrogram



Identification of Commuting Zones: Clusters of counties based on our 0.98 criterion were defined as commuting zones. For the entire Nation, we identified 741 commuting zones with the 1990 journey to work data. Figure 4 illustrates the commuting zones that result from the sample

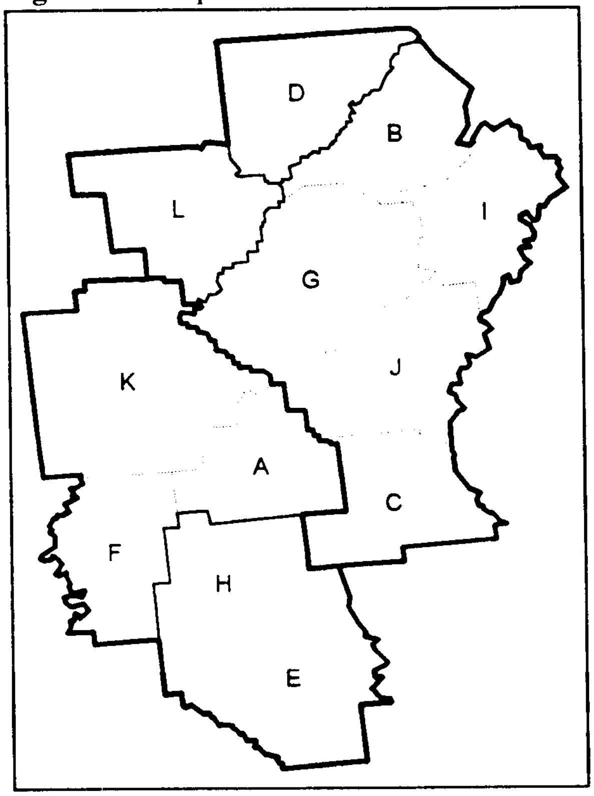
Figure 4. Sample Commuting Zones



outcomes in the dendrogram (figure 3). There are three commuting zones that are clusters of counties: A, F, and K; E and H; and B, G, J, I, and C. We refer to counties L and D as isolates because they cluster only with themselves. In this way, we delineated local labor markets that can be used for research and statistical purposes.

Identification of Labor Market Areas. The delineation of commuting zones was done without regard for population totals. To use our labor market geography with individual-level census data, however, it was necessary for us to develop a scheme in which each labor market area had at least 100,000 persons. The 100,000 criterion is used by the Bureau of the Census to ensure confidentiality of public-use data on individuals. The same population criterion was in effect for 1980 Census data as well. Some county clusters met the population criterion at the outset and received the dual designation of commuting zones and labor market areas. In our coding convention, we employ a five-digit code with the LMA represented by the first three digits and the CZ by all five digits. The fourth and fifth digits of commuting zones that are also LMAs are '00'. When commuting zones did not meet the 100,000 threshold, we formed labor market areas by combining commuting zones until the population rule was satisfied. When an LMA is composed of multiple CZs because of population limitations, the fourth and fifth digits of the commuting zones are arbitrarily coded beginning with '01'. This permits researchers to distinguish between labor market areas that are intact, single commuting zones and those that are aggregates of multiple commuting zones. Commuting zones were combined by magnitude of commuting relationships. In practice, we followed the hierarchy of association in the dendrogram to group commuting zones into labor market areas. The result was 394 labor market areas for the United States.

Figure 5. Sample Labor Market Areas



To illustrate the delineation of labor market areas, the populations of the sample counties are indicated in figure 4. The commuting zones composed of clusters AFK and BGJIC have populations well in excess of 100,000. These commuting zones are also labor market areas. The commuting zone containing counties E and H, however, has only 50,000 inhabitants. To include it in a labor market area, we use the dendrogram (figure 3) to locate the cluster (or isolate) most strongly tied to E and H. The length of the bar connecting EH with AFK is longer than the bar connecting EH with the other clusters. This indicates that the least distant cluster is AFK. Thus, counties E and H would be added to the commuting zone/labor market area composed of AFK. For illustrative purposes, isolate counties L and D must also be placed in a labor market area.[5] County L just missed the break point and very nearly was a member of the large cluster around G. As we had anticipated, County D is weakly tied to the G cluster. Nonetheless, the dendrogram indicates that both counties D and L are more associated with the G group than with the other cluster. Thus, D and L would be

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[5]Fringe areas pose a problem in an analysis of so few counties. In the much larger multi-state matrix, counties L and D are tied to counties other than those included in this example. We minimized fringe problems by overlapping our distance matrices by one entire State. However, we chose not to complicate our example with additional data.

added to the labor market area anchored by county G. Our five sample commuting zones (three clusters and two isolates) thus would become two labor market areas as indicated in figure 5.

Delineation Results

Descriptive Statistics. Summary descriptive information on the delineation of commuting zones and labor market areas is presented in table 8. The columns of the table permit comparisons of the 1980 and 1990 labor market geographies. Using 1990 journey-to-work data, we identified 741 commuting zones, 23 fewer than in 1980. The average resident population in a commuting zone for 1990 was just over 335,000 which is roughly 40,000 higher than the mean for 1980. The median 1990 commuting zone population was 11,000 larger than the 1980 median area. In terms of resident population, the largest commuting zone in 1980 was the New York City area. The largest commuting zone in the 1990 delineation was the Los Angeles-Southern California area. In both 1990 and 1980,

Table 8. Descriptive Information on Delineation Outcomes

	Commuting Zones		Labor Market Areas	
	1980	1990	1980	1990
Number of areas	764	741	382	394
Resident population:				
Mean	296,139	335,641	593,019	631,243
Standard deviation	829,206	934,028	1,109,349	1,239,750
Median	83,110	94,372	269,746	273,359
Minimum	513	1,324	100,878	100,066
Maximum	11,786,924	14,545,373	11,786,924	14,545,373
County composition:				
Mean	4.10	4.24	8.21	7.97
Standard deviation	2.60	2.51	4.84	4.81
Median	4	4	7	7
Minimum	1	1	1	1
Maximum	23	19	34	35
Number of isolates	88	62	2	3

the typical commuting zone was composed of approximately four counties. The number of counties per commuting zone ranged from 1 to 21 in 1980 and 1 to 19 in 1990.

The smaller number of commuting zones for 1990 suggests that some consolidation took place between 1980 and 1990. The figures on isolate (single-county) commuting zones in table 8 indicate that there were one-third fewer (62 versus 88) isolates in the 1990 delineation. Since we employed the same distance criterion for both delineations, we interpret the reduction in isolates as a clear sign of more intercounty commuting in 1990 than 1980. We suspect this is indicative of the economic restructuring that took place in the United States during the 1980s. A test of this general hypothesis, however, is beyond the scope of this technical report.

Since labor market areas are based on both commuting and population criteria, straightforward comparisons with commuting zone outcomes are difficult. When we focus on the 1980 and 1990 labor market area delineations, we see that the number of areas increased over time by roughly 10 percent. The 394 1990 labor market areas had an average resident population of 630,000 which constitutes less than a 10-percent increase from 1980. The median 1980 and 1990 labor market area populations are very similar. Like the commuting zone results, the largest 1980 labor market area was the New York City area. For 1990, the largest labor market area was southern California. For both points in time, the typical labor market area was composed of approximately seven counties. There was essentially no change in the very small number of isolate labor market areas. With these descriptive statistics in mind, we now turn to a consideration of the urban and rural character of the commuting zones and labor market areas.

Classification of 1990 Commuting Zones and Labor Market Areas by Center Size

A key purpose of this delineation has been to identify those local labor markets operating beyond the boundaries of the cities, based on the assumption that the strengths and weaknesses of the labor force and the nature of the opportunities available in rural, more sparsely settled local economies continue to differ from those found in the larger, more densely populated city economies. In this section, we examine the population settlement patterns in the 741 commuting zones and the 394 labor market areas. We also examine the regional locations of these local labor markets, again based on the assumption that the way that local labor markets are organized and the way they perform in the West or the Midwest continue to differ in significant ways from the way they are organized and perform in the South or the Northeast.

Commuting Zones. We begin with a classification of the 1990 commuting zones and labor market areas based on population settlement patterns. We grouped the commuting zones (and labor market areas) into nonmetropolitan commuting zones/labor market areas (i.e., those containing no MSAs--

Metropolitan Statistical Areas) and metropolitan commuting zones/labor market areas (i.e., those containing one or more MSAs or PMSAs--Primary Metropolitan Statistical Areas), using the Office of Management and Budget's definitions (OMB Bulletin 93-17). There was little change in the mix of nonmetro and metro commuting zones or labor market areas between 1980 and 1990: 483 (65.2 percent) of the 741 commuting zones in 1990 are nonmetro, compared with 508 (66.5 percent) nonmetro commuting zones out of the 764 in 1980; and 139 (35.3 percent) of the 394 labor market areas in 1990 are nonmetro, compared with 134 (35.1 percent) nonmetro labor market areas out of the 382 in 1980.

We then ranked the **nonmetro** commuting zones and labor market areas based on the size of the largest city, town, or CDP (Census Designated Place). The three subcategories of nonmetro commuting zones/labor market areas are:

Small Town/Rural: population of largest place in the commuting zone/labor market area in 1990 was less than 5,000

Small Urban Center: population of largest place ranged from 5,000 to less than 20,000 in 1990

Larger Urban Center: population of largest place in 1990 was at least 20,000

We ranked the **metro** commuting zones and labor market areas according to the population size of the largest Metropolitan Statistical Area. The three subcategories of metro commuting zones/labor market areas are:

Small Metro Center: population of the largest MSA in the commuting zone/labor market area was less than 250,000 in 1990

Medium Metro Center: population of largest MSA was at least 250,000 but less than 1,000,000

Major Metro Center: population of largest MSA in 1990 was 1,000,000 or greater, or commuting zone/labor market area is part of a Consolidated Metropolitan Statistical Area

Sixty two commuting zones required special treatment:

I. Seventeen commuting zones contained one or two fringe metropolitan counties. These "fringe" commuting zones typically contain a small city or town that appears to be simultaneously serving as a bedroom community for an MSA and an employment center for an outlying rural labor force. For the purposes of summarizing these commuting zones in 1990, we placed them into the nonmetro category and ranked them by the size of their largest city or town, not by the size of the nearby MSA.

II. Fourteen commuting zones split six MSAs and one PMSA into two areas. Most of these "split MSA" commuting zones are located in the Southeast and all of them contain two or more independent cities: three MSAs (6 commuting zones) in North Carolina, one MSA (2 commuting zones) in South Carolina, one MSA (two commuting zones) on the Kentucky-Indiana border, one MSA (2 commuting zones) in southern Virginia, and one split PMSA in Ohio. We treated these split MSA commuting zones as metropolitan, but ranked them on the basis of the size of their largest city or town, not on the size of their MSA.

III. Thirty one commuting zones contain parts of a Consolidated Metropolitan Statistical Area (CMSA). These are ranked according to the size of the largest Primary MSA in the commuting zone. The largest PMSAs in 21 of these 31 commuting zones have populations over one million and thus, are automatically included in the Major Metropolitan Center category. However, the largest PMSAs in 10 of these commuting zones represent smaller, fringe parts of the CMSA, with populations less than a million. In these 10 cases, we ignored the population size of the PMSA and included them in the Major Metropolitan Center category.

The top panel of table 9 shows the distribution of commuting zones across these six size categories, followed by some descriptive statistics of size, location, and rural/urban population patterns. Almost 18 percent of the commuting zones do not contain an urban center of even 5,000 population. The commuting zones in this category, not surprisingly, have small total populations (mean population of commuting zone=16,994), are sparsely populated (mean number of people per square mile=12), and contain, on average, only two counties. These smallest commuting zones are concentrated in the Midwest and the West (see table 10), and have almost 85 percent of their populations living in rural farm and nonfarm areas. One of the smallest of these **Small Town/Rural commuting zones** is a commuting isolate (i.e., a single county) in southeastern Utah, an area with spectacular scenery and very few people. The largest town in this commuting zone is Loa, population 444. As small as Loa is, 20 percent of the entire population of the county live there.

At the other extreme, almost 7 percent of the commuting zones have a central place with at least a million population. The largest of these **Major Metro Center commuting zones** is the 6-county commuting zone with the Los Angeles-Long Beach PMSA at its center with a population in the PMSA alone of 9 million people. The commuting zones in this category average a total population of more than 2.6 million people, are made up of, on average, 7 to 8 counties, and have a population concentration of 586 people per square mile. These 49 megalopolises are over-represented in the Northeast and the West.

Between these two extremes lie a vast range of commuting zones. The most common commuting zones (243, or 33 percent) are those containing a **Small Urban Center**. On average, these commuting zones have a total population size of 64,000 and are made up of 3 to 4 counties. They are most likely to be found in the South and the Midwest, and the majority of their residents are most likely to be living in a rural, rather than urban, area. A typical southern commuting zone in this category is the one containing the small urban center of Magnolia, Arkansas (city population=11,151). The center of this local labor market is 43 miles from the larger city of Hope, Arkansas, and 51 miles from the small metropolitan center of Texarkana. The commuting zone includes two counties, 68 percent of its population lives in rural areas, and it has approximately 27 people per square mile. The commuting zone containing Scotts Bluff, Nebraska (city population=13,711) as its center is fairly typical of midwestern commuting zones in this category. One hundred and nine miles from the small metropolitan center of Cheyenne, Wyoming, the Scotts Bluff commuting zone has a total population of 66,000 people, encompasses six sparsely settled counties, with a population density of less than nine people per square mile.

Table 9. Size of Largest Place in Commuting Zone by Number of Persons and Counties

	NONMETRO CZs			METRO CZs		
	Small Town/ Rural	**Small Urban Center**	**Larger Urban Center**	**Small Metro Center**	**Medium Metro Center**	**Major Metro Center**
Number of CZs	132	243	108	122	87	49
Percent of Total Czs	17.8	32.8	14.6	16.5	11.7	6.6
CZ Population Size			Number of Persons			
Mean	16,994	63,705	120,324	257,770	660,809	2,633,737
St. Dev.	17,730	43,190	62,445	127,554	324,106	2,616,337
Smallest	1,324	8,200	32,402	72,354	268,822	127,042
Largest	85,936	248,653	368,497	904,324	2,588,518	14,545,373
Size of Largest Place			Number of Persons			
Mean	2,672	11,164	28,984	136,543	498,002	2,134,239
St. Dev.	1,195	4,213	7,171	48,429	211,589	1,978,191
Smallest	444	5,055	20,027	15,085	250,454	96,255
Largest	4,983	19,959	46,535	247,052	985,026	8,863,164
Geographic Size			Number of Counties			
Mean	2.04	3.48	4.34	5.21	6.37	7.57
St. Dev.	1.03	1.36	1.80	1.98	2.78	3.88
Smallest	1	1	1	1	1	1
Largest	6	9	12	13	17	19

Table 10. Size of Largest Place in Commuting Zone by Location and Residential Patterns

	NONMETRO CZs			METRO CZs		
	Small Town/ Rural	**Small** Urban Center	Larger Urban Center	**Small** Metro Center	**Medium** Metro Center	**Major** Metro Center
Location			Percent of CZs in Region			
Northeast	2.3	2.9	3.7	6.6	10.3	22.5
South	18.9	42.8	38.9	50.0	51.7	30.6
Midwest	42.4	36.2	35.2	32.0	21.8	24.5
West	36.4	18.1	22.2	11.5	16.1	22.4
Residential Patterns			Mean			
Density (Persons Per Sq. Mile)	11.6	28.5	41.8	81.3	176.1	585.9
Percent Rural Farm	12.0	6.8	4.4	3.2	1.5	0.7
Percent Rural Nonfarm	72.3	54.9	44.0	39.1	26.7	16.1
Percent Urban Living Outside Urbanized Area	15.7	37.8	47.9	16.0	12.2	7.4
Percent Urban Living Inside Urbanized Area	0.0	0.39	3.7	41.7	59.5	75.8

Fifteen percent of the commuting zones contain a **Larger Urban Center**. These nonmetro commuting zones have an average population size of 120,000 and include an average of little over 4 counties. They are concentrated in the South and Midwest, although slightly less so than the Small Urban Center commuting zones. The average size of their central place is 29,000, and less than half of their total populations live in rural areas. Population density in these commuting zones averages 42 persons per square mile. A typical southern commuting zone in this category has Columbia, Tennessee (city population= 28,583), as its center. Two of the five counties in this commuting zone border the much larger Nashville, Tennessee, commuting zone and Columbia itself is approximately 50 miles from the Nashville MSA. Population density here in the south central part of Tennessee is a little over 50 persons per square mile and over half of the population lives in rural areas. The commuting zone containing Mason City, Iowa (city population=29,040), as its center is fairly typical of midwestern commuting zones in this category. One hundred and twenty one miles from the medium metropolitan center of Des Moines, the Mason City commuting zone has a total population of 79,484 people, encompasses four counties, and has a population density of almost 41 persons per square mile, a majority of whom live in urban areas.

The third largest category of commuting zones contain a **Small Metropolitan Center** (average MSA size=136,543). Half of the 122 commuting zones in this category are located in the southern region. Although the average total population in these commuting zones is fairly similar across the four regions (ranging from 336,000 in the Northeast to 205,000 in the West), the population density in these commuting zones varies considerably (ranging from 88 persons per square mile in the South to only 28 persons per square mile in the West). For example, the Wheeling, West Virginia-Ohio, MSA is the largest place in an average southern Small Metro Center Commuting zone, and the Redding, California, MSA is the largest place in an average western Small Metro Center commuting zone. Both commuting zones have approximately 200,000 total populations, the MSA sizes are comparable (Wheeling=159,301 and Redding=147,036), and both commuting zones have similar percentages (45 -48) living in rural areas. However, the Wheeling commuting zone has 101 persons per square mile and the Redding commuting zone has fewer than 30.

Eighty seven of the commuting zones contain a **Medium Metro Center**. Once again, half of the commuting zones in this category are located in the South, although the remaining commuting zones are more evenly distributed across the Northeast, Midwest, and West. The average size of MSAs in these commuting zones is close to 500,000 in all four regions of the country. And in all four regions, over half of the population in the commuting zones, on average, live in urban areas. The largest and most densely populated commuting zones in this category are in the Northeast. With the exception of the Honolulu commuting zone (1,393 persons per square mile), the commuting zones in the West average a population density of only 55 persons per square mile). Typical Medium Metro Center commuting zones in each of the regions include the Harrisburg-Lebanon-Carlisle, Pennsylvania, commuting zone in the Northeast (total population=958,912; MSA population=587,986; population density=249; percent in rural areas=47), the Canton-Massillon, Ohio, commuting zone in the Midwest (total population=664,018; MSA population=394,106; population density=191; percent in rural areas=41), the Little-Rock-North Little Rock, Arkanasas, commuting zone in the South (total population=554,185; MSA population=513,117; population density=119; percent in rural areas=29), and the Albuquerque, New Mexico, commuting zone in the West (total population=623,210; MSA population=589,131; population density=45; percent in rural areas=13).

<u>**Labor Market Areas.**</u> The distribution of the labor market areas across the size categories is shown in the top panel of table 11, and descriptive statistics on some demographic and geographic characteristics are shown in the remaining panels of tables 11 and 12. Given the 100,000 minimum population criterion for the labor market areas, it is not too surprising that none of the labor market areas fits into the smallest category (no urban center greater than 4,999 population). One-hundred thirty-nine labor market areas contain nonmetro urban centers (56 labor market areas with a small urban center and 83 with a larger one). With the exception of the size of the largest place, these two

Table 11. Size of Largest Place in Labor Market Area by Number of Persons and Counties

	NONMETRO LMAs		METRO LMAs		
	Small Urban Center	Larger Urban Center	Small Metro Center	Medium Metro Center	Major Metro Center
Number of LMAs	56	83	120	87	48
Percent of Total	14.2	21.1	30.5	22.1	12.2
LMA Population			Number of Persons		
Mean	160,429	174,478	292,871	688,680	2,712,178
St. Dev.	56,510	60,854	127,504	326,052	2,693,042
Smallest	100,066	102,548	125,056	268,822	127,042
Largest	353,079	368,497	904,324	2,588,518	14,545,373
Size of Largest Place			Number of Persons		
Mean	13,599	29,730	136,843	498,002	2,129,074
St. Dev.	4,057	7,479	48,703	211,589	1,998,790
Smallest	5,416	20,398	15,085	250,454	96,255
Largest	19,859	46,535	247,052	985,026	8,863,164
Geographic Size			Number of Counties		
Mean	7.96	7.89	7.78	7.86	8.88
St. Dev.	5.56	4.77	4.45	3.92	6.41
Smallest	3	1	2	1	1
Largest	34	27	28	20	35

nonmetro categories demonstrate relatively few differences. The average total population of labor market areas with small urban centers (160,429) is only 14,000 less than that in labor market areas with larger urban centers (174,478). Similarly, the average number of counties in these two nonmetro

categories (7.96 and 7.89) are essentially the same. Labor market areas with larger urban centers are more concentrated in the West than are those with small centers (20 versus 7 percent), are slightly more densely populated (43 versus 41 persons per square mile), and have a notably higher percentage of the population living in urban areas (45.9 versus 29.3).

Differences among the metro labor market areas are significantly greater. The 120 Small Metro Center labor market areas have an average total population less than half that in the 87 labor market areas with Medium Metro Centers, which in turn are only a quarter the size of the Major Metro Center labor market areas (292,871 versus 688,680 versus 2,712,178). The size of largest place shows even greater differences: Medium Metro Center labor market areas average a central place that is more than three times the size of Small Metro Centers and less than one-fourth the size of Major Metro Centers. Similar patterns are found with population density. Labor market areas with Small Metro Centers average 75 persons per square mile, compared with 154 and 551 persons in the Medium Metro and Major Metro Center labor market areas.

Table 12. Size of Largest Place in Labor Market Area by Location and Residential Patterns

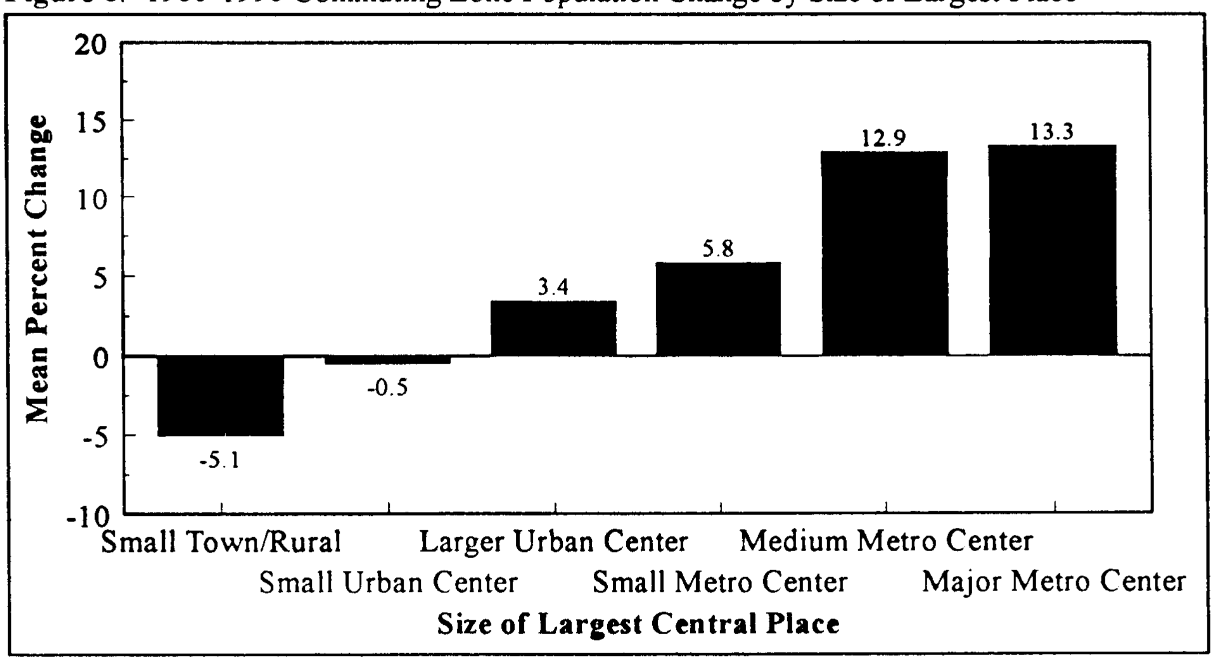
	NONMETRO LMAs		METRO LMAs		
	Small Urban Center	Larger Urban Center	Small Metro Center	Medium Metro Center	Major Metro Center
Location			Percent of LMAs in Region		
Northeast	7.1	4.8	5.8	10.3	22.9
South	46.4	37.4	50.8	50.6	31.3
Midwest	39.3	37.4	31.7	21.8	22.9
West	7.1	20.5	11.7	17.2	22.9
Residential Patterns			Mean		
Density (Persons per Square Mile)	40.8	43.1	75.0	153.6	551.3
Percent Rural Farm	6.1	5.1	3.6	1.7	0.8
Percent Rural Nonfarm	64.6	48.9	41.5	28.1	16.6
Percent Outside Urbanized Area	28.8	41.5	19.1	13.4	7.7
Percent Inside Urbanized Area	0.5	4.4	35.8	56.8	74.9

Population Change in 1990 Commuting Zones and Labor Market Areas by Center Size

In this final section describing the commuting zones and labor market areas, we examine population changes between 1980 and 1990, again by the size of the largest place in the commuting zones and labor market areas by region. Figure 6 shows the average percent population change in commuting zones in the six size categories (where population change is defined as the difference between the population in 1990 and 1980 as a percentage of the population in 1980).[6] On average, most of the population growth occurred in the metro commuting zones, primarily within the two largest categories.

Figure 7 demonstrates the importance of the size-region interaction. Having a metropolitan center was strongly associated with high population growth only in the South and the West. In fact, in the Northeast, the nonmetropolitan commuting zones actually grew faster than did those with metro centers. And in the Midwest, there simply was little growth anywhere. Figures 8 and 9 for the labor market areas show essentially the same patterns.

Figure 6. 1980-1990 Commuting Zone Population Change by Size of Largest Place



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[6]In computing population change, we used the same set of counties in 1980 and 1990, based on the counties found in the CZs in 1990.

Figure 7. 1980-1990 Commuting Zone Population Change by Region and Metro/Nonmetro Status

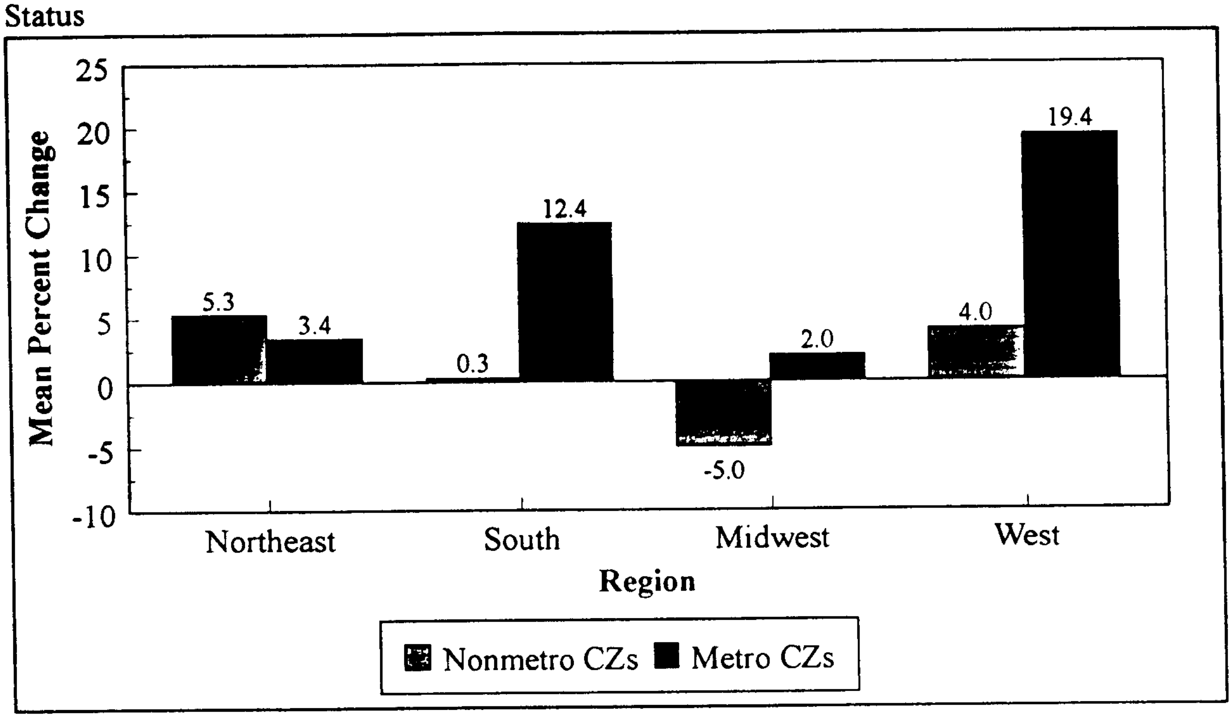


Figure 8. 1980-1990 Labor Market Area Population Change by Region and Metro/Nonmetro

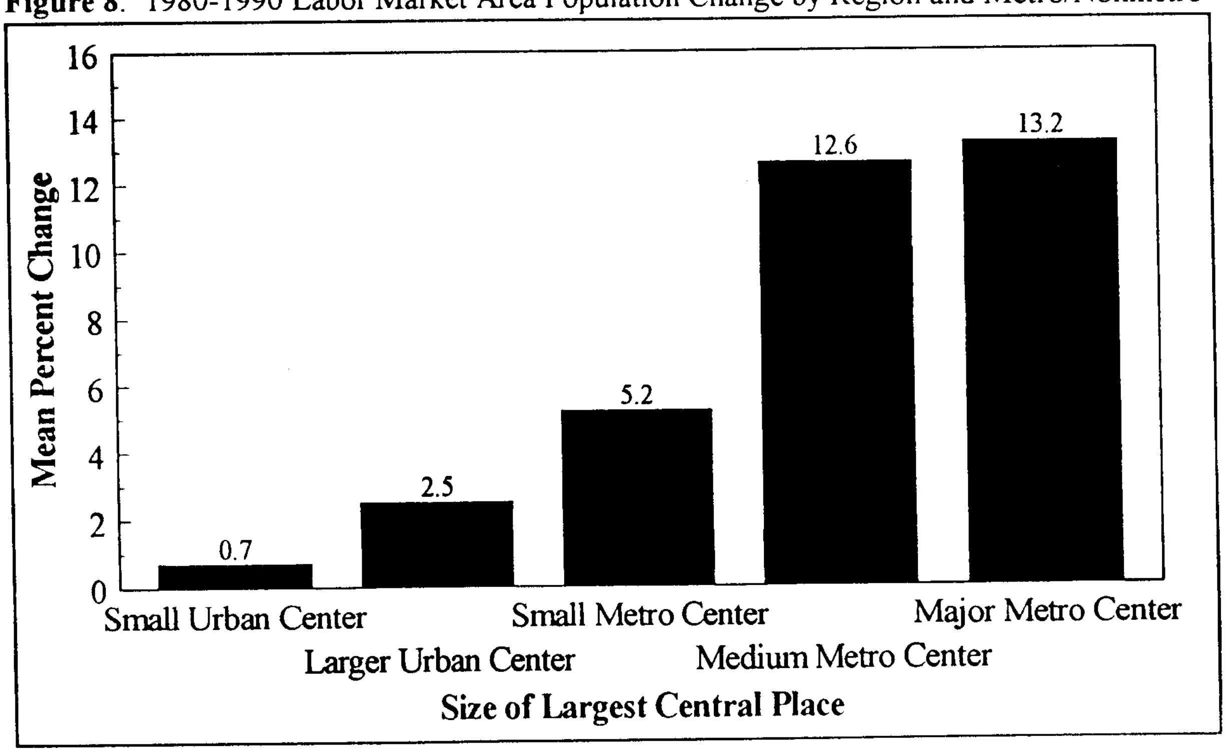
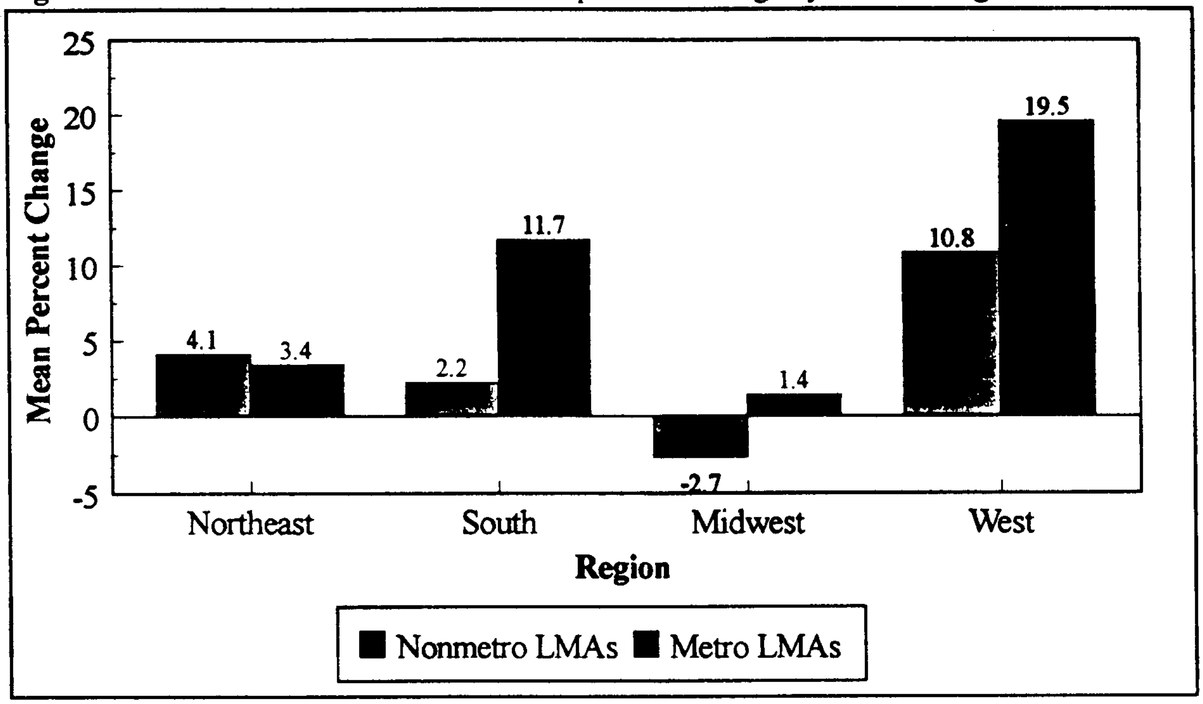


Figure 9. 1980-1990 Labor Market Area Population Change by Size of Largest Place



Availability of Geography and Data Files

The Louisiana Population Data Center maintains a presence on the Internet where further information on the commuting zones and labor markets areas can be found. Prospective users of the the labor market geography and associated files will find useful files on the server. The most important files for users are the geographic equivalency files that link counties and county equivalents to commuting zones and labor market areas. As of this writing, the current version of the equivalency file is CZLMA903.EQV. This file was used to generate the Appendix A and Appendix B of this report. Two other important files are a commuting zone file (CZSIZE9.1) and a labor market area file (LMSIZE9.1) which contain the metro/nonmetro classification schemes introduced above. The Center has produced a special CD-ROM version of the PUMS-L data file which is available for a modest charge. Further information can be obtained by contacting the Center at 504-388-5359 or by sending electronic mail to info@lapop.lsu.edu. To reach the Center via its Internet server, use one of the following:

Access via the Internet

Anonymous FTP:

1. FTP to:	ftp.lapop.lsu.edu
2. Userid (in lower case):	ftp
3. Password (your email address):	userid@server.location.domain
4. Change directory:	cd /pub/czlma90
5. Get files of interest	
Gopher: Point gopher to:	gopher.lapop.lsu.edu
World Wide Web:	http://www.lapop.lsu.edu

Summary

In this document, we provide an overview of research that identifies U.S. commuting zones and labor markets with journey-to-work data from the 1990 Census. This research replicated a previous delineation of 1980 U.S. commuting zones and labor market areas. County-to-county flows of commuters were analyzed with a hierarchical cluster algorithm. The results of the cluster analysis were used to identify commuting zones (i.e., groups of counties with strong commuting ties). Where necessary, the commuting zones were then aggregated into labor market areas that met the Bureau of the Census' criterion of a 100,000 population minimum.

For 1990, 741 commuting zones were delineated for all U.S. counties and county equivalents. These commuting zones are intended for use as spatial proxies for local labor markets. Since many have small populations, researchers will be most likely to conduct aggregate-level analyses with the commuting zones. Readily available county-level data can be organized to correspond to the commuting zone geography. Our work with the commuting zones suggests that they are meaningful spatial units and plausible representations of local economies.

Researchers who wish to combine individual- and area-level data will find the 394 labor market areas and the PUMS-L data file most useful. This special data file identifies labor market areas in which individuals live and work. Such data facilitate the multilevel modeling of basic socioeconomic processes. Important strides have been made in the methodologies of multilevel modeling (for a review, see DiPrete and Forristal, 1994). We are pleased to provide the research community with a 1990 update of our earlier work that will facilitate the new modeling strategies.

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