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# A CRITIQUE OF ECONOMIC REGIONALIZATIONS OF THE UNITED STATES

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## Introduction

This paper critically analyzes and evaluates various regionalizations of the United States. Each of the delineations considered aggregates county units in order to facilitate social and economic analyses and each exhausts the national territory.

From an economic viewpoint there are essentially three types of space: homogeneous, polarized, and program (or planning) space. Thus, in the first place,

> The region can be characterized by its more or less pronounced uniformity: it is more or less homogeneous. In the second place, the region can be studied from the point of view of its more or less pronounced degree of coherence, that is to say, according to the interdependence of its diverse parts; it is more or less polarized. Finally, the region can be envisaged from the point of view of the goal that it pursues, of the program that it establishes; this is the program region or planning region [6, p. 8].

In this approach a homogeneous region corresponds to a continuous space wherein each of the constituent parts or zones has relevant characteristics as close as possible to those of the others. In contrast, the notion of polarized space is closely related to that of a hierarchy of urban centers ranked according to the functions they perform; a polarized region is a heterogeneous space whose different

parts complement and support one another, and where these parts have more exchanges of goods and services with a dominant intra-regional urban center, or pole, than with neighboring regions. Moreover, there are three types of polarization: national, regional, and local. This hierarchy corresponds to the hierarchy of specialized goods and services which are produced or furnished at these levels. Thus, national goods circulate throughout a given country, regional goods are characterized by a distribution network for the most part limited to the boundaries of a given region, and local goods are generally provided for only a small local market. A national center would therefore also be a regional and local center; it would perform the whole range of polarized functions. Finally, the planning region is a space whose various parts depend on the same decision; it is, in addition, placed in the hands of an authority, whether or not localized in the region, to attain a given economic goal. While there exist as many planning regions as there are distinct problems, the interdependence of diverse activities requires a planning region chosen with the intention of coordinating solutions to various problems.

It is increasingly recognized that analyses of spatial economic and demographic change processes need to be made within the context of urban regions, through which the space-economy is organized. As Berry [3] points out, this city-centered organization has two major elements: a functional urban

hierarchy and corresponding urban spheres of influence, or urban fields. Moreover, economic changes tend to be transmitted simultaneously along three planes: (a) outward from heartland megalopolitan centers to regional hinterlands; (b) from higher to lower centers in the hierarchy in a pattern of "hierarchical diffusion"; and (c) outward from urban centers into their surrounding urban fields. An uncritical acceptance of this theory would lead to the conclusion that if economic growth can be sustained over long periods then there will be a progressive integration of the space economy and eventual elimination of rural-urban income disparities.

On the other hand, there is evidence that when metropolitan areas or regions achieve sufficient scale they will benefit from self-sustained growth, whereas peripheral areas may be condemmed to receiving slow-growth, low-wage industries, especially if these areas lack amenities and high-quality human resources. Under these conditions regional income disparities are likely to persist or perhaps even increase (Thompson [15], Berry [3], Hansen [11]). Such circumstances have in fact spawned numerous growth center proposals for spatially dispersing economic growth.

It is now widely recognized that lack of meaningful spatial units has been a major hindrance to gaining better understanding of spatial growth processes. Exhaustive regional delineations have been made within the context of homogeneous, nodal-functional, and planning regions. In recent years, the states, under pressure from the federal government, have delineated multicounty planning and development districts, though

the criteria used have not always been clear within states and certainly not uniform among states. Meanwhile, university scholars and federal government officials -- often working in concert -- have sought to delineate nationally exhaustive sets of economic regions. Although there are clear differences in these approaches, the criteria in each case have been applied consistently to the nation as a whole. These delineations will now be considered in turn.

## Principal Delineations

### Bureau of Economic Analysis Regions

The Regional Economics Division of the BEA (formerly known as the Office of Business Economics, or OBE), U.S. Department of Commerce, carries out a continuing program of regional measurement, analysis, and projection of economic activity. To facilitate this program BEA has defined economic areas on the basis of the nodal-functional concept. In contrast to Boudeville's polarization approach, which emphasizes flows of goods and services, the BEA approach is based primarily on commuting patterns, i.e. on functional labor market areas. These areas are essentially derived from Brian Berry's studies of Daily Urban Systems, a term coined in 1967 by C. A. Doxiadis. Doxiadis argued that "sixty DUSs were now being formed in the United States, each with an average radius of ninety miles 'within which people will move the way they now move within well-organized metropolitan areas'" [3, p. 11]. Berry, however, based his analysis on the actual evidence from the 1960 census about commuting patterns around existing economic centers.

Thus, in the BEA approach surrounding county units are attached to each urban center where economic activities are directly or indirectly focused. Insofar as possible, each BEA area combines the place of work and place of residence of employees. There is therefore a minimum of commuting across BEA area boundaries. Each area approaches self-sufficiency in its residentiary industry. That is, even though each area produces goods and services for export, most of the services and some of the goods required by the residents and firms of the area are provided within the area.

The BEA areas correspond fairly closely to the closed trade areas of central place theory, in which the number and type of firms and their size and trade areas are bounded by the relative transportation costs from hinterland to competing centers. Each area approaches closure with respect to residentiary industries that include general and convenience retail and wholesale trade activities and those other services which, because they are difficult to transport, are most efficiently consumed in the vicinity of their production. On the other hand, the areas remain largely open to the movement of transportable commodities and to nontransportable special services, such as education at Cambridge and recreation at Miami.

On the basis of his early pioneering work on functional economic area delineation, Karl Fox wrote that "With the possible exception of influence upon national farm policies, it appears to us that economic linkages and communications between the

nationally-oriented center and the smaller urban places in Iowa tend to be mediated and transmitted through the cities of 25,000 population or larger which are the central cities of functional economic areas" [10, p. 34; see also 9]. In the BEA delineation process Standard Metropolitan Statistical Areas were chosen where possible as economic centers because of their obvious significance as wholesale and retail trade centers and as labor market centers. However, not all SMSAs were made centers: some are part of larger metropolitan complexes, as in the New York area. In rural parts of the country where there are no SMSAs, cities in the 25,000 to 50,000 population range were chosen as centers, provided that two criteria were met: first, the city had to be a wholesale trade center for the area; and second, the area as a whole had to have a minimum population of about 200,000 persons, although some exceptions were made in sparsely populated areas. Once centers were identified, intervening counties were allocated to them on the basis of comparative time and distance of travel to them, the interconnection between counties because of journey to work, the road network, and other linkages and geographic features. In cases where commuting patterns overlapped, counties were included in the economic area containing the center with which there was the greatest commuting connection. In more rural parts of the country, where journey-to-work information was insufficient, distance of travel to the economic centers was the major factor in establishing the boundaries of economic areas. The 173 BEA

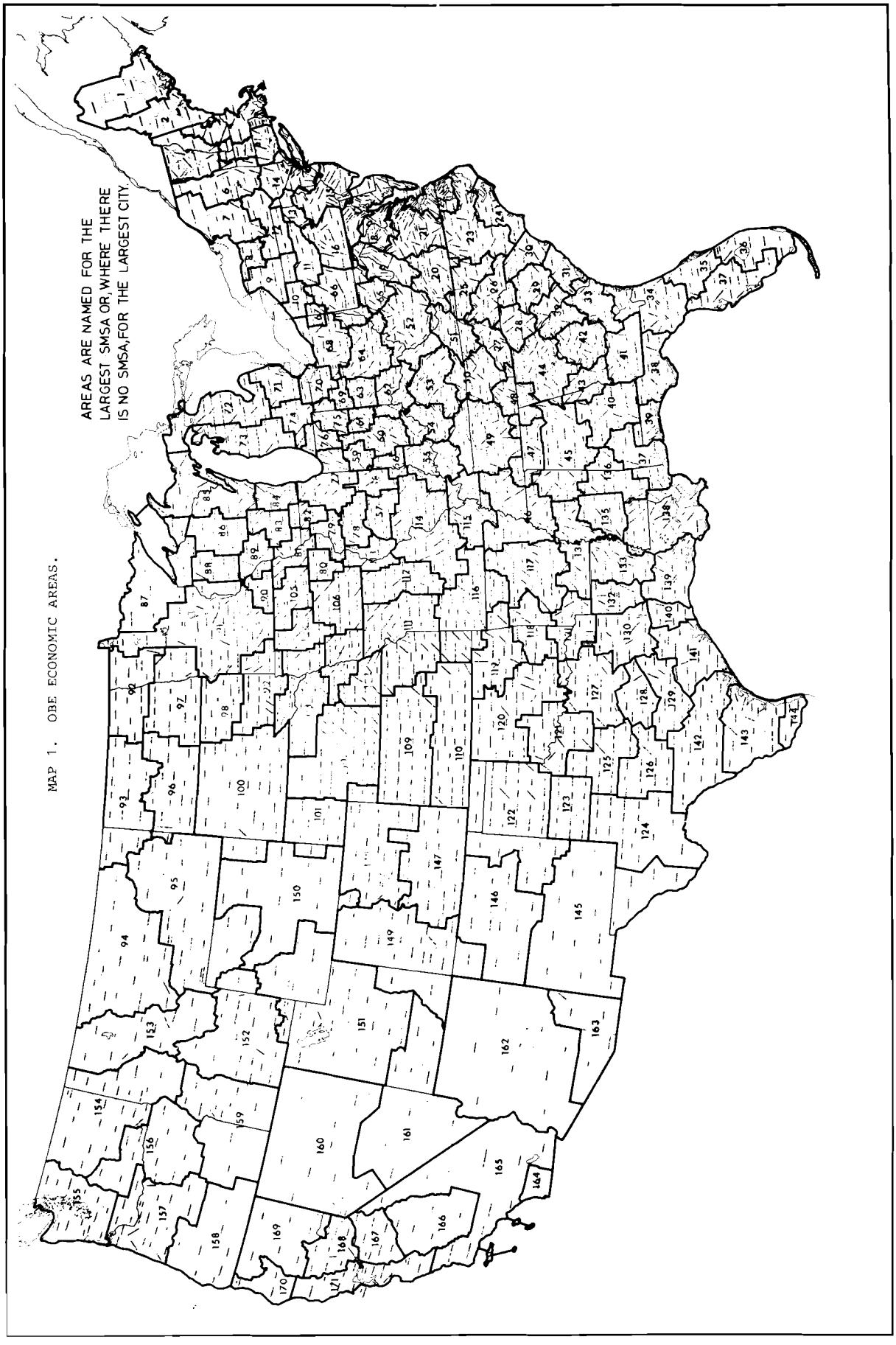
areas are shown on Map 1.

It is noteworthy that county economic and social data available on a computer tape of the County and City Data Book 1972 [16] have been compiled by BEA region [14]. Data are presented for 130 variables. Unfortunately, no distinction is made between urban core counties and hinterland counties, so it is not possible to analyze possible spread effects within urban fields on the basis of the data published in this volume. A wide variety of data by BEA region is also available on computer print-out from the Bureau of Economic Analysis in Washington, D.C.

Urban Spheres of Influence

In a recent study David Huff attempted to delineate the spheres of influence of all major American cities [12]. These cities, together with their respective hinterlands, comprise an exhaustive national set of regions. A distinctive feature of this undertaking is that a model and a computer program were used in making the delineations, as opposed to subjective or empirical approaches. Consequently, the same basis was utilized in estimating the spheres of influence of all cities concerned. Moreover, the procedure is completely replicative, and delineations can be made quickly and inexpensively: desirable features if periodic monitoring is expected.

Huff employs a gravity model in which it is postulated that $P_{ij}$, the probability of an individual located at a point i travelling to an urban place j, is proportional to the ratio




MAP 1. OBE ECONOMIC AREAS.

MAP 1. THE BEA ECONOMIC AREAS.
(Source: Ref. [3])

1. Bangor, Maine
2. Portland, Maine
3. Burlington, Vt.
4. Boston, Mass.
5. Hartford, Conn.
6. Albany-Schenectady-Troy, N.Y.
7. Syracuse, N.Y.
8. Rochester, N.Y.
9. Buffalo, N.Y.
10. Eria, Pa.

11. Williamsport, Pa.
12. Binghamton, N.Y.-Pa.
13. Wilkes-Barre-Hazelton, Pa.
14. New York, N.Y.
15. Philadelphia, Pa.-N.J.
16. Harrisburg, Pa.
17. Baltimore, Md.
18. Washington, D.C.-Md.-Va.
19. Staunton, Va.
20. Roanoke, Va.

21. Richmond, Va.
22. Norfolk-Portsmouth, Va.
23. Raleigh, N.C.
24. Wilmington, N.C.
25. Greensboro-Winston Salem-High Point, N.C.
26. Charlotte, N.C.
27. Asheville, N.C.
28. Greenville, S.C.
29. Columbia, S.C.
30. Florence, S.C.

31. Charleston, S.C.
32. Augusta, Ga.
33. Savannah, Ga.
34. Jacksonville, Fla.
35. Orlando, Fla.
36. Miami, Fla.
37. Tampa-St. Petersburg, Fla.
38. Tallahassee, Fla.
39. Pensacola, Fla.
40. Montgomery, Ala.

41. Albany, Ga.
42. Macon, Ga.
43. Columbia, Ga.-Ala.
44. Atlanta, Ga.
45. Birmingham, Ala.
46. Memphis, Tann.-Ark.
47. Huntsville, Ala.
48. Chattanooga, Tenn.-Ga.
49. Nashville, Tenn.
50. Knoxville, Tenn.

51. Briston, Va.-Tenn.
52. Huntington-Ashland, W. Va.-Ky.-Ohio
53. Lexington, Ky.
54. Louisville, Ky.-Ind.
55. Evansville, Ind.
56. Terre Haute, Ind.
57. Springfield, Ill.
58. Champaign-Urbana, Ill.
59. Lafayette-West Lafayette, Ind.
60. Indianapolis, Ind.

61. Muncie, Ind.
62. Cincinnati, Ohio-Ky.-Ind.
63. Dayton, Ohio
64. Columbus, Ohio
65. Clarksburg, W. Va.
66. Pittsburgh, Pa.
67. Youngstown-Warren, Ohio
68. Cleveland, Ohio
69. Lima, Ohio
70. Toledo, Ohio

71. Detroit, Mich.
72. Saginaw, Mich.
73. Grand Rapids, Mich.
74. Lansing, Mich.
75. Fort Wayne, Ind.
76. South Bend, Ind.
77. Chicago, Ill.
78. Peoria, Ill.
79. Davenport-Rock Island-Moline, Iowa-Ill.
80. Cedar Rapids, Iowa

81. Dubuque, Iowa
82. Rockford, Ill.
83. Madison, Wis.
84. Milwaukee, Wis.
85. Green Bay, Wis.
86. Wausau, Wis.
87. Duluth-Superior, Minn.-Wis.
88. Eau Claire, Wis.
89. La Crosse, Wis.
90. Rochester, Minn.

91. Minneapolis-St. Paul, Minn.
92. Grand Fords, N.D.
93. Minot, N.D.
94. Great Falls, Mont.
95. Billings, Mont.
96. Bismark, N.D.
97. Fargo-Moorhead, N.D.-Minn.
98. Aberdeen, S.D.
99. Sioux Falls, S.D.
100. Rapid City, S.D.

101. Scotts Bluff, Nebr.
102. Grand Island, Nebr.
103. Sioux City, Iowa-Nebr.
104. Ford Dodge, Iowa
105. Waterloo, Iowa
106. Des Moines, Iowa
107. Omaha, Nebr.-Iowa
108. Lincoln, Nebr.
109. Salina, Kans.
110. Witchita, Kans.

111. Kansas City, Mo.-Kans.
112. Columbia, Mo.
113. Quincy, Ill.
114. St. Louis, Mo.-Ill.
115. Paducah, Ky.
116. Springfield, Mo.
117. Little Rock-No. Little Rock, Ark.
118. Fort Smith, Ark.-Okla.
119. Tulsa, Okla.
120. Okalhoma City, Okla.

121. Wichita Falls, Tex.
122. Amarillo, Tex.
123. Lubbock, Tex.
124. Odessa, Tex.
125. Abilene, Tex.
126. San Angelo, Tex.
127. Dallas, Tex.
128. Waco, Tex.
129. Austin, Tex.
130. Tyler, Tex.

131. Texarkana, Tex.-Ark.
132. Shreveport, La.
133. Monroe, La.
134. Greenville, Miss.
135. Jackson, Miss.
136. Meridian, Miss.
137. Mobile, Ala.
138. New Orleans, La.
139. Lake Charles, La.
140. Beaumont-Port Arthur-Orange, Tex.

141. Houston, Tex.
142. San Antonio, Tex.
143. Corpus Christi, Tex.
144. Brownsville-Harlingen-San Bernito, Tex.
145. El Paso, Tex.
146. Albuquerque, N.M.
147. Pueblo, Colo.
148. Denver, Colo.
149. Grand Junction, Colo.
150. Cheyenne, Wyo.

151. Salt Lake City, Utah
152. Idaho Falls, Idaho
153. Butte, Mont.
154. Spokane, Wash.
155. Seattle-Everett, Wash.
156. Yakima, Wash.
157. Portland, Ore.-Wash.
158. Eugene, Ore.
159. Boise City, Idaho
160. Reno, Nev.

161. Las Vegas, Nev.
162. Phoenix, Ariz.
163. Tucson, Ariz.
164. San Diego, Calif.
165. Los Angeles-Long Beach, Calif.
166. Fresno, Calif.
167. Stockton, Calif.
168. Sacramento, Calif.
169. Redding, Calif.
170. Eureka, Calif.

171. San Francisco-Oakland, Calif.
172. Anchorage, Alaska
173. Honolulu, Hawaii

$S_j/D_{ij}^{\gamma}$, where $S_j$ is the size of an urban place j; $D_{ij}$ is the distance from an individual's travel base i to j; and $\gamma$ is a constant that reflects the effect of distance on various kinds of trips, e.g. shopping, recreation, and medical. Let n equal the total number of urban places in a given area. Then

$$P_{ij} = \frac{S_j/D_{ij}^{\gamma}}{\sum_{j=1}^{n} S_j/D_{ij}^{\gamma}}$$

such that $\sum_{j=1}^{n} P_{ij} = 1$;

and $0 \leq P_{ij} \leq 1$.

Given the existence of (a) n urban places of unequal sizes, (b) uniform friction of distance in all directions, (c) a constant value of $\gamma$, and (d) the direction of travel in a straight line, then the sphere of influence of any particular urban place can be described as follows:

(1) About each urban place are isoprobability lines determined by

$$P_{ij} = \frac{S_j/D_{ij}^{\gamma}}{\sum_{j=1}^{n} S_j/D_{ij}^{\gamma}} = \text{constant}$$

where $D_{ij} = \sqrt{\left(X_i - X_j\right)^2 + \left(\gamma_i - \gamma_j\right)^2}$ .

(2) The line of equilibrium between any two urban places k and h is derived by

$$\frac{S_k/D_{ik}^{\gamma}}{\sum_{j=1}^{n} S_j/D_{ij}^{\gamma}} = \frac{S_h/D_{ih}^{\gamma}}{\sum_{j=1}^{n} S_j/D_{ij}^{\gamma}}$$

or

$$\frac{D_{ik}}{D_{ih}} = \left(\frac{S_k}{S_h}\right)^{1/\gamma}$$

and these lines are circles or parts of circles.

Past studies have used different measures to reflect the size of urban places, depending on the type of spatial interaction under consideration, e.g. population, employment, retail and wholesale sales, commodity output, etc. In Huff's analysis a measure of functional city size was sought that would encompass a number of different variables associated with city influence. Population, public services provided, retail goods and services offered, and similar variables could be combined to reflect a composite measure of city functional size. Such a measure was derived by Berry [2] in a previous factor analysis approach to the latent structure of the American urban system. Berry identified fourteen such dimensions, accounting for 77 per cent of the original variance of the 97 variables he used. One dimension, termed "functional size of cities in an urban hierarchy," reflects the aggregate economic power, or, more generally, the status of each city within the nation's urban

hierarchy. Twenty-one of the 97 variables comprised this latent dimension. The factor scores measuring each city's rating on the functional size dimension were used for the size variable in Huff's gravity model. Those cities that had factor scores greater than 2.00 were regarded as first-order urban places. There were 73 urban places in this category. Those cities that had factor scores ranging from 0.25 to 1.99 were designated as second-order urban places, of which there were 274. The 347 cities comprising these first two levels in the urban hierarchy were used in calculating the lines of equilibrium between all pairs of cities. The boundaries of urban spheres of influence that resulted from the computer program output were altered to conform to county boundaries, because the county represents the basic geographical unit for reporting economic and social data. The following criteria were established for deriving multicounty delineations: (1) a county was assigned to the urban place whose sphere of influence encompassed the largest proportion of the county's total area; (2) if the sphere of influence of an urban place encompassed less than the major portion of a county it was eliminated; and (3) if two urban places were located in the same county the smaller of the two places was eliminated. One of the 73 first-order places and 55 of the 347 first-order and second-order places did not meet the criteria for inclusion.

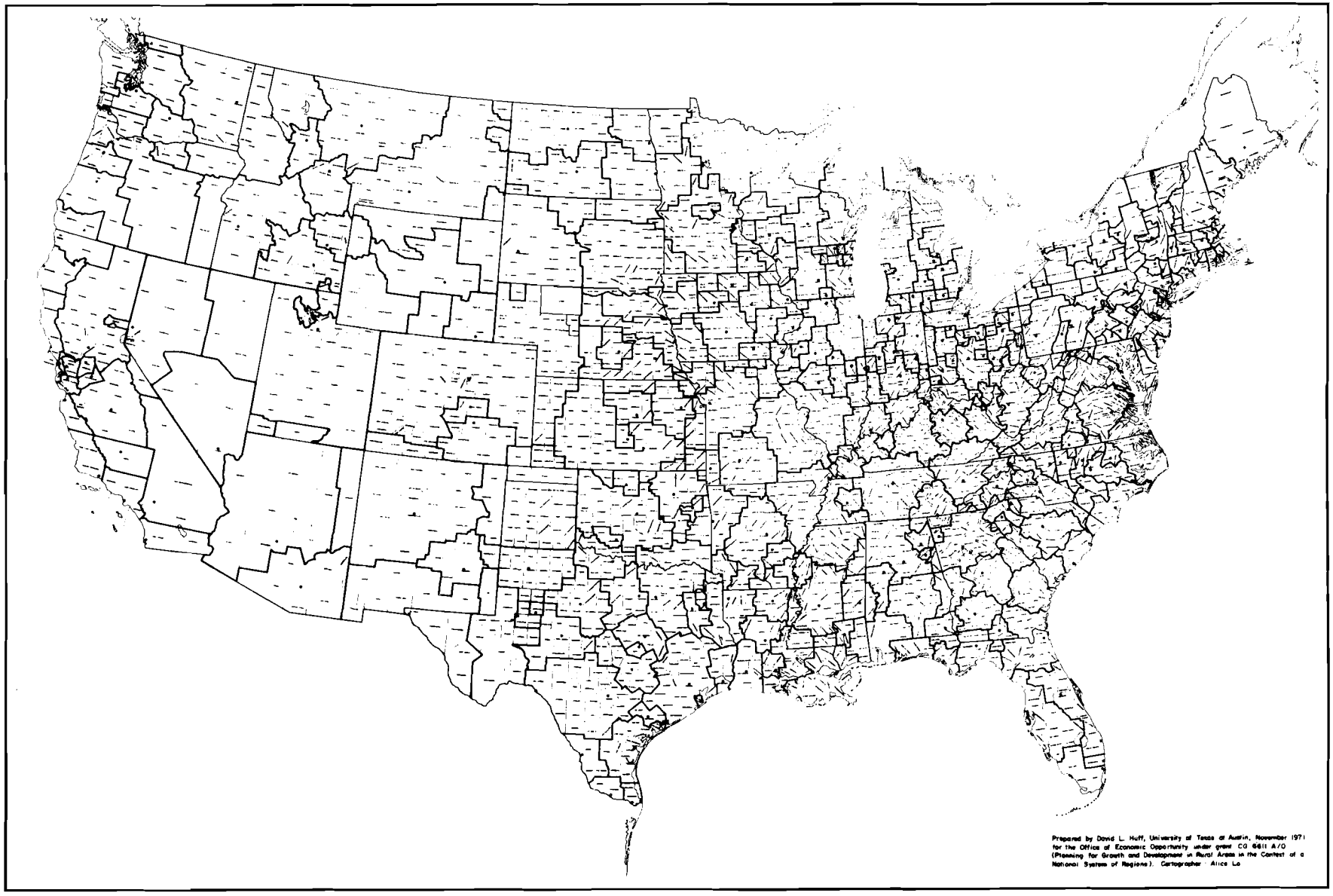
Map 2 and Map 3 show, respectively, the multicounty delineations for the 72 first-order urban spheres of influence and the 292 first-order and second-order urban spheres of influence.

MAP 2

# MULTI-COUNTY DELINEATIONS OF 72 URBAN SPHERES OF INFLUENCE

MAP 3

# MULTI-COUNTY DELINEATIONS OF 292 URBAN SPHERES OF INFLUENCE

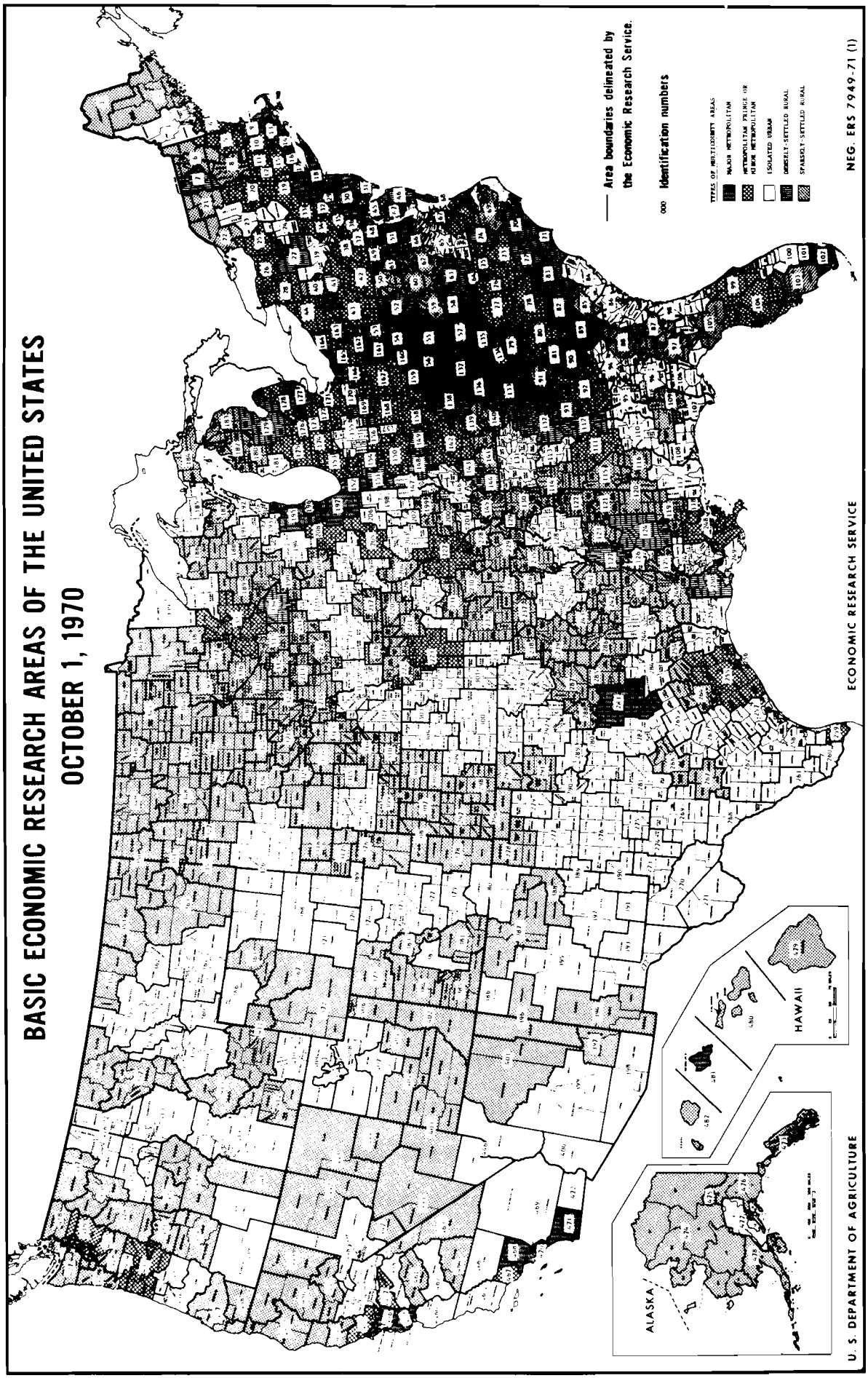


Basic Economic Research Areas

BERAs (see Map 4) have been used as geographic units of analysis in a number of studies, but principally by the Economic Research Service of the U.S. Department of Agriculture. Like the delineations discussed previously, the BERAs are based on the nodal-functional concept. Every county in the nation is placed in one of 482 regions according to criteria which reflect economic interdependence. These criteria involve a combination of considerations of population size of urban centers, commuting time to urban centers, and trading patterns as indicated by Rand McNally. Each county is supposed to exhibit greater economic interdependence with the urban center and other counties in its own BERA than with any other urban center or counties assigned to other regions.

The BERA delineation utilized basic commuting information provided by Brian Berry's study of commuting patterns as indicated by the 1960 Census survey of journey-to-work patterns. For each of over 300 cities, Berry determined the area within which 50 per cent or more of the working residents commuted to the central city, the area within which at least five per cent similarly commuted, and the area within which some but less than five per cent of the residents commuted. In delineating the BERAs, no 50 per cent commuting areas were split off from their corresponding urban centers, and as far as possible the five per cent labor shed of an urban area was assigned to the

MAP 4.


BASIC ECONOMIC RESEARCH AREAS OF THE UNITED STATES
OCTOBER 1, 1970
Area boundaries delineated by the Economic Research Service.
000 Identification numbers
TYPES OF ARTICULATED AREAS
MAJOR METROPOLITAN
METROPOLITAN FRINGE OF MAJOR METROPOLITAN
ISOLATED URBAN
DENSELY-SETTLED RURAL
SPARSELY-SETTLED RURAL
ALASKA
HAWAII
U. S. DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE
NEG. ERS 7949-71 (1)

region. Consideration also was given to geographic or topological factors affecting the nature of the relationship between a county and a nearby urban center, as well as to the condition and location of roads linking counties and urban centers.

In the BERA delineation an urban center is defined as a city which, with its adjacent suburbs, has a minimum population of 25,000. A county that contained one or more urban centers, but was also strongly interrelated with a more dominant urban center in another county, was assigned to the region corresponding to the dominant urban center. However, most of the population of that county must be within two hours commuting time of the core urban center. If the county had no urban center but was economically interdependent with an urban center within two hours commuting time for most of its residents, then the county was assigned to the region corresponding to the urban center. If the county had no urban center and was not within two hours commuting time of an urban center, it was grouped with similar neighboring counties; thus, such regions were formed around cities with less than 25,000 population. In other words, the criterion concerning size of urban place was sacrificed in favor of the commuting criterion. Although commuting from neighboring counties to the small urban center was negligible, it was felt that it could take place if the center were to develop employment opportunitites and quality services. (At the other extreme, where commuting fields

of several urban centers overlapped in high population density areas, counties were assigned to the region with which their economic interdependence was greatest.) No criterion was established with respect to a minimal region population size, or with respect to a minimum number of counties.

State Economic Areas

In contrast to the basically nodal-functional delineations that have been considered thus far, the SEAs represent relatively homogeneous subdivisions of states. They consist of counties or groups of counties which have similar economic and social characteristics. The SEAs were originally delineated for the 1950 Census as a product of a special study [5] sponsored by the Bureau of the Census in cooperation with the Bureau of Agricultural Economics and several state and private agencies. The delineation process was devised by Donald Bogue, then of the Scripps Foundation, on loan to the Bureau of the Census. Originally 501 SEAs were identified, but in the interest of increasing the stability of sample data some sparsely settled adjacent areas were combined, reducing the number of areas for which data were reported to 453. At the time of the 1960 Census no attempt was made to re-examine the original principles or to apply them to more recent data relating to homogeneity. However, modifications made in recognition of changes in the composition of certain SMSAs, and the inclusion of Alaska and Hawaii, increased the number of SEAs to 509. With the

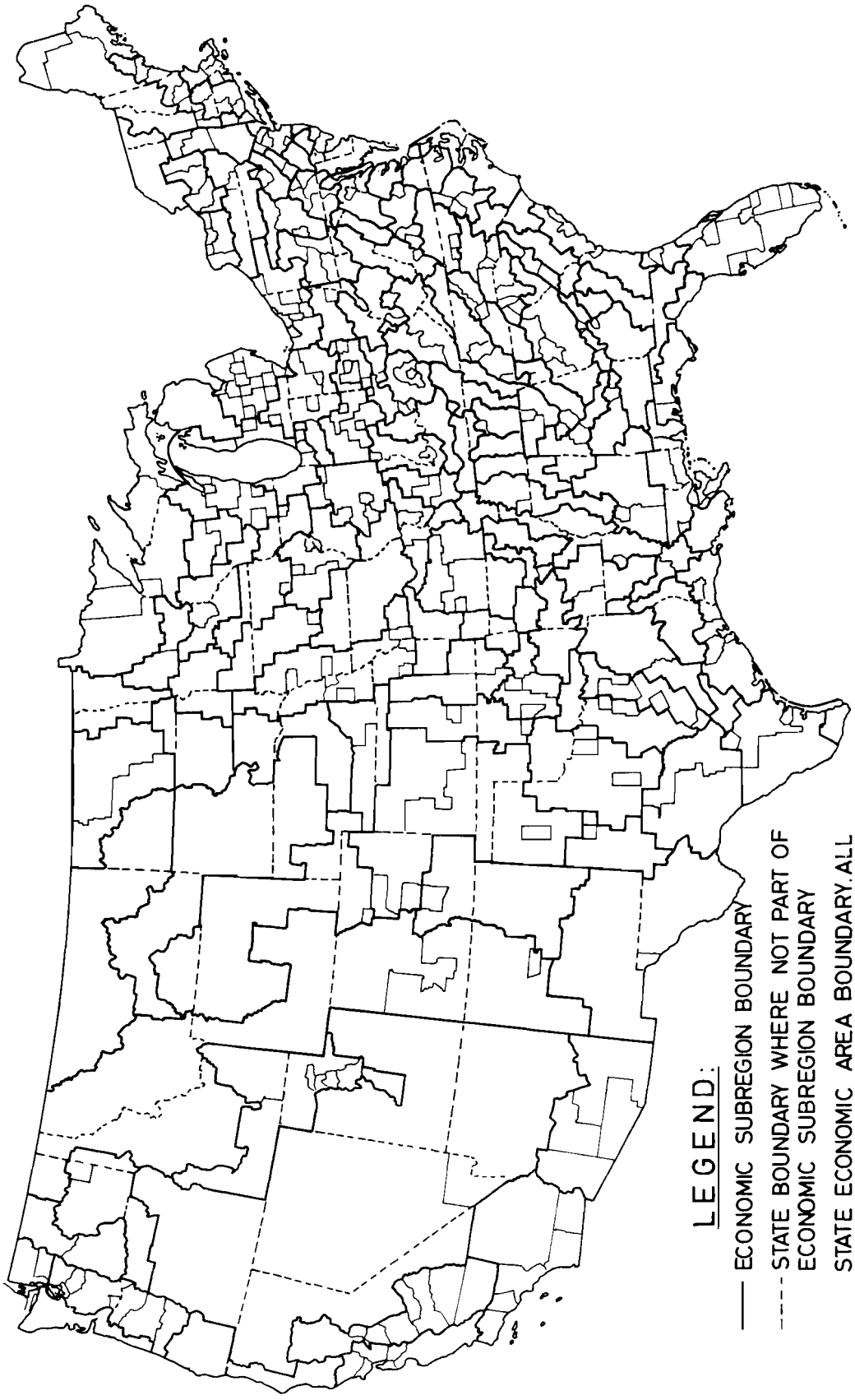
exception of one SEA added in Wisconsin, the areas for which 1970 Census data are reported are the same as those used in 1960.

In delineating the SEAs, three sources of information and data were used: (1) previous descriptions of areas and previous area delineations made by geographers, economists, and others interested in regional differences; (2) data about the economy and population of each county available from census material and other government reports; and (3) opinions, criticism, advice, and suggestions made by specialists who resided in particular areas or by persons who otherwise had first-hand familiarity with them. General impressions and informal observations were relied upon only when no other conclusive data were to be had. Homogeneity with respect to economic and social conditions was a principal criterion in judging the quality of the delineations. However, all state boundaries were regarded as SEA boundaries, a condition imposed in order to permit the publication of SEA data for each state. Despite this constraint, care was taken to make it possible to integrate SEA boundaries across state lines so that data could be summarized for a few major economic and resource areas. The SEAs are shown on Map 5.

## An Assessment of the Delineations

In terms of functional labor market analysis, the BEA regions are in many respects a clear improvement over any

MAP 5. ECONOMIC SUBREGIONS AND STATE ECONOMIC AREAS IN 1970.



previously delineated economic units of analysis. Clearly counties are too small in size. Whole states usually are too large and contain multiple labor market areas; moreover, state political boundaries often have no more economic meaning than county boundaries. The great advantage of the BEA regions is that they have been specifically delineated on the basis of the fact that the spatial economic organization of the country is closely related to its urban system.

Use of the BEA regions focuses attention on the interdependencies between nonmetropolitan counties and metropolitan areas (SMSAs) and it provides a vehicle for analyzing the welfare consequences of access to SMSAs. Nevertheless, the SMSA orientation of the BEA regions poses some problems for the analysis of rural labor markets, especially in areas where few or no workers commute to an SMSA.

Berry [4] maintains that all but five per cent of the population of the U.S. resides within the daily commuting fields of metropolitan centers. Because commuting patterns play such a large role in the delineation of functional economic areas, it is instructive to consider more closely the nature of rural areas with noncommuting populations. A recent study [17] finds that over half of the nation's counties are far removed from the economic, social, and cultural benefits usually available in larger cities. Three categories of counties are identified in this analysis. Urban counties are defined to be counties with 25,000 or more urban population, or having 10,000 or more nonfarm wage and salary jobs in 1970. Counties from which ten

per cent or more of all workers commuted to jobs located in urban counties (as defined in 1960, the most recent date for which commuting data were available) are defined to be commuter counties. The remaining counties are the noncommuter counties.

Noncommuter counties are concentrated in the middle of the country, as well as in many of the parts of the West and South. In contrast, the Northeast and the industrial Middle West account for a large proportion of both the 806 urban counties and the 572 commuter counties. Commuting also is common in the South Atlantic states. The noncommuter counties have smaller populations. Moreover, between 1960 and 1970 they experienced net outmigration of ten per cent and a population decline of 1.2 per cent. In 1960, the incidence of poverty in noncommuter counties -- four persons in every ten -- was double that in urban counties. In 1967, per capita income in the noncommuter counties was only about two-thirds of that in the combined urban-commuter counties. Although the national incidence of poverty has declined since then, the evidence suggests that the rural-urban differential has remained about the same in absolute terms. Similarly, while the noncommuter counties had twelve per cent of the nation's occupied housing units, they accounted for 21 per cent of the total number of crowded or inadequate housing units.

It should be noted that the expansion of the Interstate Highway System, as well as other highway systems, during the 1960s certainly induced increased commuting in relation to the patterns that prevailed in 1960. The ten per cent standard used

in the study just cited was deliberately conservative to compensate for expected changes between 1960 and 1970. Nevertheless, on this basis 1,718 counties had little or no linkage with urban centers; their population in 1970 was 24 million, or twelve per cent of the national total. The noncommuting population obviously would have been even greater if commuting to SMSAs (which have a minimum population of 50,000) had been examined rather than commuting to counties with 25,000 or more urban population. Thus, Berry's contention that five per cent of the nation's population lived within the daily commuting fields of SMSAs in 1960 seems strained. Even if this were true on the basis of, say, a five per cent commuting field, it would still mean that 19 out of 20 workers did not commute. However, Calvin Beale, a highly respected demographer with the U.S. Department of Agriculture, has indicated to me in conversation that in 1960 about forty million nonmetropolitan residents lived in counties where less than five per cent of the population commuted to SMSAs. This amounted to two-thirds of the entire nonmetropolitan population. On this basis it would appear that Berry classified as a commuter county any county from which anyone commuted to an SMSA!

In sum, then, the BEA regions represent a valid and useful framework for many kinds of spatial-economic analysis. The great majority of Americans live within BEA urban centers and their contiguous urban field hinterlands. Nevertheless, the relevance of the BEA regions to problems of more distant hinterland areas may be quite limited, and the total population of

these areas is far from negligible. Obviously there are many millions of Americans who cannot or will not commute or migrate to SMSAs. The labor markets that are relevant to them are much smaller than BEA regions, even though there exist numerous nonmetropolitan multicounty areas where 100,000 or more people live within commuting distance of one another, but not within commuting distance to SMSAs.

The urban spheres of influence delineated by Huff pose different problems. The set of regions based on first-order urban places (Map 2) magnifies the difficulties just discussed with regard to the BEA regions. The regionalization based on 292 first-order and second-order urban places (Map 3) appears to be more appropriate, but it suffers from a common problem in Huff's general approach. For one thing, it is based on a factor analysis by Berry, which in turn has been sharply criticized by Alford.

> The purpose for which a classification of cities is devised should determine not only the selection of a unit of analysis and the particular set of those units but also the choice of data that are collected and summarized about those units. Berry makes the same point....but he fails to consider its relevance to the selection of 97 primary variables included in his factor analysis. In fact no criteria for the inclusion of those 97 primary variables are presented. The result is that the factor structure that is produced necessarily reflects the nature of the input data, which refer primarily to the characteristics of the population, labor force, economic base, income, and a variety of demographic indicators....
>
> In fact it could be argued that the factor analysis prevents <u>any</u> causal inferences, because it artificially lumps some variables under one factor and others under another factor in a manner that exaggerates their independence and makes it difficult to analyze their relationships [1, p. 333].

Even more to the point, it will be recalled that Huff's model relies on factor scores representing a "latent dimension" of American cities, entitled "functional size of cities in an urban hierarchy". Alford points out that "Berry finds a size factor because he includes a number of labor-force characteristics highly correlated with size, as well as the size of the city counted twice, five years apart. Given the arbitrariness of the selection of variables, the factor structure is determined by the selection of certain variables and not others" [1, p. 333-34]. It is therefore not surprising that an empirical study using Huff's regions found them to be unsatisfactory. This report presents the conclusions of six intensive on-site case studies of rural economic growth in the United States. Changes in the level of employment in each area were the central concern of the research, though the study was designed to provide as broad a view as possible of factors contributing to employment growth and the consequences of such growth. The six regions examined were originally selected from Huff's set of 292 regions. They included the areas surrounding Lafayette and Lake Charles, Louisiana; Springfield and Marion, Ohio, and San Angelo and Midland-Odessa, Texas. The researchers found that:

> The regional system used as a basis for the site selection in this study is an interesting application of a technique of mathematical geography. In each of the case study areas, however, the original region did not correspond to an integrated economic unit. In some cases, counties which the core cities in fact influenced were omitted and in others, counties were included that have little or no economic connection with the core city [18, p. 29].

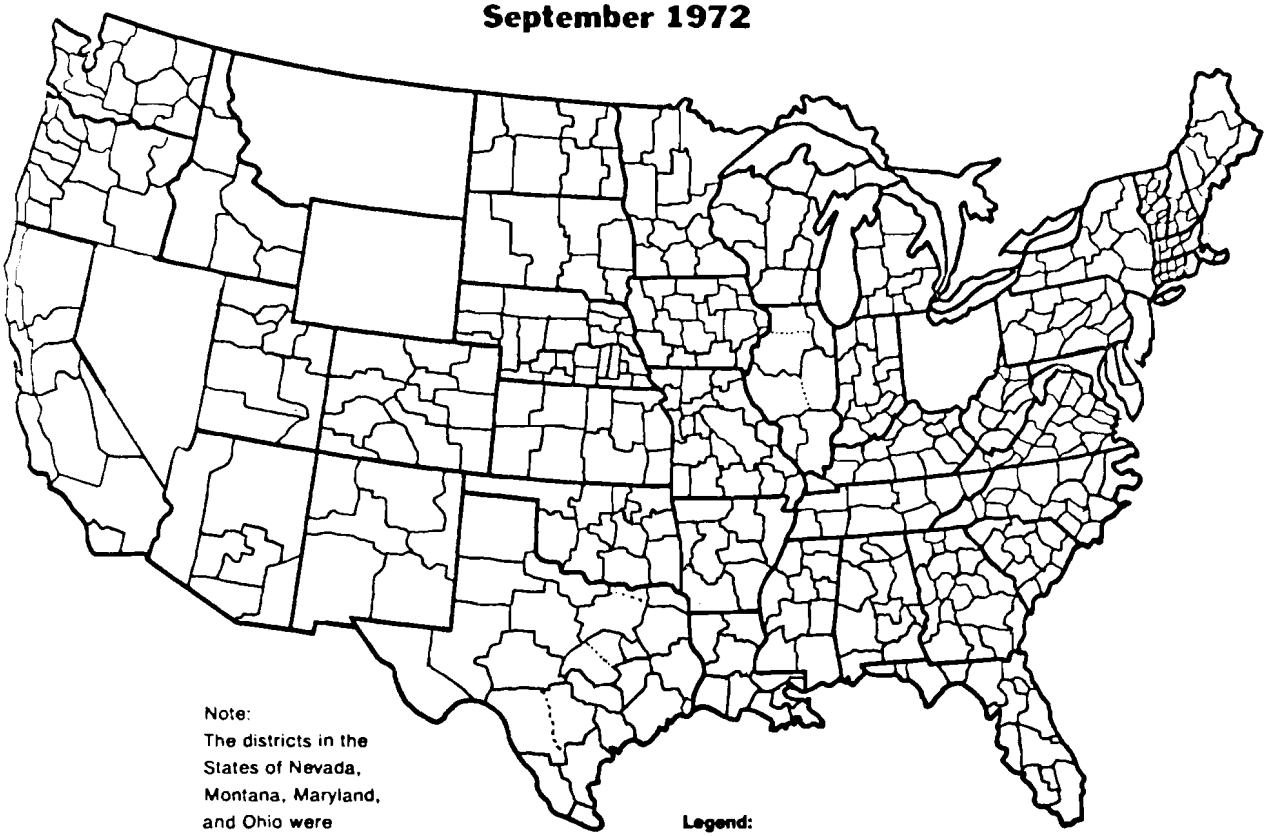
The Basic Economic Research Areas (Map 4), on the other hand, represent a more realistic nodal-functional approach in hinterland areas. This is probably a consequence of the relatively nonmetropolitan orientation of the persons responsible for the delineation. The process was based on urban centers ranging in size down to 25,000 persons, but it also took account of the fact that some areas should be regarded as separate regions even though they do not currently contain a center of even this modest size. The BERAs also have the advantage that their size and location bear at least a rough correspondence to many substate planning and development district delineations (see Map 6). Indeed, it would not take much imagination to modify many of the BERAs so that they conform with district boundaries. After all it is readily admitted that frequently

> ...it was difficult to determine the BERA to which a particular county should belong, either because some of the criteria led to conflicting possibilities, or because none of the criteria indicated the existence of strong economic interdependencies among counties. In these ambiguous cases, the assignment of counties to BERA's was to some extent arbitrary. A different weighting of the factors could lead to other groupings of the counties involved. Counties on the borders of BERA's are the ones most likely to be in this situation [13, p. 7].

The State Economic Areas have the advantage that census data have been grouped and published in this context. Yet however accurately they may reflect relatively homogeneous subregions, they do not readily lend themselves to development planning. The SEA boundaries are not easily reconcilable with those of the governor-designated substate planning and development districts. Of course, one might argue "so much the worse

MAP 6

**Sub-state Planning and Development Districts, September 1972**



Note:
The districts in the States of Nevada, Montana, Maryland, and Ohio were tentative as of September, 1972. States lacking districts as of September, 1972, were Alaska, Delaware, Hawaii, New Jersey, Rhode Island and Wyoming

**Legend:**

**State Boundary**

**District Boundary**

**Subdistrict Boundary (in Texas and Illinois)**

*Source: U.S. Department of Agriculture, Economic Research Service.*

for the districts". However, the SEAs have a fundamental conceptual drawback; they are essentially descriptive, and do not provide much insight into the functional relations involved in such processes as service delivery and innovation diffusion.

The results of studies by Edwards and Coltrane [7, 8] provide some justification for the BERA and substate district frameworks. They compared alternative delineations of multicounty areal observation units from the point of view of analyzing rural development problems. The nine delineations used were: (1) 3,068 counties; (2) 509 substate planning areas designated by state governors; (3) 507 SEAs; (4) 489 Rand McNally Basic Trading Areas; (5) 472 BERA regions; (6) 171 BEA regions; (7) 119 aggregates of SEAs; (8) 49 Rand McNally Major Trading Areas; and (9) 49 states including the District of Columbia. The Rand McNally Trading Areas have not been considered in detail in the present study because the precise uniform conceptual foundation of their delineation has not been specified. However, it is known that Rand McNally works with empirical evidence on trading area linkages rather than the commuting logic of other functional area delineations.

The nine regionalization schemes were tested in terms of twelve variables covering a broad spectrum of economic and social attributes. In one test the twelve variables were aggregated into a single index of economic development by means of principal component analysis. The BERAs were chosen

as the basis of comparison, and the difference between each delineation coefficient and that for the BERAs was calculated. On this basis the various regionalization schemes were virtually indistinguishable. Moreover, the absolute difference in coefficients was the lowest when the BERAs were compared with the governor-delineated districts. Statistical properties also were compared when specific variables were not aggregated. In this instance comparisons of means, variances, and coefficients of skewness showed that the descriptive properties of a specific variable are a function of the delineation. However, the BERAs and the governor-delineated districts again appeared to have similar descriptive properties (as did the SEA, BEA regions and Rand McNally Basic Trading Areas).

## Conclusions

In the United States, as in most countries, administrative regions are usually unsatisfactory units of analysis for studying the nature and significance of spacial innovation diffusion, spatial-temporal economic changes, regional welfare differences and trends, and related phenomena. Because individual counties are too small to be functional economic areas it is necessary to group them into larger units.

Berry [3] has demonstrated that the BEA regions, which approximate daily urban systems, represent meaningful units for analyzing a wide variety of spatial processes. Moreover, data have been complied by BEA region from the 1960 and 1970 Censuses for a

large number of variables. This data base would be substantially improved if a distinction were made between urban cores and their respective hinterland counties, thus permitting analysis of the degree and nature of spread effects.

Regional policy issues usually involve problems of lagging nonmetropolitan areas; many of these counties have few actual daily linkages with BEA region urban cores. For this reason it would be desirable to have a regionalization scheme that provides finer spatial resolution than the BEA regions. Here more attention should be given to the BERAs, whose rationale does not differ substantially from that for the BEA regions. It would not be difficult to aggregate county data in terms of the BERAs, as well as for their respective cores and hinterlands. Moreover, for analytic purposes the BERAs conform rather closely with the governor-designated multicounty planning and development districts, which represent the framework within which the federal system will in fact attempt to deal with problems of nonmetropolitan areas.

At present the delineation of functional economic areas involves a great deal of cumbersome empirical work. Although it would be desirable to be able to use gravity models or other relatively simple models to facilitate the delineation process, exclusively mechanical methods have not yet produced nationally exhaustive regionalizations that are accurate for policy purposes.

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