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FUNCTIONAL URBAN REGIONS AND CENTRAL PLACE REGIONS IN THE FEDERAL REPUBLIC OF GERMANY AND SWITZERLAND

Koren Sherrill

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Preface

One of the principal activities of the IIASA research task on Human Settlement Systems: Development Processes and Strategies is the delineation of functional economic areas in countries in Eastern and Western Europe, North America and Japan. These urban regions consist of core cities or agglomerations and their surrounding hinterlands, which are linked to the urban cores by flows of people, goods and services, and information. The present paper sets out the delineation criteria for functional urban regions of the Federal Republic of Germany and Switzerland. Economic and demographic analyses carried out in the context of these spatial units along with discussions of their policy relevance will appear in forthcoming papers in this series.

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Papers in the IIASA Series on Human Settlement Systems: Development Processes and Strategies

1. Peter Hall, Niles Hansen and Harry Swain, *Urban Systems: A Comparative Analysis of Structure, Change and Public Policy*, RM-75-35, July 1975.

2. Niles Hansen, *A Critique of Economic Regionalizations of the United States*, RR-75-32, September 1975.

3. Niles Hansen, *International Cooperation and Regional Policies Within Nations*, RM-75-48, September 1975.

4. Peter Hall, Niles Hansen and Harry Swain, *Status and Future Directions of the Comparative Urban Region Study: A Summary of Workshop Conclusions*, RM-75-59, November, 1975.

5. Niles Hansen, *Growth Strategies and Human Settlement Systems in Developing Countries*, RM-76-2, January 1976.

6. Niles Hansen, *Systems Approaches to Human Settlements*, RM-76-3, January 1976.

7. Allan Pred, *The Interurban Transmission of Growth in Advanced Economies: Empirical Findings Versus Regional Planning Assumptions*, RR-76-4, March 1976.

8. Niles Hansen, *The Economic Development of Border Regions*, RM-76-37, April 1976.

9. Piotr Korcelli, *The Human Settlement Systems Study: Suggested Research Directions*, RM-76-38, April 1976.

10. Niles Hansen, *Alsace-Baden-Basel: Economic Integration in a Border Region*, RM-76-51, June 1976.

11. Peter Nijkamp, *Spatial Mobility and Settlement Patterns: An Application of a Behavioral Entropy*, RM-76-45, July 1976.

12. Niles Hansen, *Are Regional Development Policies Needed?* RM-76-66, August 1976.

13. Galina Kiseleva, *Commuting: An Analysis of Works by Soviet Scholars*, RM-76-64, August 1976.

14. Koren Sherrill, *Functional Urban Regions in Austria*, RM-76-71, September 1976.

15. Niles Hansen, *Economic Aspects of Regional Separatism*, RM-77-10, February 1977.

Abstract

The first part of this paper contains a discussion of the criteria and procedures used to delimit functional urban regions in the Federal Republic of Germany. Each region consists of an urban core, containing at least 20,000 jobs and 50,000 population, and all hinterland counties that are linked to the core through journey-to-work flows from hinterland to core. The second part of the paper discusses central-place regions in Switzerland and concludes that these regions are conceptually similar to functional urban regions.

These German and Swiss regions are to serve as the spatial frameworks of policy-relevant and analytical studies of regional growth and change in both countries during the 1960-70 period.

Acknowledgments

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Functional Urban Regions and Central Place Regions in the Federal Republic of Germany and Switzerland

THE CONCEPT OF A REGION

Introduction

The basic concept of a region flows from the observations that geographical space is differentiated with respect to both human activities and natural features and that particular aspects of the nature and degree of differentiation can be used as criteria to isolate regions within geographical space. The way in which a region is defined is highly important in analyses of spatial structures and processes. Because the region is the basic unit of data collection, it conditions analyses, projections and forecasting. However, there exists no operationally unique definition of a region. There are as many different types of "regions" as there are questions to be addressed. The criteria for regionalizing geographic space appear to be somewhat arbitrary rather than logical in format; their selection depends entirely on the nature of the problem at hand.

> Regions are simply generalizations of the human mind. The choice of a particular set of regions, their cores and boundaries, their internal structures and hierarchical arrangement, etc., depends on the particular problems to be examined... [The] concept of a region is a very generalized and flexible one (Isard, 1956, p. 19, p. 21).

Meyer has suggested that the conceptually unique problem within the field of regional economics centers around the difficulties in defining a region (Meyer, 1963, p. 23; for a dissenting opinion, see Friedmann, 1966, pp. 39-40). These problems are basically empirical in nature, and arise because there is no *a priori* procedure in formulating criteria for partitioning geographical, economic, or political space. Furthermore, there exists no systematic method or theoretical apparatus with which to evaluate the performance properties of a set of criteria for partitioning

space; i.e., there are no formal tests of the efficiency with which a given delimitation procedure generates a set of regions that conforms to predetermined requirements (Vining, 1953, p. 48; see also Boudeville, 1966, pp. 32-45; and Paelinck and Nijkamp, 1975, pp. 167-177).

Although the process of developing criteria with which to demarcate regions is somewhat ad hoc in approach, it is traditional in the literature to distinguish among three broad types of regions: homogeneous regions, planning or programming regions, and nodal-functional or polarized regions (Boudeville, 1960; 1966, pp. 32-45; Isard, 1956; Meyer, 1963, pp. 21-27; Paelinck and Nijkamp, 1975, Chapter Four, esp. pp. 169-177; and Richardson, 1973, pp. 6-13). This trichotomy is not a mutually exclusive one since there is considerable overlap among regional types.

A programming or planning region is simply a spatial entity from an administrative or planning perspective; it constitutes the areal framework for goal-formulation, decision-making, and policy implementation by planners and administrators and by those responsible for specified activities within the region. It may consist of one or more political or administrative districts, such as counties or states, or it may consist of a geo-physical region such as a flood plain or a river basin. The distinguishing feature of a planning region is that it cannot be given a precise definition; it merely represents the spatial framework of analysis for a particular problem and it may be delineated on the basis of any criteria deemed appropriate for the activities of the relevant planning authorities.

A homogeneous region is an internally uniform region with respect to certain characteristics, whether of an economic, social or geographical nature. The delimitation of homogeneous regions usually involves the aggregation of a set of spatial units that contain elements which display a high degree of similarity. A region may be homogeneous with respect to per capita incomes, industrial or employment structure, levels of urbanization, population density, etc. The actual delineation criteria vary according to the inclinations of those doing the delineation; thus the concept of a homogeneous region rests on the criterion

or criteria by means of which regional characteristics are identified.

Nodal-functional regions, as opposed to homogeneous regions, are characterized by internal (intra-regional) spatial differentiation. They exhibit wide internal variation in the location, density, and composition of clusters of economic activity and population. A nodal-functional region consists of an urban core or economically dominant node and the surrounding hinterland areas which are linked to the core by flows of goods and services, labor (commuting) and capital, and information. Ideally, the boundaries of a nodal-functional region delimit the maximum spatial extent of metropolitan or urban dominance; the operational problem lies in devising a means with which to measure the extent of this dominance. A fairly general procedure in partitioning space into a set of nodal-functional regions is to identify, based on a minimum population or employment size constraint, the cores or centers of economic activity, and then to allocate to each core those hinterland areas that are functionally complementary with that core. It is clear, however, that there is no exclusive and unique criterion with which to indicate the degree of functional linkages between core and hinterland. This basic problem is aggravated by the absence of spatially disaggregated data on the nature and magnitude of flows, including their origins and terminations. A commonly accepted hypothesis is that commuting linkages between two or more spatial units can serve as a surrogate measure of general functional linkages. Commuting data are usually collected in census enumerations, and their general availability makes them a useful tool in delineating the spatial extent of urban dominance.

Functional Economic Regions

A particular type of nodal-functional region is the functional economic area (FEA) originally defined by Fox (Fox and Kumar, 1965; Fox, 1966) and given empirical content by Berry (Berry, 1973, pp. 10-17) and the Bureau of Economic Analysis, U.S. Department of Commerce. A functional economic area is usually defined in terms of commuting flows between a central or

nodal city and its hinterland, although the concept itself is not necessarily limited to the commuting criterion. The most universal approach in delimiting a functional economic area is in terms of a central city as an agglomeration of places of work surrounded by a wider area, the limits of which are determined by the outer limits of commuting to work in the central city. The functional economic area is, in this context, a self-contained labor market.

The FEA, as defined by Fox, is synonymous with a labor market that is centered on towns of 25,000 population or more. Starting with the assumptions that people prefer to spend their daily disposable time in places rather than in transit between them, and that the average American worker is willing to spend no more than two hours per day in travelling between place of residence and place of work (a maximum of one hour each way), Fox concluded that commuting data could be utilized to demarcate the boundaries of FEA's as labor market areas.

> It seems reasonable to examine commuting data for evidence of the existence of labor market areas of such size that the vast majority of home-to-work trips require less than an hour's automobile travel each way. If there are centralizing tendencies at work (some economies of size and in locating specialized services at the center of a population cluster), each labor market area should be organized around a central city which provides the largest and most diversified array of jobs in the area... In the central United States, as elsewhere in this country, we can observe the de facto existence of labor market areas with "radii" roughly equivalent to one hour's travel time from center to periphery. These areas are centered, in most cases, on towns of 25,000 population or larger. Within each area, we can discern several kinds of trade and service centers which appear to form a hierarchy. (Fox and Kumar, 1965, pp. 58-59.)

Thus, by definition, a functional economic area qua labor market area is relatively closed with respect to both the income producing activities of its inhabitants and the consumer-oriented residentiary activities located within it. Almost all of the goods demanded in the area are purchased within it, and nearly all of the labor resident in the region is employed within it.

The key characteristics of an FEA are (1) that it is spatially differentiated, with most income producing activities

clustered in an urban center whose labor shed is coterminous with the region, and (2) that a hierarchy of central places exists within the region to serve the needs of the dispersed population. The most basic pattern is temporal rather than spatial, since the outer boundaries of an FEA represent travel isochrons rather than a specified number of miles from the center (Ibid., p. 68). The concepts of economic distance and the disutility of travel clearly dominate that of physical distance. As a spatial entity, an FEA is a polarized region or a nodal-functional region. The components of an FEA are mutually dependent and complementary, and internal economic relationships are much more intensive than are relationships with areas outside the region.

Fox and Kumar's analysis of commuting patterns among Iowa counties confirmed their earlier hypothesis that a 60 minute[1] travel isochron around a central population cluster roughly approximated the boundary of an FEA. Although the mapping of travel isochrons around a central population and employment cluster could be employed as the main criterion for delimiting a set of FEA's, it has become common practice to use commuting flows.

One example of delimiting a set of functional urban regions using population, employment, and commuting (journey-to-work) criteria is provided by the 173 functional urban regions of the U.S. These regions were delimited on the basis of 1960 census data by the Bureau of Economic Analysis, U.S. Department of Commerce, and are known as BEA regions (Berry, 1973, pp. 10-17). Each region consists of an economically dominant urban core, usually a Standard Metropolitan Statistical Area (SMSA)[2], plus

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[1] This number was selected on the basis of an average travel time of 50 to 60 miles per hour by private automobile on freeways or principal highways in the U.S.

[2] An SMSA is a county or group of contiguous counties which contains at least one city of 50,000 persons. Other counties that are contiguous to the core county (or counties) are included in the SMSA if they are socially and economically integrated with the core county (or counties). (See Berry and Horton (1970) pp. 252-253; Goheen (1968); and U.S. Bureau of the Census (1971), pp. XII-XIII.)

all surrounding counties that are linked to the urban core through commuting flows. In sparsely populated areas of the U.S. where there are no SMSA's, smaller cities of 25,000 to 50,000 population were selected as urban cores, provided that these smaller cities were wholesale trade centers for their respective regions and that each region contained about 200,000 inhabitants. Peripheral counties that did not exhibit any commuting linkages with an urban core were allocated to an urban region on the basis of newspaper circulation, bank deposits, telephone traffic, the road network, and topographical features (Berry, 1973, p. 11). The BEA regions are the spatial bases of much regional research in the U.S., and the U.S. Bureau of the Census provides a great deal of data by BEA region. A critique of these regions is available in Berry and Horton (1970) and Hansen (1975).

Functional Urban Regions in Western European Countries: The Delineation Criteria

The concept of a nodal-functional region as a self-contained labor market is clearly behind the definition of a "functional urban region", the spatial unit of analysis of the Human Settlement Systems (HSS) Project currently being conducted at IIASA (Hall, Hansen, and Swain, 1975a; 1975b). The urban region consists of a core area meeting minimum requirements of population size, number of jobs, and employment density, plus all surrounding hinterland areas that are linked to the core through commuting flows. These criteria were applied in delimiting functional urban regions in Great Britain (Hall and Hay, 1976a), Denmark (Hall and Hay, 1976b) and Austria (Sherrill, 1976).

Hall and Hay employed two sets of delineation criteria in their regionalization of Great Britain, both of which are based on 1971 employment and commuting data (Hall and Hay, 1976a). One set of criteria, derived from the concept of a nodal-functional region, was used to define and delimit urban regions, each of which consists of a clearly dominant center and its commuting hinterland; the other set of criteria was used to delimit non-urban regions in sparsely-settled rural areas that do not contain

a strong urban center. The latter set of criteria will not be discussed since this procedure was not used in delimiting any German or Swiss regions.

Urban cores, as defined by Hall and Hay, consist of cities containing at least 20,000 jobs, to which are added all contiguous communities that contain at least 12.35 jobs per hectare (five jobs per acre). Every hinterland district is allocated to the urban core to which it sends the greatest number of its resident economically active population, provided that the district is either contiguous to the core or to another hinterland district that has already been allocated to the core in question. If a hinterland district is not contiguous to any part of a region to whose core it sends the greatest number of commuters, then it is assigned to the core to which it sends the next largest proportion of its work force, provided that contiguity occurs. Contiguity outwards from the core is observed in all cases. Relatively isolated hinterland districts that are located on the peripheries of already defined urban regions, and which do not send commuters to any core, are assigned to the urban regions with which they exhibit the greatest connectivity, as measured by commuting to neighboring counties.

The procedure for identifying urban cores did not include any population criterion for core size. The justification for omitting a population constraint is that the employment criterion of 20,000 is roughly equivalent to 50,000 population and has the additional advantage of identifying employment centers as opposed to dormitory centers. The only population criterion employed by Hall and Hay was that the combined core and hinterland must contain at least 60,000 persons; if not, the core was not eligible for designation as an urban core.

The regionalization of Great Britain produced a set of 158 regions which exhaust the national territory. A similar procedure was utilized to regionalize Denmark into a set of 12 urban regions and 20 non-urban regions (Hall and Hay, 1976b). A comparable regionalization of Austria resulted in the identification of 13 functional urban regions in this country (Sherrill, 1976).

Comparable delineations of functional urban regions in Portugal, Spain, France, the Benelux countries, Norway, Hungary, and Poland are nearing completion, and these regions will serve as the spatial framework of comparative and analytical studies of regional growth and change during the 1960-70 period in these countries. This work is to be coordinated by the HSS Project.

The work currently being conducted at IIASA for the HSS Project is concerned with descriptions and analyses of regional development in Austria, the FRG, and Switzerland within the context of a system of urban regions. The remainder of this paper focuses on a discussion of functional urban regions in the latter two countries.

FUNCTIONAL URBAN REGIONS IN THE FEDERAL REPUBLIC OF GERMANY (FRG)

The analysis of employment centers and commuting flows to major employment centers in the FRG resulted in the identification of 78 functional urban regions, which together exhaust the contiguous territory of the country. (Berlin was excluded from the outset.) The employment, population and commuting data that were used in making the delineation are from the national population census[3] (Volkszählung) of May 27, 1970. The regionalization is based on county (Landkreise and kreisfreie Städte) boundaries as of 1970. Before discussing the regionalization in greater detail, however, mention should be made of the 63 higher-order central place regions (Oberbereiche) and the 164 labor market regions of Klemmer (Klemmer, 1975). Both sets of regions are based on delimitation concepts comparable to those employed in the delimitation of functional urban regions. Indeed, these regions were frequently employed as aids in determining the boundaries of functional urban regions, especially in situations where it was difficult to determine the urban core to which a given hinterland county should be allocated. And furthermore, given the unavailability of commuting data for some areas of the Federal Republic, the boundaries of both the higher-order central place regions and the Klemmer regions were compared to determine the boundaries of urban regions in these areas.

Central Places and Central Place Regions in the FRG

Central places have long been accorded a dominant status in regional policies in the FRG. The basic regional planning law of the FRG of 1965 (Bundesraumordnungsgesetz) singled out three types of areas as the object of regional policies: lagging or stagnating areas, central places, and congested areas (BROP, 1974, p. III). The actual designation of these areas was left to the individual Länder, while the criteria for identifying

[3]Some of the employment data are from the employment census (Arbeitsstättenzählung) of 1970. Although employment data from the latter are not strictly comparable to employment data from the population census, the differences are negligible for our purposes.

and delimiting each type of area were worked out by representatives of regional agencies in the Länder and the federal government. Central places were designated as the most important aspect of regional policies, because the development of a network of central places throughout the national territory is the means through which regional disparities are to be eliminated. The specifically urban, as opposed to regional, focus of spatial planning in the FRG has its origins in the Federal Spatial Planning Law of 1965.

The Joint Committee for Regional Planning in the FRG--the MKRO--was created in 1967 and consists of representatives of the Länder and federal agencies concerned with regional policies. In its conference resolution of 1968, the MKRO established criteria for the selection of a four-level hierarchical central place scheme and specified guidelines for the provision for and development of "adequate" infrastructure according to the characteristics of each level of central place. The four levels of central places prescribed were (1) Oberzentren (higher-order central places), (2) Mittelzentren (middle-order central places), (3) Unterzentren (lower-order central places) and (4) Kleinzentren (small centers). The Länder were requested to identify central places within their respective territories that were within reasonable travelling distances of all inhabitants. Centers were identified and classified primarily on the basis of population size and infrastructure profiles, while the boundaries of hinterlands were determined on the basis of travelling times on public transit between core and periphery. The central place classifications of the Länder are discussed in greater detail in Kroner (1970) and BROB (1974, pp. 130-141).

Within the context of development policies, the middle-order and higher-order centers are the most important, since from these are selected the development centers of the county (BROP, 1974, p. 49). The MKRO concluded that middle-order centers should serve as sub-regional centers and development centers for regions of between 20,000 and 40,000 population and that each of these centers should be accessible within an hour's travelling time on public transit to all hinterland residents

(BROB, 1974, p. 32). Higher-order centers should be regional centers, capable of inducing stable and self-generating growth throughout their respective regions, and should serve as regional employment centers, infrastructure centers, and settlement and agglomeration centers (BROB, 1974, p. 31). The MKRO emphasized that only cities that are or appear to be capable of fulfilling these functions should be designated as either middle-order or higher-order centers. In accordance with the recommendations of the MKRO, the Länder identified 650 middle-order centers and 79 higher-order centers. Since this central-place hierarchy is basically a planning concept, many of the centers that were actually selected were chosen on the basis of their planned future development potential rather than on the basis of actual functions that they performed at the time of their selection. Although various and often vaguely defined criteria were employed by the Länder in the actual designations of higher-order central places (see BROB, 1974, pp. 130-141), most of these cities contain at least 50,000 inhabitants and 20,000 jobs and are major regional centers.[4] The higher-order central places are listed in Table 1. "Partial" higher-order centers, as indicated in Table 1, are basically "underdeveloped" higher-order central places that are believed to be capable of functioning as "full" higher-order centers at some unspecified time in the future. Only 17 higher-order centers have less than 50,000 population, and many of these are located in the weakly urbanized areas of Bayern.

These 79 higher-order central places are the basis of the 63 higher-order central place regions (Oberbereiche) of the FRG. These regions were delineated on the basis of travelling times between middle-order and higher-order center; that is, each middle-order center and its hinterland were allocated to the higher-order central place region whose center was nearest to the middle-order center as measured by travelling times in individual modes of transit (Kroner and Kessler, 1976, p. 23).

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[4] Specific population and employment criteria were not used to select higher-order centers.

The higher-order central place regions are, in many instances, good approximations of functional urban regions. An analysis of commuting to major cities, based on journey-to-work data from the 1970 census, indicated that the boundaries of many higher-order central place regions do correspond to the commuting sheds of the urban centers of these regions. Higher-order central place regions are conceptually equivalent to functional economic areas as discussed in an earlier section of this paper; particularly if the former are delineated on the basis of actual functional linkages between core and hinterland rather than on the basis of subjective or planning criteria. Indeed, many authors tend to equate the two types of regions (Berry, 1973, p. 15; BROB, 1974; BROP, 1974; Fox and Kumar, 1965, p. 59, p. 68ff.; Klemmer, 1975, p. 16, p. 23; and Ringli, 1976). However, in many other cases this correspondence is notably lacking, especially in areas where the central place delineations were structured on the basis of planning notions or subjective criteria concerning "optimal spacing" of centers or future development potential of centers. It is for this reason that the higher-order central place regions of the FRG were not used in toto as the spatial units of analysis of regional development. However, since journey-to-work data for Baden-Württemberg, Hessen, the northeastern part of Nordrhein-Westfalen, and the northern half of Schleswig-Holstein were not available to the author, the higher-order central place regions in these areas were used as approximations of functional urban regions. A check on the accuracy of these latter regions was carried out by comparing their boundaries to those of the Klemmer regions.

Klemmer Regions (Regionale Arbeitsmärkte)

Another set of regions that played an important role in determining the boundaries of functional urban regions in the FRG are the 164 Klemmer regions or regional labor markets (Klemmer, 1975). Klemmer conducted a detailed analysis of 1970 commuting flows to all cities of at least 30,000 population in the FRG and identified 164 regional labor markets on the basis

of his analyses.[5] The major criteria used by Klemmer in identifying employment centers and in delimiting their respective commuting sheds were (1) population size of at least 30,000 persons for an employment center (or less in weakly urbanized areas of the country), (2) employment density in the center, (3) commuting balance in the center relative to its population, (4) distances to other centers, (5) the existing and planned network of federal railroads and highways, and (6) a "reasonable" journey-to-work time of 45 minutes. These regions are shown in Map 1. They were consulted extensively in drawing the boundaries of functional urban regions, especially in situations when commuting data were not available or when the available data indicated that a particular hinterland county was functionally linked to two or more urban cores. The boundaries of the Klemmer regions were often the decisive factor in determining the boundaries of urban regions in these situations. In some areas of the country, the boundaries of functional urban regions are coterminous with those of Klemmer regions, while in other areas, two or more Klemmer regions, whose cores do not conform to the selection criteria of the HSS Project, nest within the hinterland of a larger urban region. An idea of the extent of the areal discrepancies between the Klemmer regions and the functional urban regions of the FRG can be obtained by a comparison of Maps 1 and 2.

Since the Klemmer regions are a good representation of urban employment centers and their respective commuting hinterlands in the FRG, they appear to be a suitable framework of analysis of regional development in this country. However, since many of the urban centers of the Klemmer regions contain considerably less than 50,000 population and 20,000 jobs, they are not comparable to the urban cores of functional urban regions that are being defined for other countries of western Europe. It is for this reason alone that they could not be used in the initial stage of regional analysis of the FRG. The Klemmer regions could serve as

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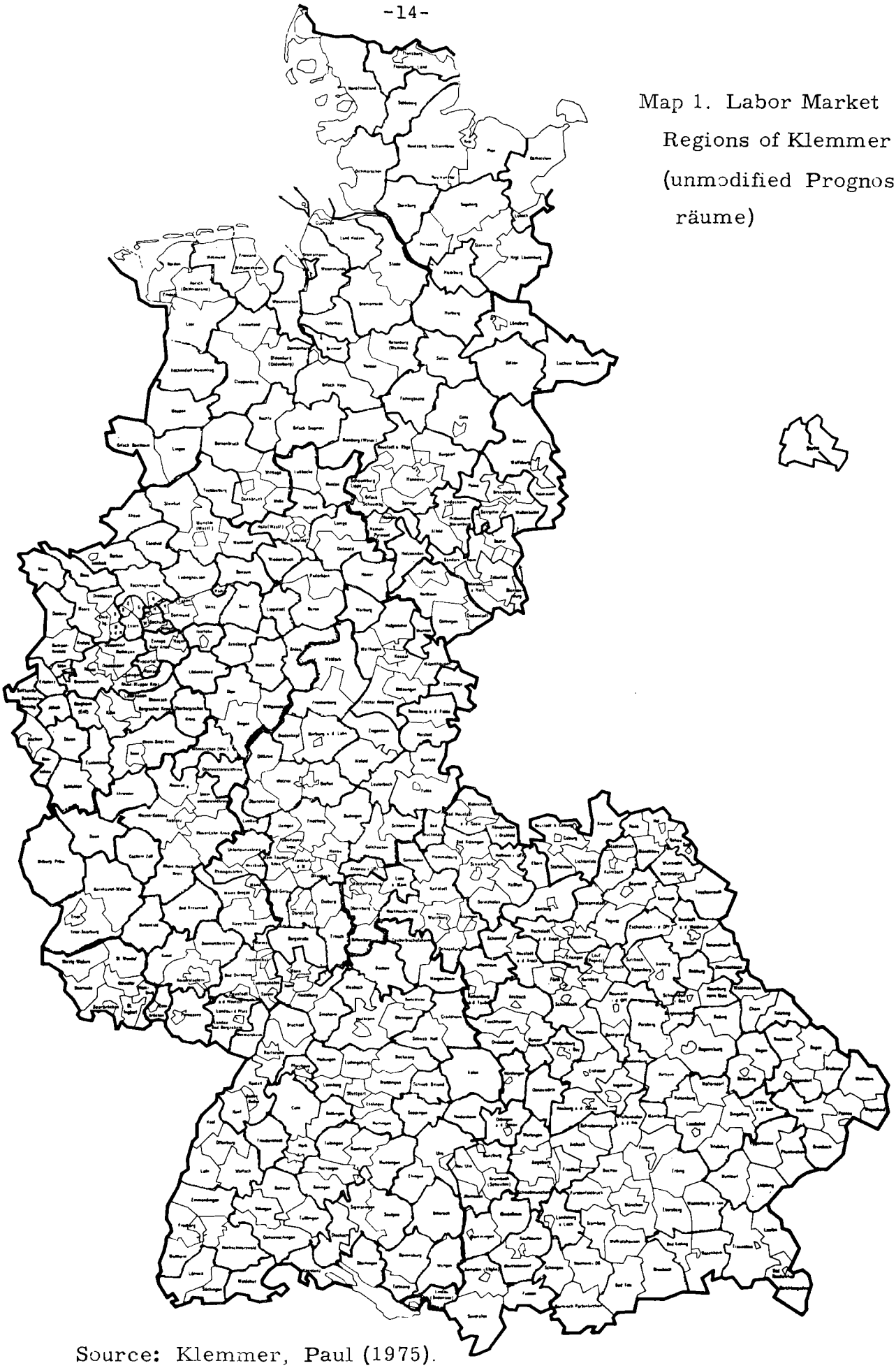
[5] Klemmer has done several regionalizations of the FRG based on similar criteria. The one discussed here consists of "unmodified" analytical regions (Prognoseräume für die regionale Wirtschaftspolitik). See Klemmer, 1975, pp. 3-6 and pp. 267-282.



Map 1. Labor Market Regions of Klemmer (unmodified Prognoseräume)

Source: Klemmer, Paul (1975). Regionale Arbeitsmärkte

an appropriate framework within which to conduct more finely disaggregated spatial analyses of the FRG, and, to the extent that ongoing research indicates that more finely disaggregated analysis is necessary, the Klemmer regions will be used in this secondary stage of the research.

Functional Urban Regions in the FRG

The criteria used in the work of the HSS Project to define and delimit functional urban regions are similar to those used by Hall and Hay in their delineations of functional urban regions in the non-German speaking countries of western Europe, as discussed earlier. The procedure for identifying urban cores in the FRG was modified somewhat, since it was not possible to examine employment data for all of the 22,510 communities[6] (Gemeinden) in the Federal Republic. As of 1970, the FRG contained 118 cities of at least 50,000 population[7], all of which contained at least 20,000 jobs. Population and employment data for these cities are shown in Table 1. These cities, plus the higher-order central places included in Table 1, were candidates for selection as urban cores. The criteria for designating a city as an urban core were (1) a minimum population of 50,000; (2) a minimum employment of 20,000 jobs; (3) a positive commuting balance; and (4) strong commuting ties with at least one contiguous hinterland county. All data are from the 1970 census. A few cities in the heavily industrialized and urbanized Ruhr satisfied criteria (1) and (2) but showed negative commuting balances, indicating that they are hinterland components of larger urban regions. These cities were excluded as core candidates. Criteria (4) was utilized to eliminate cities that are weakly developed employment subcenters within a larger urban region. In these cases, if a core candidate was an important destination of commuters from a county that sent most of its outcommuters to another nearby urban center, then the former urban center was

[6] As of 1970.

[7] Berlin is excluded.

Table 1. Population and employment in higher-order central places and cities of at least 50,000 population in the Federal Republic of Germany, 1970 (without Berlin).

LAND City	POPULATION	TOTAL EMPLOYMENT[1]	ADMINISTRATIVE STATUS[2]	HIGHER-ORDER CENTRAL PLACE	CENTER OF FUNCTIONAL URBAN REGION
BADEN-WÜRTTEMBERG					
Stuttgart	633,158	447,442	KS	yes	yes
Manheim	332,163	219,147	KS	yes	With Ludwigshaven
Karlsruhe	259,245	161,048	KS	yes	yes
Freiburg i.B.	162,222	94,499	KS	yes	yes
Hiedelberg	121,023	75,759	KS	yes	With Ludwigshafen
Heilbronn	101,660	72,126	KS	yes	yes
Ulm	92,943	77,735	KS	yes	With Neu Ulm
Pforzheim	90,338	67,373	KS	yes	yes
Esslingen a.N.	87,418	47,803	Esslingen	no	no
Reutlingen	79,534	49,823	Reutlingen	no	With Tübingen
Ludwigsburg	78,019	45,151	Ludwigsburg	no	no
Konstanz	61,160	31,959	Konstanz	yes	With Villingen
Tübingen	54,892	33,978	Tübingen	yes	With Reutlingen
Heidenheim a.d.B.	50,292	29,785	Heidenheim	no	yes
Villingen	37,906	24,742	Villingen	partial	With Konstanz
Ravensburg	32,068	22,905	Ravensburg	yes	yes
BAYERN					
München	1,293,590	803,894	KS	yes	yes
Nürnberg	473,555	305,164	KS	yes	With Fürth, Erlangen
Augsburg	211,566	143,209	KS	yes	yes
Regensburg	129,589	82,465	KS	yes	yes
Würzburg	117,147	77,936	KS	yes	yes
Fürth	94,774	50,830	KS	no	With Nürnberg
Erlangen	84,110	50,346	KS	no	With Nürnberg
Bamberg	70,581	48,736	KS	partial	yes
Ingolstadt	70,414	49,737	KS	partial	yes
Bayreuth	64,536	39,616	KS	partial	yes
Schweinfurt	58,390	54,339	KS	partial	yes
Aschaffenburg	55,193	40,206	KS	partial	yes
Hof	54,424	29,996	KS	partial	yes
Landshut	52,417	32,490	KS	partial	yes
Kempten	44,910	28,087	KS	partial	yes
Coberg	42,619	27,175	KS	partial	yes
Wieden i.d.OPf.	42,302	23,286	KS	partial	yes
Amberg	41,522	25,381	KS	partial	yes
Straubing	37,531	21,336	KS	partial	With Passau
Rosenheim	37,051	26,590	KS	partial	yes
Memmingen	32,917	22,005	KS	partial	no
Passau	30,700	20,971	KS	partial	With Straubing
Ansbach	30,603	20,430	KS	partial	no

LAND City	POPULATION	TOTAL EMPLOYMENT[1]	ADMINISTRATIVE STATUS[2]	HIGHER-ORDER CENTRAL PLACE	CENTER OF FUNCTIONAL URBAN REGION
BREMEN					
Bremen	582,277	317,717[4]	KS	yes	yes
Bremerhaven	140,455	57,335[4]	KS	yes	yes
HAMBURG	1,793,823	980,997[4]		yes	yes
HESSEN					
Frankfurt a.M.	669,635	516,284	KS	yes	yes
Wiesbaden	250,122	132,629	KS	yes	With Mainz
Kassel	214,156	127,742	KS	yes	yes
Darmstadt	141,224	97,976	KS	yes	yes
Offenbach a.M.	117,306	62,591	KS	yes	no
Giessen	75,555	53,965	KS	yes	yes
Rüsselheim	59,861	45,556	Gross-Gerau	partial	no
Hanau	55,379	46,739	KS	partial	no
Marburg a.d.L.	46,968	27,679	KS	yes	yes
Fulda	45,539	37,983	KS	yes	yes
Wetzlar	36,618	35,127	Wetzlar	partial	no
Bad Hersfeld	23,268	18,160	Hersfeld	partial	no
Friedberg	16,836	10,025	Friedberg	partial	no
Limburg	15,269	15,759	Limburg	partial	no
NIEDERSACHSEN					
Hannover	523,941	366,558	KS	yes	yes
Braunschweig	223,700	132,497	KS	yes	With Salzgitter
Osnabrück	143,905	88,550	KS	yes	yes
Oblenburg	130,852	67,205	KS	yes	yes
Salzgitter	118,201	54,769	KS	no	With Braunschweig
Göttingen	108,991	62,826	Göttingen	yes	yes
Wilhelmshaven	102,732	44,285	KS	yes	yes
Hildesheim	93,800	55,798	KS	no	yes
Wolfsburg	88,655	76,648	KS	no	yes
Delmenhorst	63,266	25,866	KS	no	no
Lüneburg	59,516	33,027	KS	no	yes
Celle	57,155	30,260	KS	no	yes
Emden	48,525	33,574	KS	no	yes
Hameln	47,414	32,022	KS	no	yes
NORDRHEIN-WESTFALEN					
Köln	848,352	471,392	KS	yes	yes
Essen	698,434	288,125	KS	yes	yes
Düsseldorf	663,586	410,364	KS	yes	yes
Dortmund	639,634	268,919	KS	yes	yes
Duisburg	454,839	214,803	KS	yes	yes
Wuppertal	418,454	206,492	KS	yes	yes
Gelsenkirchen	348,292	131,432	KS	no	no
Bochum	343,968	152,547	KS	yes	yes
Bonn	274,518	146,137	KS	yes	yes
Oberhausen	246,736	89,080	KS	no	no
Krefeld	222,250	118,280	KS	no	yes
Hagen	200,909	91,332	KS	no	no
Münster (Westf.)	198,371	105,189	KS	yes	yes

LAND City	POPULATION	TOTAL EMPLOYMENT[1]	ADMINISTRATIVE STATUS[2]	HIGHER-ORDER CENTRAL PLACE	CENTER OF FUNCTIONAL URBAN REGION
NORDRHEIN-WESTFALEN (continued)					
Mülheim a.d.R.	191,468	72,285	KS	no	no
Solingen	176,420	78,023	KS	no	no
Aachen	173,475	97,229	KS	yes	yes
Bielefeld	168,937	102,657	KS	yes	yes
Mönchengladbach	151,090	71,376	KS	no	yes
Remscheid	136,419	66,927	KS	no	no
Recklinghausen	125,237	46,585	KS	no	no
Neuss	114,613	51,510	KS	no	no
Leverkusen	107,546	67,580	KS	no	no
Bottrop	106,657	31,325	KS	no	no
Herne	104,077	34,352	KS	no	no
Rheydt	100,077	42,074	KS	no	no
Wanne-Eickel	99,156	34,346	KS	no	no
Witten	97,379	41,348	KS	no	no
Viersen	85,326	33,829	Kempten-Krefeld	no	no
Hamm	84,942	41,976	KS	no	yes
Castrop-Rauxel	84,146	28,274	KS	no	no
Gladbeck	83,246	25,499	KS	no	no
Wattenscheid	80,756	23,262	KS	no	no
Lüdenscheid	78,993	108,832[3]	Lüdenscheid	no	yes
Marl	77,182	117,600[3]	Recklinghausen	no	no
Gütersloh	75,297	75,217[3]	Wiedenbrück	no	no
Porz a.R.	74,915	28,587	Rhienisch-Bergischer Kreis	no	no
Lünen	71,658	23,850	KS	no	no
Rheinhausen	69,430	28,886	Moers	no	no
Paderborn	66,829	60,255[3]	Paderborn	yes	yes
Herford	65,531	100,672[3]	Herford	no	no
Detmold	63,266	60,974[3]	Detmold	no	no
Hattingen	58,994	100,083[3]	Ennepe-Ruhr-Kreis	no	no
Iserlohn	57,577	28,302	KS	no	no
Siegen	57,302	104,726[3]	Siegen	yes	yes
Velbert	55,411	30,305	Düsseldorf-Mettman	no	no
Dinslaken	54,731	21,876	Dinslaken	no	no
Düren	53,620	29,937	Düren	no	yes
Herten	52,669	117,600[3]	Recklinghausen	no	no
Moers	52,539	18,536	Moers	no	no
Hürth	51,512	20,430	Köln	no	no
Troisdorf	51,271	24,025	Rhein-Sieg-Kreis	no	no
Rheine	50,321	72,239[3]	Steinfurt	no	no
Unna	50,025	75,610[3]	Unna	no	no
Bocholt	48,852	25,166	KS	no	yes
RHEINLAND-PFALZ					
Ludwigshafen a.R.	176,031	115,086	KS	yes	With Heidelberg, Mannheim
Mainz	172,195	97,735	KS	yes	With Wiesbaden
Koblenz	119,434	75,214	KS	yes	yes
Trier	103,724	54,486	KS	yes	yes
Kaiserslautern	99,617	57,299	KS	yes	yes
Worms	76,697	34,002	KS	no	no
Neuwied	62,560	54,430[3,4]	Neuwied	no	no
Pirmasens	55,692	31,321	KS	no	yes
Neustadt a.d.W.	50,909	21,711	KS	no	no
SAARLAND					
Saarbrücken	127,989	101,164	KS	yes	yes

LAND City	POPULATION	TOTAL EMPLOYMENT[1]	ADMINISTRATIVE STATUS[2]	HIGHER-ORDER CENTRAL PLACE	CENTER OF FUNCTIONAL URBAN REGION
SCHLESWIG-HOLSTEIN					
Kiel	275,561	129,718[3]	KS	yes	yes
Lübeck	242,628	107,845[3]	KS	yes	yes
Flensburg	96,486	45,324[3]	KS	partial	yes
Neumünster	84,746	37,499[3]	KS	partial	no
Norderstedt	56,645	52,343[3,4]	Segeberg	no	no

[1]Defined as labor force by place of work (Erwerbstätige am Arbeitsort). These data are from the German Population Census (Volks- und Berufszählung 1970). Total employment equals employed resident labor force (Erwerbstätige am Wohnort) plus employed incommuters minus employed outcommuters. The labor force is defined to include all persons, both German citizens and foreigners who reside in the F.R.G., who engage in some type of economic activity on a weekly basis. Included are soldiers, non-paid family helpers who assist in running family businesses, students who hold part-time jobs, prisoners, members of religious orders who are of working age, and the regularly employed. There is no minimum constraint on hours worked per week as a criterion for inclusion in the labor force.

[2]As of May, 1970. Cities which have the administrative status of counties (kreisfreie Städte) are indicated with the abbreviation KS. The counties with which the remaining cities are administratively united are listed in this column.

[3]Kreis (county data). Data for cities not available to the author.

[4]Defined as total employed (Beschäftigte ingesamt) by place of work. These data are from the German Employment Census (Unternehmen und Arbeitsstätten) of 1970. Includes proprietors, employees, and family helpers. Excludes the unemployed.

Sources: The population and employment data, along with administrative status, are available in the following publications:

Statistiches Landesamt Baden-Württemberg, Gemeinde-Statistik 1970, Heft 2. Bevölkerung und Erwerbstätigkeit, 1970 (Stuttgart: Statistisches Landesamt, 1973).

Bayerisches Statistisches Landesamt, Bayerische Gemeindestatistik 1970. Band 4: Bevölkerung und Erwerbstätigkeit (München: Bayerisches Statistisches Landesamt, 1973).

Statistisches Bundesamt, Statistisches Jahrbuch 1971 für die Bundesrepublik Deutschland (Stuttgart: W. Kohlhammer GmbH, 1971).

Hessisches Statistisches Landesamt, Hessische Gemeindestatistik, 1970. Bevölkerung und Erwerbstätigkeit, Band 2. (Weisbaden: Hessisches Statistisches Landesamt, 1973).

Niedersächsisches Landesverwaltungsamt, Gemeindestatistik Niedersachsen, 1970, Teil 2. Bevölkerung und Erwerbstätigkeit, Band 187, Heft 2: Regierungsbezirk Hildesheim, and Band 194, Heft 9: Ergebnisse für Regierungs- und Verwaltungsbezirke, kreisefreie Städte und Landkreise (Hannover: Niedersächsisches Landesverwaltungsamt, 1973).

Statistisches Landesamt Nordrhein-Westfalen, Die Wohnbevölkerung in den Gemeinden Nordrhein-Westfalens 1970 Sonderreihe Volkszählung 1970, Heft 1 (Düsseldorf: Statistisches Landesamt Nordrhein-Westfalen, 1972).

Statistisches Landesamt Rheinland-Pfalz, Gemeindestatistik von Rheinland-Pfalz, 1970. Teil II. Bevölkerung und Erwerbstätigkeit 1970, Band 221 (Bad Ems: Statistisches Landesamt Rheinland-Pfalz, 1973).

Statistisches Amt des Saarlandes, Gemeindestatistik 1970, Bevölkerung und Erwerbstätigkeit (Saarbrücken: Statistisches Amt des Saarlandes, 1972).

Statistisches Landesamt Schleswig-Holstein, Öffentliche Haushaltsrechnungen, 1969 (Kiel: Statistisches Landesamt Schleswig-Holstein, 1971).

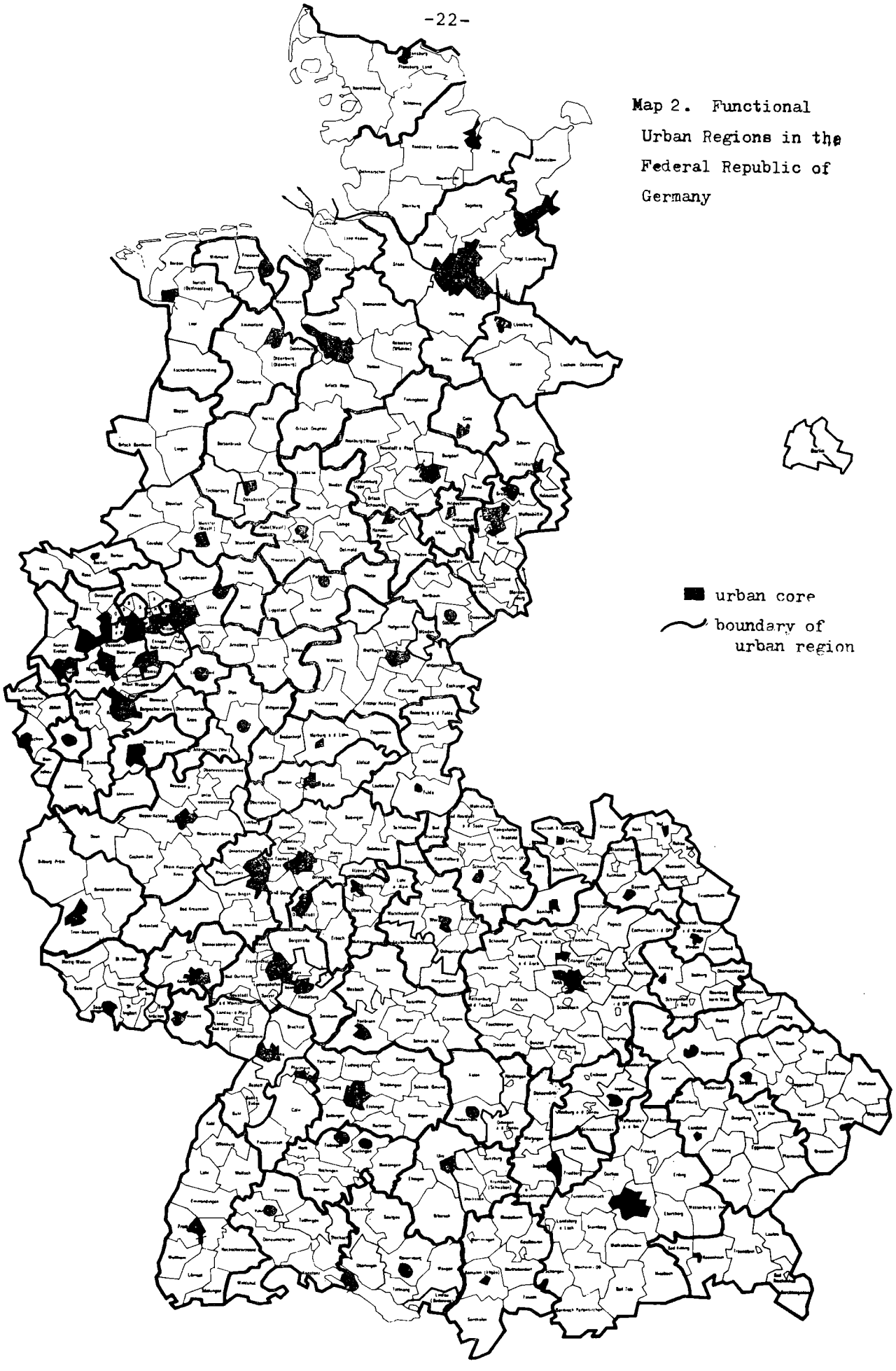
The central place classifications are available in Kroner, Günter, and Kessler, Hans-Reiner (1976). "Vorschlag einer räumlichen Gliederung des Bundesgebietes nach der Erreichbarkeit von Oberzentren." Informationen zur Raumentwicklung, Heft 1: Flurbereinigung bei Planungsräumen (Bonn-Bad Godesberg: Bundesforschungsanstalt für Landeskunde und Raumordnung), pp. 15-33, at p. 23.

eliminated as a potential core and was assigned to the urban region with which it displayed the most interdependence, as measured by commuting flows.

The 139 candidates for core status are listed in Table 1, along with their central place designations. Most of these cities contained at least 20,000 jobs; however, not all satisfied the remaining criteria and were therefore excluded from candidacy. Of these 139 cities, 87 met all criteria with but few exceptions, and these were designated as urban cores. This designation is included in Table 1. Most of these 87 urban cores are also higher-order central places.

In a few cases, adjacent or nearby cities that satisfied the selection criteria were combined to form the urban core of a single region, especially if the cities are mutually dependent components of a large urbanized area. Five regions contain cores consisting of two or more cities, and these are noted both in Table 1 and Appendix A. Thirteen cores located in relatively isolated areas of the FRG contain less than 50,000 population. They were selected as urban cores because they satisfy the remaining criteria and because they are major employment centers for their respective hinterlands. The two regions of Passau-Straubing and Konstanz-Villingen contain two urban cores which are not contiguous. In each region, both cities are weakly developed employment centers for the entire region, and since it was not possible to separate their commuting sheds on the basis of available data, both were designated as urban cores. These 87 urban cores are the basis of the 78 functional urban regions of the Federal Republic which are shown in Map 2.

The procedure for allocating hinterland counties to urban cores was based on a study of commuting flows at the county (kreisfreie Stadt and Landkreis) level. The county was selected as the unit of observation for two reasons. In the first place, there were 542 counties and nearly 23,000 communities in the Federal Republic as of 1970. Because of resource limitations, it was not possible to investigate commuting flows among 23,000 units of observation. The considerably smaller number of counties made them feasible units of observation. More importantly, however,



Map 2. Functional Urban Regions in the Federal Republic of Germany

it was necessary to delimit urban regions such that their boundaries do not violate the county boundaries of 1970, since all of the data that are being employed in the analyses of regional development in the FRG are available only by county. Every hinterland county was allocated to the urban core to which it sends the most commuters, provided that it is contiguous to the urban core or to other hinterland counties that were already allocated to the core. Contiguity outward from the core was observed in the delineation of each region. If a particular county had no commuting ties with any urban core, but had commuting linkages with neighboring hinterland counties, then it was allocated to the urban region to which its neighbors were allocated. Additional considerations were used to allocate counties located at the peripheries of urban regions and which have no commuting linkages with either an urban core or with neighboring counties. In these cases, which occurred frequently, a county was allocated to the urban region to which the nearest urban center, as defined in terms of highway distances, had already been allocated. The boundaries of both the Klemmer regions and the higher-order central place regions also figured importantly in the allocation of marginal counties to urban regions.

The core and hinterland components of each urban region of the FRG are listed in Appendix A. A forthcoming Research Memorandum will discuss the nature and extent of demographic and economic changes in each of these regions during the 1960-70 period.

CENTRAL PLACE REGIONS IN SWITZERLAND

In 1974 the Institut für Orts-, Regional- und Landesplanung (ORL), Eidgenössische Technische Hochschule, Zürich, completed its work on a delineation of Switzerland into 13 higher-order central place regions and 66 middle-order central place regions (ORL, 1975; Ringli, 1976). These regions are shown in Maps 3 and 4, respectively. The delineation was carried out at the request of the regional planning committee of the Swiss parliament. The delineation has divided the country into two sets of polarized urban regions. Each of these regions consists of an urban core (central place) and the surrounding areas that are functionally linked to that urban core. The hinterlands of each region were delimited on the basis of both travelling times between hinterlands and cores and commuting flows between hinterlands and cores. Although the delineation itself is based on central place notions and planning criteria, the conceptual basis of the delineation corresponds broadly to that employed in delineating functional urban regions in other European countries. The 13 higher-order central place regions (see Map 3) are being used by the HSS Project as the spatial units of analysis of Swiss regional development during the 1960-70 period. These 13 regions consist of an aggregation of 66 middle-order central place regions, and to the extent that more finely spatially disaggregated analysis of the country is indicated, these 66 regions will be used for this purpose (see Map 4).

Although Switzerland does not have a history of comprehensive regional planning at the federal level, there recently have been numerous discussions within the federal parliament concerning the need for a national regional policy, the goals of regional policies, and measures that could be taken to achieve these goals.[8] The regionalization that is discussed here has been used as the

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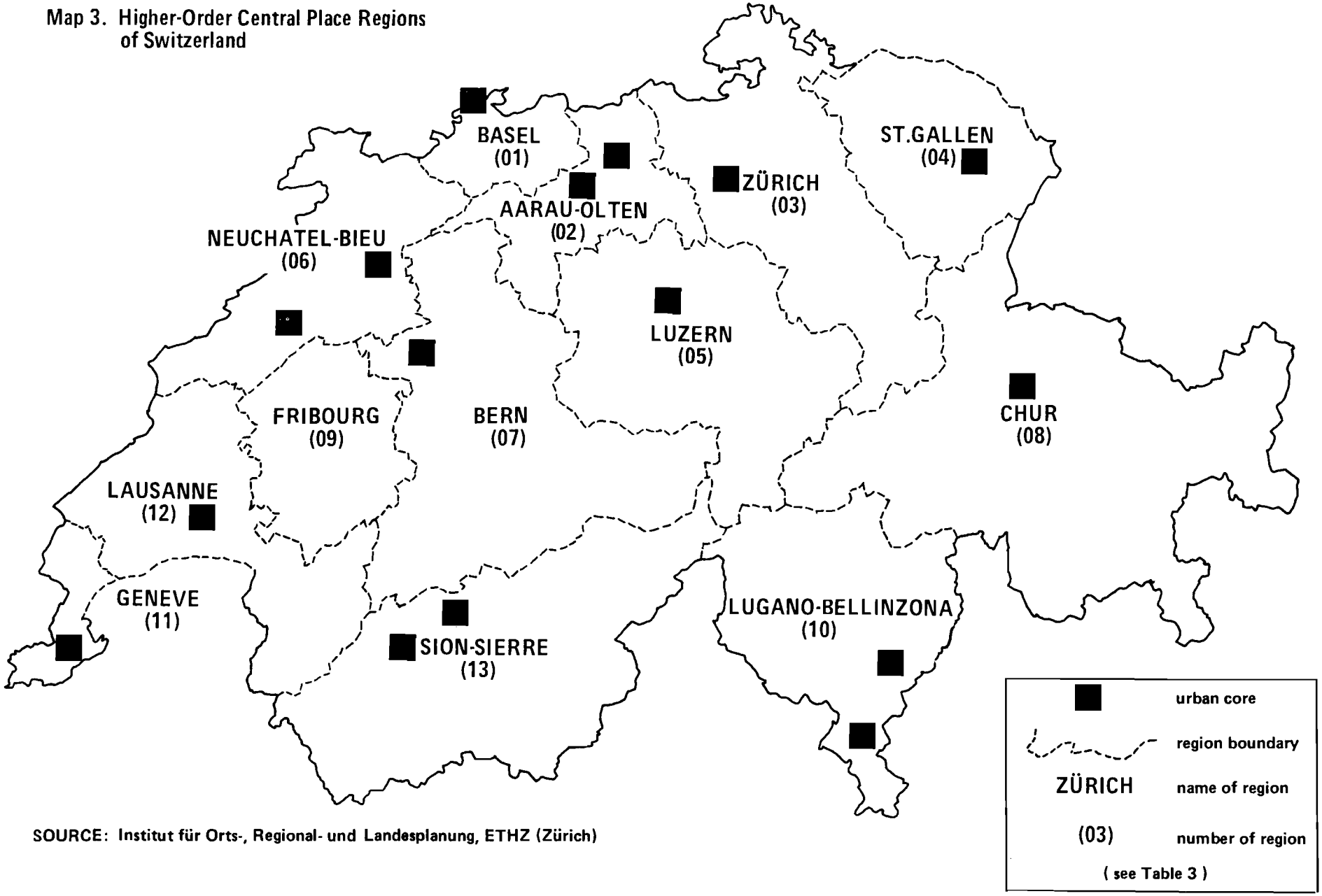
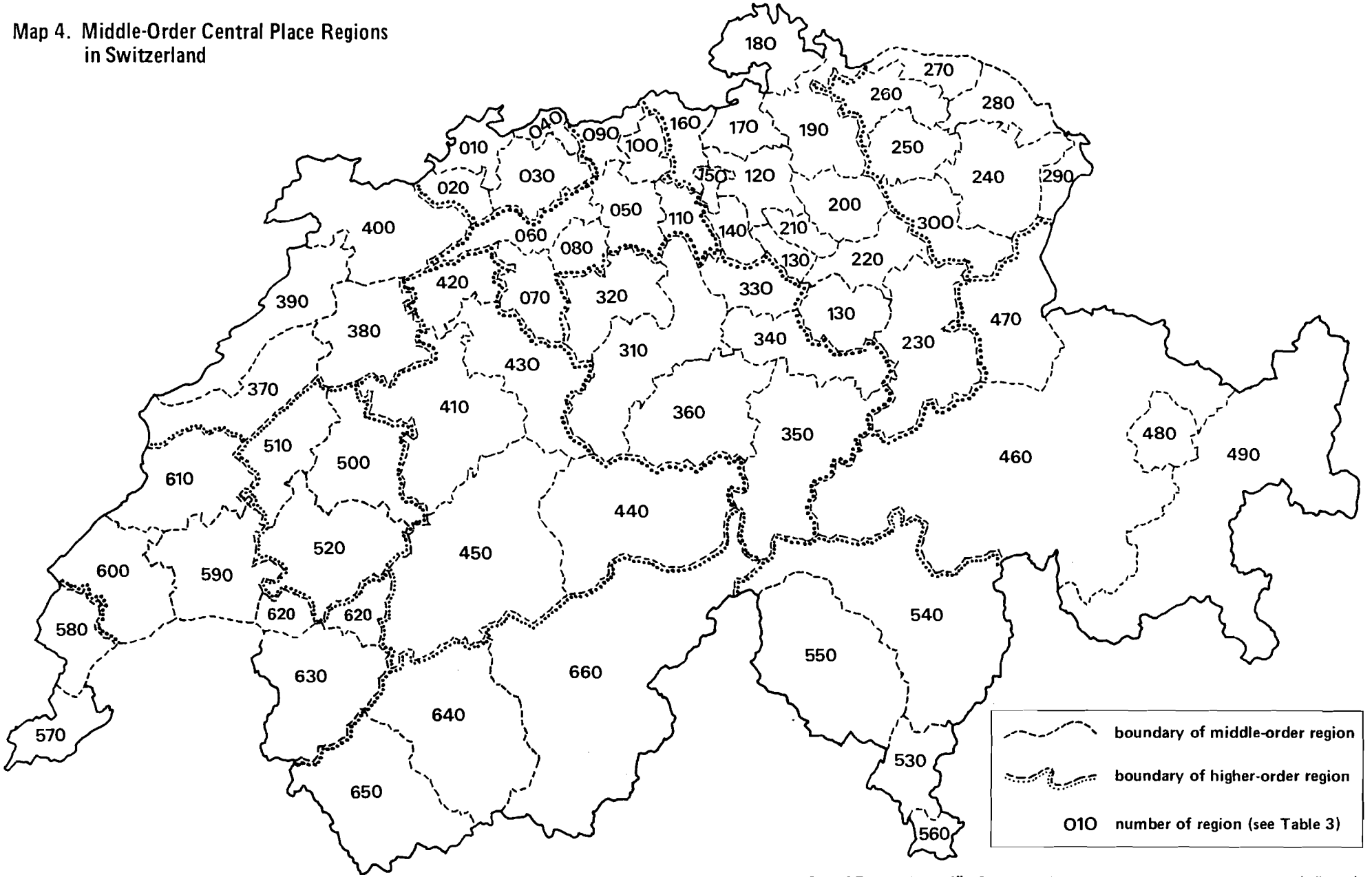
[8] Regional problems and policies in Switzerland are discussed in Chiffelle, 1975; and OECD, 1976, pp. 196-213. An excellent and detailed analysis of regional trends and alternative patterns of development is available in ORL, 1971. National regional planning policies are discussed in Delegierter für Raumplanung, 1974.

Map 3. Higher-Order Central Place Regions of Switzerland



SOURCE: Institut für Orts-, Regional- und Landesplanung, ETHZ (Zürich)

Map 4. Middle-Order Central Place Regions in Switzerland



SOURCE: Institut für Orts,- Regional- und Landesplanung, ETHZ (Zürich)

regional focus for these deliberations; moreover, a tentatively approved regional plan that has been worked out for the country is structured on the basis of these regions (Delegierter für Raumplanung, 1974; Ringli, 1974, 1976). The criteria for this delineation, the central place typology employed therein, and planning considerations used in the delineation have been discussed elsewhere (ORL, 1975; Ringli, 1976) and will not be repeated here.

As of 1970, Switzerland had 8 cities that contained at least 50,000 population and 20,000 jobs. (See Table 2.) All of these cities have been designated as the urban cores of higher-order central place regions. One of these 8 cities, Biel, has been combined with Neuchâtel, which meets the employment criterion, to form a multiple-core urban area. The jurisdictions of Biel and Neuchâtel are not contiguous; however, the two cities are within 35 kilometers of one another. Of the urban cores of the remaining five higher-order central place regions, two, Fribourg and Chur, are single urban entities. Fribourg does not meet the population requirement; however, it does meet the employment requirement and is, in addition, an important commuting center for its region. Chur meets neither the population nor employment criterion; it does, however, serve as the regional center for the easternmost part of Switzerland and is the only urban area of any consequence in that alpine region. Chur is also a small but relatively important commuting center for its immediate region.

The urban cores of the three remaining higher-order central place regions consist of two cities each: (1) Aarau-Olten, (2) Bellinzona-Lugano, and (3) Sion-Sierre. None of these six cities, taken alone, meets either the population or employment criterion; however, all are relatively important employment centers for their immediate regions.

The Aarau-Olten complex is the only major settlement center in the Zürich-Basel-Bern settlement axes that is of sufficient distance from these major urban centers to support an urban region that is relatively independent of the spheres of influence of the larger cities. Both Aarau and Olten are major commuting

Table 2. Population, employment, and commuting, 1970, in urban cores of higher-order central place regions of Switzerland.

City	Population	Employed Residents	Outcommuters	Incommuters[1]	Total Employed
Zürich	422,640	227,507	17,231	92,319	302,595
Basel	212,857	111,554	9,179	42,458	144,833
Geneva	173,618	95,028	13,652	40,201	121,577
Bern	162,405	83,544	5,637	40,144	118,051
Lausanne	137,383	68,179	7,777	24,272	84,674
Biel-Neuchâtel	103,117	53,475	5,102	18,823	67,196
(Biel)	(64,333)	(33,990)	(2,828)	(11,292)	(42,454)
(Neuchâtel)	(38,784)	(19,485)	(2,274)	(7,531)	(24,742)
St. Gallen	80,852	38,588	2,653	9,362	45,297
Luzern	69,879	33,498	5,733	15,985	43,750
Aarau-Olten	38,090	18,845	4,391	19,981	34,435
(Aarau)	(16,881)	(8,662)	(1,754)	(11,499)	(18,407)
(Olten)	(21,209)	(10,183)	(2,637)	(8,482)	(16,028)
Fribourg	39,695	17,633	1,905	7,163	22,891
Sion-Sierre	32,942	14,247	1,885	6,270	18,632
(Sion)	(21,925)	(9,427)	(626)	(5,004)	(13,805)
(Sierre)	(11,017)	(4,820)	(1,259)	(1,266)	(4,827)
Lugano-Bellinzona	39,259	17,738	3,221	15,359	29,876
(Lugano)	(22,280)	(10,562)	(1,850)	(11,043)	(19,755)
(Bellinzona)	(16,979)	(7,176)	(1,371)	(4,316)	(10,121)
Chur	31,193	14,407	913	3,409	16,903

Source: Eidgenössisches Statistisches Amt, Statistisches Jahrbuch der Schweiz (Bern: July, 1975).

[1] Excludes foreign incommuters.

centers. The combined employment of the two cities is over 34,000, and nearly 20,000 of these positions are occupied by incommuters. (See Table 2.) Since these two cities are within 20 kilometers of one another and since both, taken together, meet the employment and commuting criteria for selection as an urban core, it was decided to combine them into a double-core urban area to serve as the urban center of the region.

The Bellinzona-Lugano centers are located in the south-central mountain regions of Switzerland. Lugano, Bellinzona and Locarno are the only urban centers of any consequence in this region. Lugano, with 19,755 jobs, over half of which are occupied by incommuters, is the most economically important center of the region. Locarno and Bellinzono are both smaller secondary centers. The initial decision was made to designate Bellinzona and Lugano as a double urban core for the region, since (1) both are employment centers for their immediate regions, (2) they are within 35 kilometers of each other, and (3) together they meet the employment criterion for core designation. It should be pointed out, however, that Lugano alone could serve as the urban core of this region. The lack of adequate data makes it difficult to evaluate at this time the respective merits of these alternatives.

Sion and Sierre are both small urban centers in the sparsely populated and weakly urbanized alpestrine region of southeastern Switzerland. Since they are within 20 kilometers of one another, and since both together contain nearly 19,000 jobs, both were designated as the urban core of the region. The paucity of urban centers in the alpine regions means that the delineation criteria for these areas must be relaxed considerably.

As stated earlier, the hinterlands of the 13 higher-order central place regions were allocated to their respective regions largely on the basis of travelling times. The hinterlands themselves are defined in terms of middle-order central places and their respective hinterlands. The urban cores of each of the 13 higher-order central place regions are listed in Table 3. The components of each of these regions, listed in column 4 of the table, are defined in terms of (1) the urban core area

Table 3. Population, employment and commuting in central place regions of Switzerland

HIGHER-ORDER CENTRAL PLACE REGION			MIDDLE ORDER (MO) CENTRAL PLACE REGION				Destinations of Commuters[1], 1970 (originating in MO)			
URBAN REGION Urban Core	Population 1970	Employment 1970	Name	Population 1970	Employment 1970	Total Commuters	Destinations in MO of Resídence	Destinations in Rest of Urban Region: Urban Core	Destinations in Rest of Urban Region: Remaining MO's	Other Urban Regions[2]
(01) Basel	497,692	245,124	(010) Basel	384,289	197,262	190,581	187,075	-	2,016	1,490
			(020) Laufen	25,392	10,681	11,813	10,089	1,604	46	74
			(030) Liestal	67,770	29,685	33,314	27,885	4,906	170	353
			(040) Rheinfelden	20,241	7,496	9,437	6,607	2,236	145	449
(02) Aarau-Olten	453,891	209,813	(050) Aarau	134,900	67,656	65,909	61,610	742[3]	2,069	1,588
			(060) Olten	82,767	37,175	38,873	33,376	1,910[4]	1,975	1,612
			(070) Langenthal	64,391	28,277	29,667	26,886	627	457	1,697
			(080) Zofingen	58,484	27,748	27,634	24,398	2,454	261	521
			(090) Stein-Frick-Laufenbg.	22,472	9,251	10,407	8,417	163	265	1,562
			(100) Brugg	38,636	17,743	19,957	13,950	1,054	266	2,687
			(110) Wohlen	52,241	21,963	24,211	20,321	1,009	369	2,512
(03) Zürich	1,443,871	725,077	(120) Zürich	591,622	375,243	311,799	301,808	-	8,967	1,024
			(130) Horgen	78,663	29,688	37,823	26,491	10,033	1,069	230
			(140) Affoltern a. Albis	30,034	9,816	14,044	8,818	4,448	255	523
			(150) Spreitenbach/Dietikon	50,308	14,948	24,442	10,956	12,425	777	284
			(160) Baden	109,552	48,566	53,340	43,593	4,845	2,008	2,894
			(170) Bülach	53,537	18,755	25,535	16,901	7,666	837	131
			(180) Schaffhausen	91,802	42,125	43,415	41,456	736	881	342
			(190) Winterthur	151,069	67,069	70,781	60,990	7,679	1,395	717
			(200) Uster-Wetzikon	108.051	45,731	52,006	41,684	7,813	2,452	57
			(210) Meilen	64,411	23,057	29,725	19,978	8,525	1,174	48
			(220) Rapperswil	70,218	28,849	32,468	26,697	2,048	3,514	209
			(230) Glarus/Niederurnen	44,604	21,230	21,660	20,792	237	545	86
(04) St. Gallen	526,394	243,171	(240) St. Gallen	179,619	86,096	84,261	81,232	-	2,642	387
			(250) Wil	71,160	31,037	32,074	28,971	1,126	904	1,073
			(260) Frauenfeld	61,116	27,772	28,733	25,487	232	1,074	1,940
			(270) Kreuzlingen	36,519	16,886	17,576	16,098	42	857	579
			(280) Romanshorn/Rorschach	93,229	43,800	44,649	40,772	2,571	1,152	154
			(290) St. Margrethen-Altst	49,580	21,193	22,349	20,538	387	1,166	258
			(300) Wattwil-Ebnat-Kappel	35,171	16,387	16,593	15,835	333	278	147
(05) Luzern	476,512	207,900	(310) Luzern	215,352	97,656	96,210	92,812	-	2,019	1,379
			(320) Sursee	56,984	23,438	24,863	22,347	1,460	28	1,028
			(330) Zug	73,249	32,971	33,217	30,570	460	110	2,077
			(340) Schwyz	46,693	19,136	20,292	18,639	732	622	299
			(350) Altdorf	34,091	14,082	14,238	13,975	49	174	40
			(360) Sarnen-Stans	50,143	20,617	21,942	20,067	1,768	66	41
(06) Neuchâtel-Biel	432,058	212,090	(370) Neuchâtel	106,695	53,080	52,761	51,531	525[5]	449	256
			(380) Biel	150,477	74,118	74,404	70,764	629[6]	285	2,726
			(390) LaChaux-de-Fonds	89,761	46,457	46,572	45,674	684	184	30
			(400) Delemont (Inter-Jura)	85,125	38,436	39,306	37,989	422	136	759

Table 3. (continued) Population, employment and commuting in central place regions of Switzerland

HIGHER-ORDER CENTRAL PLACE REGION			MIDDLE ORDER (MO) CENTRAL PLACE REGION				Destinations of Commuters[1], 1970 (originating in MO)			
URBAN REGION Urban Core	Population 1970	Employment 1970	Name	Population 1970	Employment 1970	Total Commuters	Destinations in MO of Residence	Destinations in Rest of Urban Region: Urban Core	Destinations in Rest of Urban Region: Remaining MO's	Other Urban Regions[2]
(07) Bern	752,226	358,175	(410) Bern	371,844	185,268	176,834	173,427	-	1,932	1,475
			(420) Solothurn	126,650	65,577	63,698	60,932	440	284	2,042
			(430) Burgdorf	88,136	37,948	40,691	36,505	2,549	1,362	275
			(440) Interlaken	40,802	17,674	17,808	17,501	99	199	9
			(450) Thun	124,794	51,708	53,774	50,334	3,204	198	38
(08) Chur	207,671	95,961	(460) Chur	115,627	52,468	52,607	52,071	-	487	49
			(470) Buchs-Sargans	52,904	22,888	23,354	22,213	369	0	772
			(480) Davos	10,238	5,716	5,601	5,580	21	0	0
			(490) St. Moritz-Samedan	28,902	14,889	14,878	14,876	0	0	2
(09) Fribourg	189,598	79,696	(500) Fribourg	111,936	46,901	48,711	44,833	-	447	3,431
			(510) Payerne	36,267	16,066	16,880	15,526	638	50	666
			(520) Bulle	41,395	16,729	17,736	16,347	779	70	540
(10) Lugano-Bellinzona	252,777	110,551	(530) Lugano	93,139	41,878	41,422	40,201	408[7]	650	163
			(540) Bellinzona	67,742	29,720	29,629	28,521	582[8]	510	16
			(550) Locarno	52,289	22,781	23,082	22,223	848	5	6
			(560) Chiasso-Mendrisio	39,607	16,172	16,721	15,557	1,036	8	120
(11) Geneve	359,572	184,179	(570) Geneve	331,131	172,995	169,768	168,941	-	308	519
			(580) Nyon	28,441	11,184	13,595	10,492	2,694	-	409
(12) Lausanne	498,407	239,106	(590) Lausanne	266,916	134,747	130,777	126,875	-	2,441	1,461
			(600) Morges-Rolle	47,968	21,051	22,964	19,517	2,782	88	577
			(610) Yverdon	58,901	27,853	28,857	27,182	1,232	168	275
			(620) Vevey/Montreux	68,521	31,057	31,915	28,941	2,148	603	223
			(630) Monthey-Aigle	56,101	24,398	24,731	23,166	323	941	301
(13) Sion-Sierre	179,114	77,226	(640) Sion	80,216	36,364	35,391	34,849	-	402	140
			(650) Martigny	37,718	16,961	17,416	16,478	405	1	532
			(660) Brig-Visp	61,180	23,901	24,785	23,763	1,008	2	12

Footnotes:

[1]Defined to be a person who works outside of community of residence. Does not include foreign workers.

[2]Includes destinations in other countries.

[3]Cross-flow from Aarau to Olten.

[4]Cross-flow from Olten to Aarau.

[5]Cross-flow from Neuchâtel to Biel.

[6]Cross-flow from Biel to Neuchâtel.

[7]Cross-flow from Lugano to Bellinzona.

[8]Cross-flow from Bellinzona to Lugano.

Source: Employment and commuting data were provided by Institut für Orts-, Regional- und Landesplanung, Eidgenössische Technische Hochschule, Zürich.

(central city, as listed in Table 2, plus suburbs) and (2) the middle-order central place regions that comprise the hinterlands of the 13 urban core areas. Population, employment, and commuting data for each of the 13 higher-order central place regions and for each of the 66 regional components are included in this table.

The main item of interest in the table is that each of the 13 regions is fairly self-contained with respect to commuting flows. The vast majority of commuters--persons who work outside of their communities of residence--work in the higher-order central place region in which they reside. This indicates that each of these regions satisfies the key concept of a functional urban region, i.e., the combination of places of employment with places of residence within a single spatial entity. Another item of interest is that many of the 49 middle-order regional components (excluding the 17 urban core components) are also fairly self-contained with respect to commuting flows, with the exception of those that are adjacent to an urban core component. Commuting linkages between the former component regions and their respective urban cores are fairly weak; furthermore, most of the commuters in these regions work in their respective region of residence. This indicates, tentatively, at least, the existence of numerous subregional employment centers within the hinterlands of the 13 larger regions. The relative importance of these subregional centers will be assessed during the course of the analysis of Swiss regional development, the overall results of which will be described in a later Research Memorandum in the HSS series of papers.

Appendix A. Components of Functional Urban Regions in the Federal Republic of Germany (without Berlin). (Kreis boundaries as of 1970.)

BADEN-WUERTTEMBERG

Urban Core	Hinterland Components[1]
Freiburg i. B. (KS)	Freiburg i. B. Emmendingen Muellheim Loerrach Saeckingen Hochschwarzwald Kehl Offenburg Lahr Wolfach
Heidenheim (LK)	Aalen Dillingen a. d. Donau (KS) Bayern Dillingen a. d. Donau Bayern Noerdlingen (KS) Bayern Noerdlingen Bayern
Heilbronn (KS)	Heilbronn Mosbach Kuenzelsau Oehringen Schwaeb. Hall Crailsheim Buchen

[1] All components refer to Landkreise unless otherwise indicated.

Explanation of abbreviations:

KS:	Kreisfrei Stadt
LK:	Landkreis
B-W:	Baden-Wuerttemberg
Nieders.:	Niedersachsen
N-W:	Nordrhein-Westfalen
R-P:	Rheinland-Pfalz
S-H:	Schleswig-Holstein

Karlsruhe (KS)	Karlsruhe Bruchsal Rastatt Baden-Baden(KS) Buehl Germersheim(R-P) Landau i. d. Pfalz (KS) (R-P) Landau - Bad Bergzabern (R-P)
Pforzheim (KS)	Pforzheim Calw Freudenstadt
Ravensburg (LK)	Lindau (Bodensee) (KS) Bayern Lindau (Bodensee) Bayern Wangen Tettnang Ueberlingen Sigmaringen Saulgau
Stuttgart (KS)	Ludwigsburg Backnang Waiblingen Esslingen Nuertingen Boeblingen Leonberg Vaihingen Goeppingen Schwaeb. Gmuend
Tuebingen (LK)-Reutlingen (LK)	Muensingen Hechingen Balingen Horb

Ulm (KS) - Neu Ulm (KS) Bayern	Neu Ulm, Bayern Guenzburg (KS) Bayern Guenzburg, Bayern Illertissen, Bayern Krumbach, Bayern Ulm Biberach Ehingen
Villingen (LK) - Konstanz (LK)	Rottweil Tuttlingen Donaueschingen Stockach Waldshut

BAYERN

Urban Core	Hinterland Components
Amberg (KS)	Amberg Schwandorf i. B. (KS) Burglengenfeld Nabburg Neunburg vorm Wald Oberviechtach
Aschaffenburg (KS)	Aschaffenburg Lohr a. Main Obernburg a. Main Miltenberg
Augsburg (KS)	Augsburg Friedberg Wertingen Schwabmuenchen Aichach Donauwoerth
Bamberg (KS)	Bamberg Ebern
Bayreuth (KS)	Bayreuth Kemnath Kulmbach (KS) Kulmbach Stadtsteinach
Coburg (KS)	Coburg Neustadt b. Coburg (KS) Kronach Lichtenfels Staffelstein

Hof (KS)	Hof Selb (KS) Rehau Naila Muenchberg Wunsiedel Marktredwitz (KS) Tirschenreuth
Ingolstadt (KS)	Ingolstadt Schrobenhausen Neuburg a. d. Donau (KS) Neuburg a. d. Donau Eichstaett (KS) Eichstaett Riedenburg
Kempten (Allgau) (KS)	Kempten Mindelheim Kaufbeuren (KS) Kaufbeuren Memmingen (KS) Memmingen Marktoberdorf Fuessen Sonthofen
Landshut (KS)	Landshut Rottenburg a. d. Laaber Mallersdorf Vilsbiburg Dingolfing Landau a. d. Isar Eggenfelden Altoetting Muehldorf Pfarrkirchen
Muenchen (KS)	Muenchen Landsberg a. Lech (KS) Landsberg a. Lech Fuerstenfeldbruck Dachau Wasserburg a. Inn Starnberg Wolfratshausen

Muenchen (KS) cont.	Pfaffenhofen a. d. Inn
	Freising (KS)
	Freising
	Erding
	Ebersberg
	Mainburg
	Miesbach
	Bad Toelz
	Schongau
	Weilheim i. Ob.
	Garmisch-Partenkirchen
Nuernberg (KS) - Fuerth (KS) - Erlangen (KS)	Nuernberg
	Fuerth
	Erlangen
	Forchheim(KS)
	Forchheim
	Hoechstadt a. d. Aisch
	Ebermannstadt
	Lauf (Pegnitz)
	Hersbruck
	Schwabach (KS)
	Schwabach
	Neustadt a. d. Aisch
	Hilpoltstein
	Scheinfeld
	Uffenheim
	Rothenburg ob d. Tauber (KS)
	Rothenburg ob d. Tauber
	Ansbach (KS)
	Ansbach
	Feuchtwangen
	Dinkelsbuehl
	Gunzenhausen
	Weissenburg i. B. (KS)
	Weissenburg i. B.
	Pegnitz
	Eschenbach i. d. Opf.
	Sulzbach-Rosenberg
	Neumarkt i. d. Opf. (KS)
	Neumarkt i. d. Opf.
	Beilngries

Regensburg (KS)	Regensburg Kelheim Parsberg Roding Cham Koetzting Waldmuenchen
Rosenheim (KS)	Rosenheim Bad Aibling Traunstein(KS) Traunstein Laufen Bad Reichenhall (KS) Berchtesgaden
Schweinfurt (KS)	Schweinfurt Hassfurt Hofheim i. Ufr. Hammelburg Gerolzhofen Bad Kissingen (KS) Bad Kissingen Bad Neustadt a. d. Saale Mellrichstadt Koenigshofen i. Grabfeld
Straubing (KS) - Passau (KS)	Straubing Bogen Deggendorf (KS) Deggendorf Viechtach Regen Grafenau Vilshofen Passau Wolfstein Wegscheid Griesbach
Weiden i. d. Opf. (KS)	Neustadt a. d. Waldnaab Vohenstrauss

Wuerzburg (KS)	Wuerzburg
	Karlstadt
	Kitzingen (KS)
	Kitzingen
	Ochsenfurt
	Marktheidenfeld
	Gemuenden
	Tauberbischofsheim (B-W)
	Mergentheim (B-W)

BREMEN

Urban Core	Hinterland Components
Bremen	Osterholz (Nieders.) Bremervoerde (Nieders.) Rotenburg (Wuemme) (Nieders.) Verden (Nieders.) Grafschaft Hoya (Nieders.) Delmenhorst (KS) (Nieders.) Grafschaft Diepholz (Nieders.) Wesermarsch (Nieders.)
Bremerhaven	Wesermuende (Nieders.) Land Handeln (Nieders.) Cuxhaven (KS) (Nieders.)

HAMBURG

Urban Core	Hinterland Components
Hamburg (Land)	Pinneberg (S-H) Segeberg (S-H) Storman (S-H) Hzgt. Lauenburg (S-H) Harburg (Nieders.) Stade (Nieders.) Soltau (Nieders.)

HESSEN

Urban Core	Hinterland Components
Darmstadt (KS)	Darmstadt Dieburg Erbach
Frankfurt (KS)	Hanau (KS) Hanau Offenbach (KS) Offenbach Main-Taunus-Kreis Obertaunuskreis Usingen Friedberg Gross-Gerau Alzenau i. Ufr. (Bayern) Gelnhausen Schluechtern Buedingen
Fulda (KS)	Fulda Huenfeld Lauterbach Bad Brueckenau (Bayern) Rotenburg a. d. Fulda Hersfeld
Giessen (KS)	Giessen Wetzlar Oberlahnkreis Alsfeld
Kassel (KS)	Kassel Hofgeismar Wolfhagen Witzenhausen Melsungen Eschwege Fritzlar-Homberg Warburg (N-W) Frankenburg Waldeck Muenden (Nieders.)

Marburg a. d. Lahn (KS)	Marburg a. d. Lahn Biedenkopf Dillkreis Ziegenhain

NIEDERSACHSEN

Urban Core	Hinterland Components
Braunschweig (KS) - Salzgitter (KS)	Braunschweig Wolfenbuettel Goslar (KS) Goslar Gandersheim Zellerfeld Blankenburg Osterode a. Harz
Celle (KS)	Celle
Emden (KS)	Aurich Aschendorf-Huemmling Norden Leer
Goettingen (LS)	Northeim Einbeck Duderstadt
Hameln (KS)	Hameln-Pyrmont Holzminden
Hannover (KS)	Hannover Springe Grafschaft Schaumburg Neustadt a. R. Nienburg (Weser) Peine Burgdorf Fallingbostel Schaumburg-Lippe
Hildesheim (KS)	Hildesheim-Marienburg Alfeld

Lueneburg (KS)	Lueneburg Uelzen Luechow-Dannenberg
Oldenburg (KS)	Oldenburg Ammerland Cloppenburg
Osnabrueck (KS)	Osnabrueck Bersenbrueck Wittlage Melle Teklenburg (N-W) Vechta
Wilhelmshaven (KS)	Friesland Wittmund
Wolfsburg (KS)	Gifhorn Helmstedt

NORDRHEIN-WESTFALEN

Urban Core	Hinterland Components
Aachen (KS)	Aachen Monschau Selfkantkreis Geilenkirchen-Heinsberg Juelich
Bielefeld (KS)	Bielefeld Halle (Westf.) Herford Wiedenbrueck Lemgo Detmold Minden Luebbecke
Bocholt (KS)	Borken Rees Kleve
Bochum (KS)	Wattenscheid (KS) Wanne-Eickel (KS) Herne (KS) Witten (KS) Recklinghausen (KS) Recklinghausen
Bonn (KS)	Rhein-Sieg-Kreis Ahrweiler (R-P)
Dortmund (KS)	Castrop-Rauxel (KS) Luenen (KS) Unna Luedinghausen Iserlohn (KS) Iserlohn Arnsberg Meschede Brilon

Dueren (LK)	Dueren
Duisburg (KS)	Oberhausen (KS) Dinslaken Moers
Duesseldorf (KS)	Duesseldorf-Mettman Leverkusen (KS) Nuess (KS) Grevenbroich Rhein-Wupper-Kreis Solingen (KS)
Essen (KS)	Gelsenkirchen (KS) Gladbeck (KS) Bottrop (KS) Muelheim a. d. Ruhr (KS)
Hamm (KS)	Beckum Soest
Koeln (KS)	Koeln Euskirchen Bergheim (Erft) Rheinisch-Bergischer Kreis Oberbergischer Kreis Schleiden
Krefeld (KS)	Kempen-Krefeld Geldern
Luedenscheid (LK)	Luedenscheid
Moenchengladbach (KS)	Rheydt (KS) Erkelenz

Muenster (Westf.) (KS)	Muenster (Westf.) Steinfurt Warendorf Coesfeld Ahaus Lingen (Nieders.) Meppen (Nieders.) Grafschaft Bentheim (Nieders.)
Paderborn (LK)	Bueren Hoexter Lippstadt
Siegen (LK)	Altenkirchen (R-P) Olpe Wittgenstein
Wuppertal (KS)	Remscheid (KS) Ennepe-Ruhr Kreis Hagen (KS)

RHEINLAND-PFALZ

Urban Core	Hinterland Components
Kaiserslautern (KS)	Kaiserslautern Kusel Donnersbergkreis
Koblenz (KS)	Mayen-Koblenz Unterwesterwaldkreis Rhein-Lahn-Kreis Rhein-Hunsrueck-Kreis Cochem-Zell Daun Oberwesterwaldkreis Limburg (Hessen)
Ludwigshafen a. R. (KS) - Heidelberg (KS) - Mannheim (KS)	Mannheim (B-W) Heidelberg (B-W) Sinsheim (B-W) Bergstrasse (Hessen) Ludwigshafen a. R. Bad Duerkheim Frankenthal (KS) Speyer (KS) Worms (KS) Neustadt a. d. W. (KS)
Mainz (KS) - Wiesbaden (KS)	Untertaunuskreis (Hessen) Rheingaukreis (Hessen) Mainz-Bingen Alzey-Worms Bad Kreuznach Birkenfeld
Pirmasens (KS)	Pirmasens
Trier (KS)	Trier-Saarburg Bernkastel-Wittlich Bitburg-Pruem

SAARLAND

Urban Core	Hinterland Components
Saarbruecken (KS)	Saarbruecken
	Saarlouis
	Merzig-Wadern
	St. Wendel
	Ottweiler
	St. Ingbert
	Homburg
	Zweibruecken (KS) (R-P)
	Zweibruecken (R-P)

SCHLESWIG-HOLSTEIN

Urban Core	Hinterland Components
Flensburg (KS)	Flensburg Land Schleswig Nordfriesland
Kiel (KS)	Rendsburg-Eckernfoede Neumuenster (KS) Steinburg Dithmarschen Ploen
Luebeck (KS)	Ostholstein

Sources: The commuting data that were used to define functional urban regions are available in the following publications:

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