 0030-0950/84/0001-0002 $2.00/0

SPATIAL VARIATION IN THE RATES OF UNEMPLOYMENT IN OHIO BY COUNTY, JANUARY 1981–JULY 1982[1]

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ABSTRACT. Spatial patterns of unemployment by county in Ohio are analyzed using quarterly labor statistics from January 1981 to July 1982. A cluster analysis grouped the 88 counties into 3 primary regions, 2 secondary groups, and 3 outlier counties. Eighty of the counties lie in the 3 primary groups, which are characterized as low, average, and high unemployment areas in relation to the statewide trend in unemployment during this period. Counties in the low unemployment group have a diversified economy and are generally located in the central corridor of Ohio extending from Cincinnati to Cleveland. Counties in the high unemployment region are located primarily in southern Ohio and contain a rural population with a high level of poverty. The county unemployment rates are also correlated with the percentage of employment concentrated in the major economic sectors. The manufacturing and agricultural sectors show positive correlations to unemployment, whereas finance, insurance, and real estate (F.I.R.E.), services, and trade show strong negative correlation.

OHIO J. SCI. 84 (1): 2–7, 1984

INTRODUCTION

Increasing unemployment has been one of the most severe problems facing the United States during the early 1980s. The impact of these high levels of unemployment has been felt in numerous ways, including long lines at unemployment offices, decreased spending and investment, defaulted mortgages, a depressed economy, and increased human suffering. Unemployment played a significant role in the recent elections for state and local offices. All candidates were forced to focus their attention on the unemployment issue in their campaigns.

Although the effects of unemployment have been felt nationwide, the most severe impact has been experienced in the Great Lakes region. The states of Michigan and Ohio have consistently recorded the highest rates of unemployment in the nation (fig. 1). As the national rate of unemployment rose to over 10% in late 1982, unemployment in Michigan and Ohio ranged from 12 to 16% (U.S. Dep. Labor 1981, 1982).

In Ohio, the statewide unemployment figures do not reflect the varying levels of unemployment occurring within different regions of the state. By using statistical methods to analyze the unemployment rates by county, it may be possible to define regional unemployment patterns and show correlations between the patterns and the employment structure.

This paper presents results from research into spatial and temporal trends of unemployment in Ohio beginning in 1981 and continuing through July 1982. Regions within Ohio that have had similar

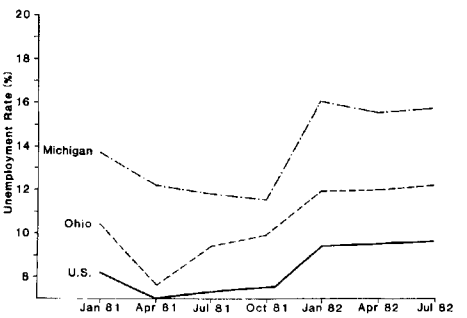

FIGURE 1. Rates of unemployment in Michigan, Ohio, and the United States, January 1981–July 1982.

[1]Manuscript received 11 March 1983 and in revised form 31 August 1983 (#83–9).

trends in unemployment over the period of the study are defined. Unemployment patterns in Ohio are also analyzed to determine relationships to the structure of employment within the state in 1980. Data for the study are taken from county-level unemployment figures tabulated by the Ohio Bureau of Employment Services (1981, 1982). Seven time periods are selected at 3-month intervals beginning with January 1981 and ending in July 1982.

METHODS

The pattern of unemployment within Ohio is first analyzed through a series of maps, one for each of the 7 quarters (fig. 2). Rather than mapping the unemployment rates (percent of work force unemployed) for each period directly, standardized (Z) scores were calculated for each county (i) as follows:

$$Z_i = \frac{U_i - \overline{U}}{SD}$$

where Z_i = standardized unemployment rate for county i, U_i = actual unemployment rate for county i, $\overline{U}$ = mean of the unemployment rates for the counties, SD = standard deviation of the unemployment rates for the counties.

Using this procedure, the patterns of unemployment during the 7 periods can be mapped and compared more easily because the influence of the average statewide unemployment rate has been removed. Counties more than one standard deviation above the mean state unemployment rate (Z scores greater than 1.0) are labeled high unemployment areas, and counties more than one standard deviation below the mean (Z scores less than -1.0) are labeled low unemployment areas (fig. 2).

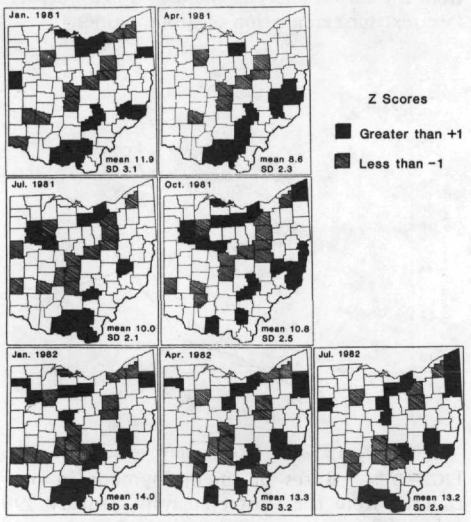

FIGURE 2. Unemployment rates in Ohio, represented as Z scores, January 1981–July 1982.

Regional patterns emerge when the 7 unemployment maps are examined. Areas of high unemployment generally occur in the southern and southwestern sections of the state. Some individual counties in the north are also high unemployment areas. Rates of low unemployment occur predominantly in the central areas of Ohio. Although some general patterns do appear, attempts to synthesize information from these 7 individual maps result in many difficulties in defining the unemployment regions within Ohio.

To overcome the limitations encountered when using separate maps, the unemployment data for the 7 time periods are analyzed using a hierarchical clustering analysis, an example of numerical taxonomy (King 1969, Ward 1963). This technique begins with the 88 counties of Ohio represented as points in a 7-dimensional mathematical space of unemployment rates. Each of the 7 dimensions represents the unemployment for one time period in the study. The procedure is a mathematical extension of the simple 2-dimensional scattergram of points used to represent the location of observations defined graphically for only 2 variables. Distances between all points or counties in the mathematical space are then calculated. Counties with similar unemployment trends during the 7 periods would lie close to each other and have a small unemployment distance.

The clustering procedure begins by grouping the 2 counties that lie closest together in unemployment distance. Of the 88 counties in Ohio, these 2 would have the most similar unemployment profile over the 7 periods. The next closest counties or groups of counties in the mathematical space are then grouped. Eventually, after the grouping process has been completed, all counties end up in one large group. However, if the clustering process is stopped before reaching this stage, a small number of groups are produced. These clusters represent unemployment regions within the state that have similar unemployment trends over the 7 periods of study.

The unemployment data for Ohio by county are also examined in relation to the general structure of employment in the state at the beginning of the period covered in the study. Data are analyzed to determine whether a relationship exists between the level of unemployment and the type of economic activities represented in each of the counties (Ohio Bur. Employment Services 1980). The percentage of employment in 1980 is tabulated for the following 9 categories: (1) agriculture, (2) mining, (3) construction, (4) manufacturing, (5) transportation and utilities, (6) wholesale and retail trade, (7) services, (8) finance, insurance, real estate (F.I.R.E.), and (9) government.

Two procedures are used to look for relationships between the rate of unemployment and the distribution of employment by category. Pearson correlation coefficients are calculated between the 9 employment classes and the 7 unemployment periods. The resulting matrix of correlation values shows the relationship between the structure of employment and the level of unemployment across the counties of Ohio.

Another way to examine this relationship uses the 3 primary unemployment regions defined in the cluster analysis. For each region and the state as a whole, the mean percentage employment for 1980 in each of the 9 employment categories is calculated by averaging the corresponding values for the counties comprising each unemployment region. An examination of these mean employment percentages offers further evidence for understanding the relationship between employment structure and unemployment rates.

RESULTS

When the clustering procedure is applied to the unemployment data for the 88 Ohio counties and the 7 time periods, 8 classes or groups emerge. Eighty counties fall into 3 primary groups (labeled low, average, and high unemployment respectively), based on their mean unemployment rates during the 7 periods (fig. 3). The pattern of unemployment rates for each primary group closely follows the statewide trend; the high unemployment region is about 4–5% above the state rate and the low unemployment region about 2–3% below the state figures. The counties in the average unemployment region lie within one percent of the state unemployment rate for the 7 periods (fig. 3).

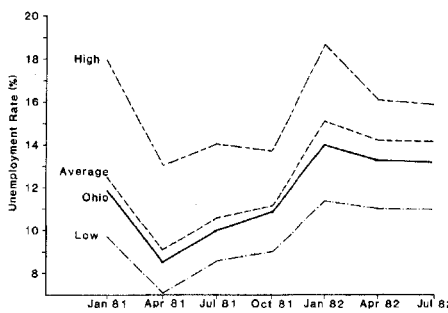

FIGURE 3. Mean rates of unemployment for Ohio and the primary groups (high, average, low) from the cluster analysis, January 1981–July 1982. (See text for explanation of group names.)

The 8 counties in Ohio that did not cluster into the 3 primary regions based on recent unemployment trends experienced unemployment patterns that were different from the set of primary regions within the state. The cluster analysis produced 2 secondary groups (labeled A and B), representing counties which differed significantly in unemployment trends from the 3 primary groups (fig. 4). Only 3 counties clustered into group A and 2 counties to group B. Three of Ohio's counties (Mercer, Monroe, and Adams) experienced unemployment trends over the 7 periods that did not match any other counties in the state (fig. 5). These counties are labeled "outliers" and represent unique, localized elements of Ohio's unemployment picture.

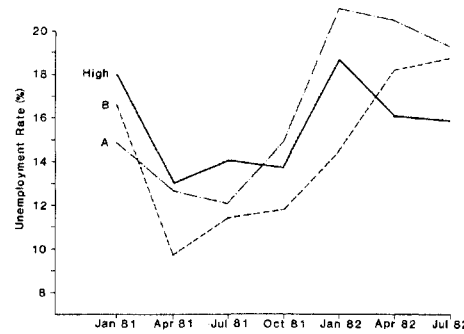

FIGURE 4. Mean rates of unemployment in secondary groups (A and B) and the high primary group from the cluster analysis, January 1981–July 1982. (See text for explanation of group names.)

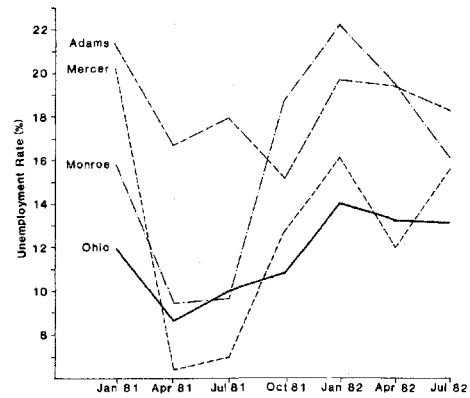

FIGURE 5. Rates of unemployment in outlier counties from the cluster analysis, January 1981–July 1982.

Correlations between employment structure and unemployment rate that are significant at probability levels equal to or greater than 95% are shown in table 1. This procedure shows that the employment categories of trade, services and F.I.R.E., are most strongly related to unemployment. Because the correlations are negative, the higher the employment percentage in each of the 3 categories for the counties of Ohio, the lower the unemployment rate. The negative correlations for services are especially strong. The employment categories of agriculture and manufacturing have significant positive correlations with unemployment rates for some of the time periods (table 1). This result shows that the counties in Ohio with a high rate of unemployment tend to have a larger concentration of agricultural and manufacturing employment. The data also indicate that during the later time periods, the relationship between level of unemployment and percentage of manufacturing employment was the strongest.

When the average employment percentages are calculated for the 3 primary regions from the cluster analysis, differences that occur are generally small (table 2). The region of low unemployment has high levels of employment in services and trade and low percentages in agriculture and manufacturing. The high unemployment region is characterized by high levels of manufacturing and government employment and low levels of services and trade. The results from this analysis correspond rather closely with the results of the earlier correlation analysis.

DISCUSSION

The location of counties for each of the primary regions follows a general pattern within the state (fig. 6). Counties in the low unemployment group lie predominantly in the central corridor of development that runs from Cincinnati to Cleveland and includes Dayton, Columbus, Wooster, and Akron. In addition to many major urban centers, this region contains major transportation routes and a diversified economy with high technology industry and productive agriculture. Except for Cuyahoga Co., automobile and steel-related industries, recently prone to high unemployment, do not predominate in this corridor (Noble and Korsok 1975).

Counties in the high unemployment group are primarily in the extreme southern sector of Ohio (fig. 6). This region is characterized by a rural population and a high level of poverty. Small industries, lumbering, and small-scale agriculture are important activities. Unemployment

TABLE 1

Correlation coefficients relating unemployment rates (1981–82) to employment categories (1980) by county in Ohio.

	Jan 81	Apr 81	July 81	Oct 81	Jan 82	Apr 82	July 82
Ag.	.18*	.23			.23	.18	
Mining		.29**			.21		
Const.							
Mfg.				.18	.22	.21	
Trans.		.23	.26				
Trade	−.25	−.20		−.21	−.40	−.24	−.19
F.I.R.E.	−.19	−.22	−.20	−.20	−.34	−.23	
Services	−.30	−.28	−.20	−.29	−.42	−.26	−.18
Govt.						−.23	

*Non-underlined values: Significant at levels between 95-99%
**Underlined values: Significant at levels greater than 99%

TABLE 2

Employment in percent by major category for the State of Ohio and 3 primary unemployment regions, 1980.

	State	Unemployment Regions Low	Average	High
Ag.	7.1	5.9	7.9	6.0
Mining	2.8	1.0	4.3	1.1
Const.	3.8	4.1	3.5	3.9
Mfg.	33.1	32.3	33.8	36.1
Trans.	4.0	3.8	4.1	4.1
Trade	19.2	20.4	18.6	18.3
F.I.R.E.	3.1	3.4	2.8	2.8
Services	12.0	13.4	11.1	10.6
Govt.	14.3	14.9	13.3	15.8

in primary metal industries occurs in the Portsmouth area of Scioto Co., located on the Ohio River. High levels of unemployment have been a long-standing problem in this section of Appalachia (Noble and Korsok 1975).

The counties grouped in the average unemployment category consist of 3 subregions (fig. 6). Most counties in northwestern Ohio have unemployment rates that are close to the statewide average. This region has high levels of agricultural activity with related industrial activity in agricultural products and equipment. Some industry in the northern part of this region relates to the auto industry in nearby Michigan. A second zone of average unemployment rates occurs in eastern Ohio along the Pennsylvania and West Virginia borders. This rural area has a relatively depressed economy with small industries and poor agriculture. The region is influenced by the poor economic conditions in steel and related industries of the West Virginia panhandle and western Pennsylvania. The third area of average unemployment occurs between the low unemployment corridor in central Ohio and the southern zone of high unemployment. This subregion represents a transition area between the two extreme zones of unemployment rates.

The counties of Guernsey, Noble and Perry in the southeastern coal region which make up secondary group A, experienced levels of unemployment between 13–15% during the early time periods and very high levels (over 18%) during the late time periods. Secondary group B, consisting of Lorain and Mahoning Counties (Youngstown) in northeastern Ohio, reflects unemployment trends in the steel and automobile industries as well as support activities for these major employment categories. When compared with the state-

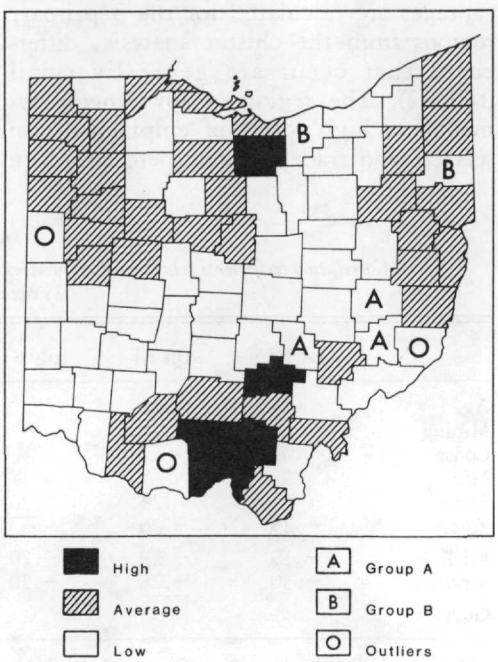

FIGURE 6. Unemployment regions in Ohio as derived by the cluster analysis.

wide unemployment trends, group B experienced unemployment rates over 15% in the early and late time periods but average unemployment (around 10–12%) during the middle period.

The 3 outliers which emerged from the cluster analysis did not share similar trends in unemployment with other counties in the state during the period of analysis (fig. 6). Adams Co., adjacent to the Ohio River, experienced the highest unemployment rate in the state during January 1981 (21%), as well as very high unemployment in the later periods (fig. 5). Monroe Co., in the Appalachian coal area of southeastern Ohio, experienced extreme variations in unemployment rates throughout the 7 periods. Whereas its unemployment was among the highest in the state during late 1981 and early 1982, the unemployment rate came close to the state average in earlier periods (fig. 5). Mercer Co., in the agricultural area of western Ohio on the Indiana border, experienced large fluctuations in unemployment. Whereas the unemployment rate in January 1981 was among the highest in Ohio, the rates in April and July 1981 were significantly below the state average. During the later time periods, Mercer Co. unemployment was close to the state average (fig. 5). In each of the 3 outlier counties, local rather than regional influences appear more significant in establishing unemployment trends.

Although the unemployment rate in Ohio was among the highest in the country during the early 1980s, much variation in unemployment levels occurred within the state. The methods of analysis presented in this paper offer a means of uncovering regional unemployment patterns and examining their relationship to economic activity. The results of the cluster analysis showed that most Ohio counties followed the state trends across the 7 time periods of study. However, 8 counties diverged significantly from these general trends. Further research will help to determine whether the unemployment patterns found here are related to the period of study or are associated with longer-range economic structures within the state.

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