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SPATIAL ASPECTS OF WAGE INFLATION WITHIN THE URBAN SYSTEM OF THE UNITED STATES

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SPATIAL ASPECTS OF WAGE INFLATION WITHIN THE URBAN SYSTEM OF THE UNITED STATES

A DISSERTATION

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By

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SPATIAL ASPECTS OF WAGE INFLATION

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A DISSERTATION

APPROVED FOR THE DEPARTMENT OF GEOGRAPHY

By

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Chapter 1

INTRODUCTION

The acceleration of inflation and high unemployment rates have been a major cause of concern in the United States since the mid-60s. Researchers and policy makers have also increasingly suspected the validity of traditional economic policies which have been used to curb inflation. The major theoretical foundation of conventional economic policy derives from the classical Phillips (1958) hypothesis: that the excess demand for labor is related to the rate of wage inflation and that the unemployment rate can be used as a proxy for this excess demand. This hypothesis was further developed by Lipsey (1960), Hansen (1970), Perry (1964) and many others, and evaluated on numerous occasions in the U.S., Britain and several other countries. Recently various neoclassical writers (Mortensen, 1970; and Phelps, 1970, are early examples) have challenged the stability of the relationship. According to their thesis, there is no trade-off between unemployment and inflation in the long run. The adjustment of wages to price expectations will keep the unemployment rate near or at its natural rate (this is the so-called natural rate hypothesis). Any trade-off that is detected between unemployment and wage inflation, therefore, is a short-run phenomenon and must be caused by adjustment lags and money illusion.

Most of the initial research in this field was of an aggregate, macro-economic nature and ignored the importance of individual labor sub-market adjustment mechanisms in the wage determination process. The pioneer work of Lipsey (1960) acknowledged the possibility that the state of the national economy is not independent of the economic performance of its constituent geographical regions. His aggregation hypothesis suggests that a more even distribution of demand for labor among regions could dampen wage inflation without the expense of high unemployment. Several researchers (e.g., Archibald, 1969; Hewings, 1978; Thomas and Stoney, 1972; Thirlwall, 1969) have tested this hypothesis for industrial and/or geographic labor markets by using the variance of unemployment as a measure of dispersion in an attempt to better understand the wage-unemployment trade-off in the context of the national economy as a whole.

Other researchers (e.g., Brechling, 1974; Cowling and Metcalf, 1967; King and Forster, 1973; Hanham and Chang, 1981; Martin, 1978; Reed and Hutchison, 1976; Thirlwall, 1970 and Weissbrod, 1976) have also tested this aggregational hypothesis by applying the Phillips curve to individual labor markets. It is assumed that wage inflation may diffuse from market to market in a hierarchical or contagious manner. The national bargaining hypothesis (Thirlwall, 1970) and regional spread hypothesis (Cowling and Metcalf, 1967) are the dominant examples of this type of approach.

A transmission mechanism has also been used to explain regional differences in the fluctuation of unemployment rates (Bassett and Haggett, 1971; Brechling, 1967; King, Casetti and Jeffrey, 1969;

Jeffrey and Webb, 1972; and King and Clark, 1978). It is assumed that local trends in unemployment (the surrogate for excess demand for local labor) can be attributed to three components: one reflecting a structural mismatching of labor demand and supply; a second reflecting fluctuations in aggregate demand originating at the national level; and a third reflecting fluctuations in demand originating at the regional level. This last component can, furthermore, be partitioned according to a number of different regional influences, the constituent submarkets of which are known.

This approach to modeling the transmission of economic impulses serves as an innovative way of developing a model of wage rate change which incorporates the concept of submarket interdependency. The argument of this study procedes as follows. Local wage rate changes are assumed to be a function of each component of local unemployment, the surrogate for excess demand for local labor. The importance difference between this and other approaches to modelling wage rate change at the disaggregated level is that this one does not require the region, of which a particular submarket is a member, or the inter-submarket links to be predefined. Instead, it is part of the output of the modelling procedure. A submarket may, furthermore, be subject to more than one regional influence, and this procedure will allow for that possibility. In keeping with the tradition of research in this field, the influence of further factors upon wage rate changes in any given labor submarket can also be gauged (e.g. Albrecht, 1966; Brinner, 1977; Kaun and Spiro, 1970; Martin, 1979; and Thirlwall, 1970); These factors, such as price inflation, wage spread effects, and governmental wage and price controls can be included in the model as independent influences.

With this background in mind, therefore, the specific aims of this study are:

(1) to measure the degree and extent to which the structural, national and regional components of the excess demand for labor have influenced unemployment rates in U.S. metropolitan areas.

(2) to measure the degree and extent to which the structural, national and regional components of the excess demand for labor, together with price inflation, wage spread effects, and wage and price controls have influenced changes in wage rates within the labor submarkets that constitute the urban system of the United States, and

(3) to explain differences among labor markets in the sensitivity of wage changes to changes in the components of unemployment and to changes in the other variables in the wage equation.

The model developed in this research was applied to 99 U.S. Standard Metropolitan Statistical Areas (SMSAs) over the time period 1964-1978. These SMSAs (see Figure 1.1 and Table 1.1) were chosen on the basis of complete availability of data during the time period. Data for many other cities were either not available in the early years or were in other respects incomplete. The period 1964-1978 was chosen because it covers the change which began to occur in the mid-1960s in both the character of inflation and in its relation to unemployment. It incorporates two recessions, which took place at the end of the 1960s and in the middle 1970s, as well as a period of national wage and price control policy during the Nixon Administration (from 1971-1974).

The following Chapter presents an overview of the trends which have taken place in the economy since the mid-1960s. An assessment of the historical development of the national economy suggests that the inflationary bias in the economy was caused by a number of factors: the cumulative effects of Vietnam War expenditures; devaluation of the dollar; the OPEC oil embargo; mismangement of grain sales to the U.S.S.R.; and the deterioration of the federal budget balance. In the last two decades the nation has also experienced some dramatic regional changes. The economic rise of the Sun Belt states and the decline of Northeast ones have changed the surface of income distribution, federal spending and investment opportunities. Issues of equity and efficiency of federal policy toward regional development have attracted increasing attention. A comparative analysis of the changing spatial and temporal distribution of wage-unemployment relationship may shed some light on the development of appropriate regional development policies.

Chapter 3 provides a conceptual framework for the wage-unemployment relationship. Two distinct lines of research are discussed. One is mainly conducted by economists, and is concerned with the theory of the Phillips curve. The other is largely undertaken by geographers and is concerned with economic transmission mechanisms within urban systems. Chapter 4 presents evidence that metropolitan unemployment is a function of three major components, namely national, structural, and regional forces. Chapter 5 presents the results of the estimation of the wage determination model for the metropolitan areas of the country. Chapter 6 offers an explanation of spatial variations in the wage determination process. A summary, policy implications and suggestions for further research are provided in Chapter 7.

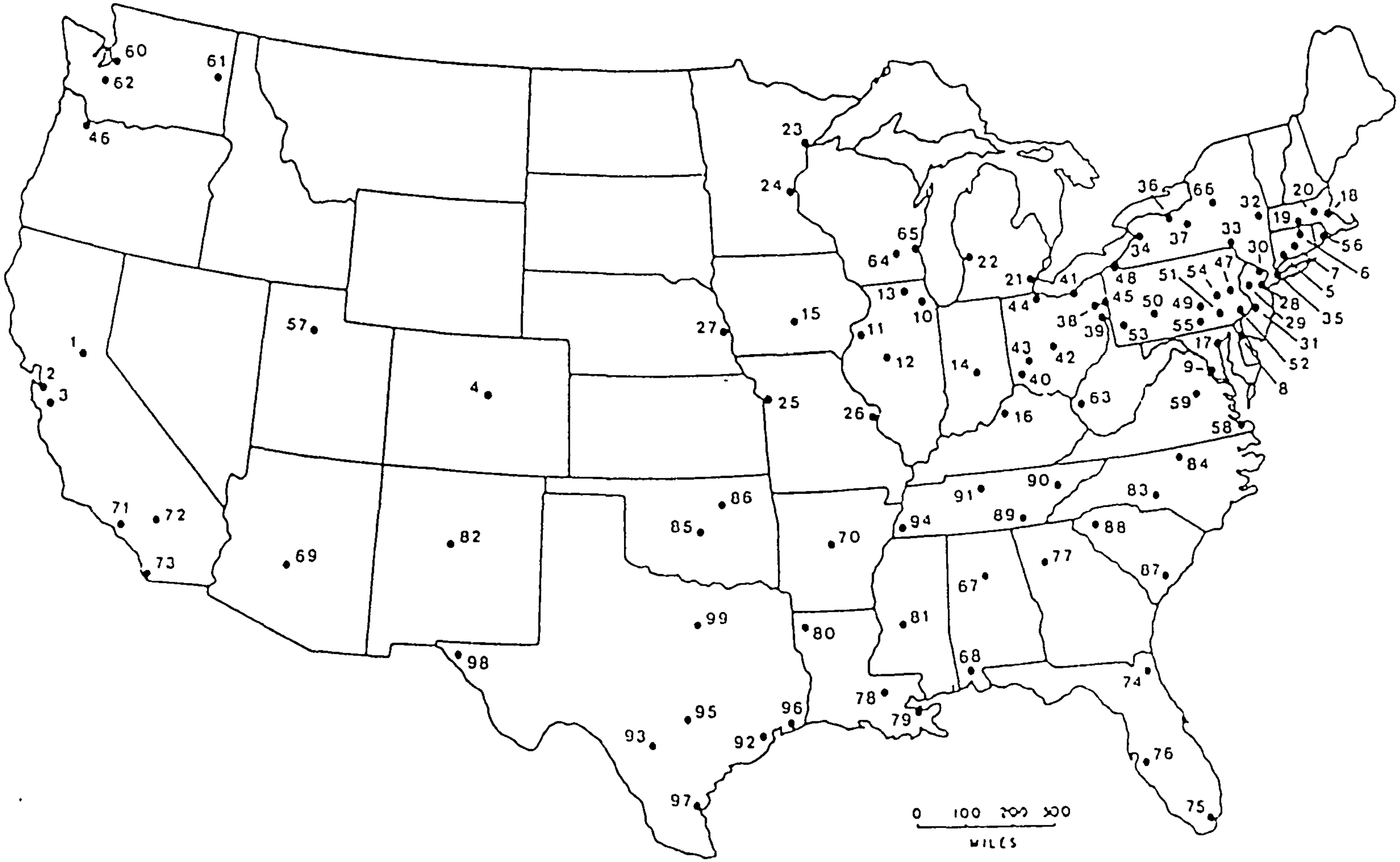


Figure 1.1. SMSAs used in the study

Table 1.1 SMSAs used in the study

CODES	METROPOLITAN AREAS
1	Sacramento, California
2	San Francisco-Oakland, California
3	San Jose, California
4	Denver-Boulder, Colorado
5	Bridgeport, Connecticut
6	Hartford, Connecticut
7	New Haven-West Haven, Connecticut
8	Wilmington, Delaware
9	Washington, District of Columbia
10	Chicago, Illinois
11	Davenport-Rock Island-Moline, Illinois
12	Peoria, Illinois
13	Rockford, Illinois
14	Indianapolis, Indiana
15	Des Moines, Iowa
16	Louisville, Kentucky
17	Baltimore, Maryland
18	Boston, Massachusetts
19	Springfield-Chicopee-Holyoke, Massachusetts
20	Worcester, Massachusetts
21	Detroit, Michigan
22	Grand Rapids, Michigan

23	Duluth-Superior, Minnesota
24	Minneapolis-St. Paul, Minnesota
25	Kansas City, Missouri
26	St. Louis, Missouri
27	Omaha, Nebraska
28	Jersey City, New Jersey
29	Newark, New Jersey
30	Paterson-Clifton-Passaic, New Jersey
31	Trenton, New Jersey
32	Albany-Schenectady-Troy, New York
33	Binghamton, New York
34	Buffalo, New York
35	New York, New York
36	Rochester, New York
37	Syracuse, New York
38	Akron, Ohio
39	Canton, Ohio
40	Cincinnati, Ohio
41	Cleveland, Ohio
42	Columbus, Ohio
43	Dayton, Ohio
44	Toledo, Ohio
45	Youngstown-Warren, Ohio
46	Portland, Oregan
47	Allentown-Bethlehem-Easton, Pennsylvania
48	Erie, Pennsylvania

49	Harrisburg, Pennsylvania
50	Johnstown, Pennsylvania
51	Lancaster, Pennsylvania
52	Philadelphia, Pennsylvania
53	Pittsburgh, Pennsylvania
54	Reading, Pennsylvania
55	York, Pennsylvania
56	Providance-Warwick-Pawtucket, Rhode Island
57	Salt Lake City-Ogden, Utah
58	Norfolk-Virginia Beach-Portsmouth, Virginia
59	Richmond, Virginia
60	Seattle-Everett, Washington
61	Spokane, Washington
62	Tacoma, Washington
63	Huntington-Ashland, West Virginia
64	Madison, Wisconsin
65	Milwaukee, Wisconsin
66	Utica-Rome, New York
67	Birmingham, Alabama
68	Mobile, Alabama
69	Phoenix, Arizona
70	Little Rock-North Little Rock, Arkansas
71	Los Angeles-Long Beach, California
72	Riverside-San Bernardino-Ontario, California
73	San Diego, California
74	Jacksonville, Florida

75	Miami, Florida
76	Tampa-St. Petersburg, Florida
77	Atlanta, Georgia
78	Baton Rouge, Louisiana
79	New Orleans, Louisiana
80	Shreveport, Louisiana
81	Jackson, Mississippi
82	Albuquerque, New Mexico
83	Charlotte-Gastonia, North Carolina
84	Greensboro-Winston-Salem-High Point, North Carolina
85	Oklahoma City, Oklahoma
86	Tulsa, Oklahoma
87	Charleston-North Charleston, South Carolina
88	Greenville-Spartanburg, South Carolina
89	Chattanooga, Tennessee
90	Knoxville, Tennessee
91	Nashville, Tennessee
92	Houston, Texas
93	San Antonio, Texas
94	Memphis, Tennessee
95	Austin, Texas
96	Beamont-Port Arthur-Orange, Texas
97	Corpus Christi, Texas
98	El Paso, Texas
99	Dallas-Fort Worth, Texas

Chapter 2

TRENDS AND CHANGE IN THE U.S. ECONOMY

2.1. Introduction

Chronic inflation may well have been the outstanding feature of the American economy in the 1970s. According to numerous public opinion surveys conducted in the second half of that decade, the majority of Americans also regarded it as the most important domestic problem. Its significance is due to the fact that the character of inflation has changed. Inflation is now caused by a new set of factors, has created a new collection of problems, and will require a novel mix of solutions. It is also occuring in a unique period of the country's regional development, namely the shift in economic growth and power from the north to the south and west. Attention will be directed in this Chapter to trends in the behavior of the national economy since the mid-1960s and to the regional economic change that has taken place during this time period. First, the historical development of inflation will be discussed. Second, trends in unemployment and wage inflation will be assessed. Third, the wage and price control policy that was implemented during the Nixon administration to curb inflation will be examined. The regional changes in the nation's economy that have taken place since the 1960s will provide the focus of the last section.

2.2. Inflation in the National Economy

One of the characteristic features of inflation within the United States during the late 1960s and in the 1970s is the fact that the processes which gave rise to it have been cumulative. The result was a continuing and accelerating rate of inflation. This contrasts with the more typical form of inflation in which a single or cluster of processes give rise to a singular rise in the price level. The significance of this distinction lies not only in their casual differences, but also in the fact that the anti-inflationary policies which are applicable to each, and the benefits resulting from them, may also be quite different. Between 1952 and 1967, for example, the national inflation rate averaged 2 percent, rising briefly to only 3.4 percent in 1957. The first half of the 1960s was characterized by a continuous rise in the rate of growth in the money supply, but it also saw a rise in the rate of growth of real GNP, output, and productivity, a continuous decline in the unemployment rate, and a stable, but low, inflation rate.

Since 1965 a succession of events has taken place that has transformed the process of price and wage decision making in the American economy into one in which the inflationary pattern is now typified by persistently high and accelerating rates. There is great concern that the behavior of households and firms has been so changed that the process of price and wage decision making now inevitably results in a chronic inflation which stubbornly feeds on itself and speeds the wage-price spiral (Okun, 1977; Okun, 1979; Shapiro, 1977). In late 1965 the decision was made to finance the Vietnam buildup in what was an inflationary manner. Employment, production, capital spending, real incomes, and prices all rose. This was not unusual for a wartime period, but the end of the war was not accompanied by the usual end to inflation. Every year since 1968 has had a higher inflation rate than any of the previous fifteen. After a sharp rise in 1966 wage rates rose faster than productivity, raising unit labor costs and contributing to the rise in inflation. Furthermore, during the remainder of the 1960s the growth rate in the money supply exceeded that of real GNP. Although this expansion ended in 1969, the recession which followed barely affected the rate of increase in wages, and unit labor costs rose by 6.3 percent (Shapiro, 1977).

It appears that from this time price expectations became permanently altered, with a consequent effect on price and wage decision making. Okun argues that as people perceive that inflation persists they change their behavior in ways which make inflation more rapid and tenacious (Okun, 1979). The result is an economy that is dominated by 'cost-oriented' prices and 'equity-oriented' wages. Pricing policies are now geared to maintain a market share over the long run, and they are set to exceed costs by a percentage markup. The downward rigidity of wages is encouraged by a tendency on the part of the employers to maintain long term relationships with their workforce. Wage increases therefore tend to follow those of workers in similar situations. The fact that prices and wages no longer largely respond to excess supply and demand is due, in Okun's opinion, to the increasing importance that is attached to lasting relationships between employers and employees, particularly skilled ones. The result of these adaptations is a cumulative spiral in the inflation process.

The brief respite in 1971 and 1972 which was caused by the mandatory wage price controls of the Nixon Administration's Economic Stabilization Program was followed by a rapid increase in inflation. A number of events about this time conspired to reinforce the changes which already were taking place with regard to price and wage decision making. These include the shift from fixed to flexible foreign exchange rates in 1971, an excessive monetary and fiscal stimulus applied in 1972, and the devaluation of the dollar, the mismanagement of U.S. grain supplies, and the sudden rise in OPEC oil prices in 1973 and 1974 (Okun, 1977; Shapiro, 1977). Even the severe recession of 1973-75 did not have a lasting effect on the ensuing inflation rate, which declined to about 6 percent but then began to rise steadily after 1977.

The economy was subjected to a further inflationary shock in 1979 when oil prices were again substantially raised by OPEC. The Carter administration initiated a restrictive monetary and fiscal policy toward the end of its term, which was drastically reinforced by the Reagan administration. As a result, inflation has been brought down to levels not seen in the U.S. economy since the 1960s, albeit at enormous cost to the economy in terms of unemployment and underutilized productive capacity. Whether the inflationary pressure has been squeezed out of the economy has yet to be seen.

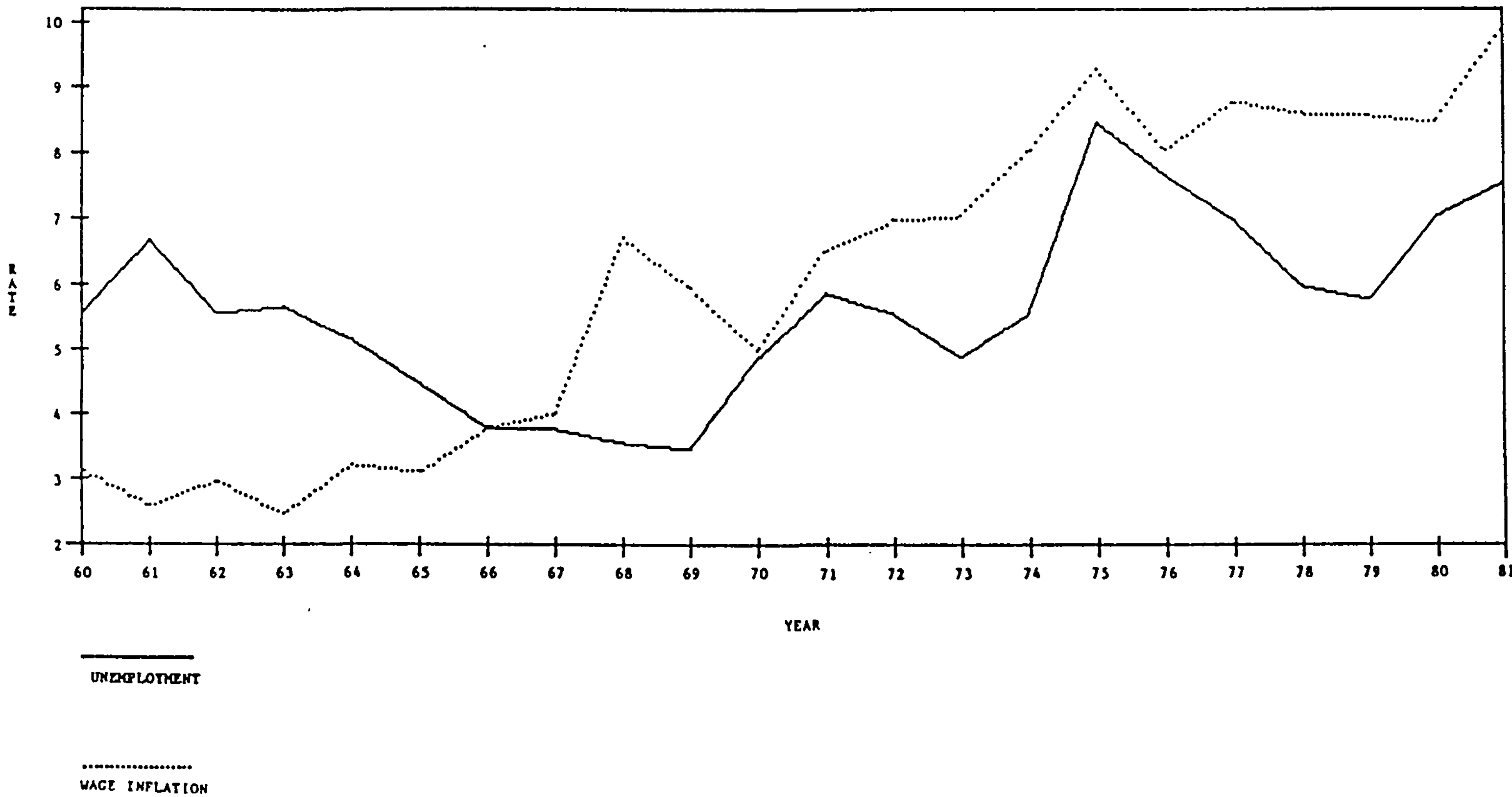
2.3. Unemployment and Wage Trends in the National Economy

Between 1960 and 1981, the nation's economy experienced substantial, but not uninterrupted economic growth. There were four recessions during the period, all characterized by a substantial increase in unemployment. The extent to which the recessions have impacted on wage rate changes and unemployment varied.

During the period from 1960 to 1966, the average hourly earnings for manufacturing workers increased at an average rate of 3.0 percent annually, compared with 7.4 percent from 1967 to 1981. Figure 2.1 shows that during the 1961-62 period, nation's economy suffered its forth postwar recession. The unemployment rate rose to 6.7 percent in 1961 while wage inflation decreased to 2.6 percent. In 1962, the nation's economy had moved to a full recovery. By 1964-65 a number of 'Great Society' social programs were initialed along with a substantially increased involvement in Vietnam. Both possessed potential inflationary pressures for the economy. Wage inflation stood at around 3 percent level and the unemployment rate slowly declined from a recession trough of 6.7 percent to 3.8 percent in 1966. After 1965, inflation became a continuing and pervasive problem in the national economy. Wage inflation jumped from 3.8 percent in 1966 to 6.7 in 1968 while the unemployment rate slowly declined to a low level of 3.6 percent since recession.

During the 1970-71 recession, money wages rose as rapidly as during the recovery phase of the previous business cycle, until wage controls were instituted in August, 1971. Nevertheless, the yearly average wage rate changes rose to 6.6 percent, which was 1.5 points higher than it was a year earlier. Wages continued to rise, albeit at a slower rate, despite the wage and price controls policy. For

Figure 2.1. UNEMPLOYMENT AND WAGE INFLATION TRENDS IN THE NATIONAL ECONOMY



essentially the first time in the nation's history, the behavior of wages during a recession was one of an upward nature. A much more severe recession began in late 1973, and during 1974 wages accelerated along with unemployment. The lifting of wage and price controls in 1974 and the boost in the minimum wage rate both contributed to this rise. Unemployment peaked in 1975, reaching 8.5 percent. Wages rose 8.0 percent in 1974 and 9.3 percent in 1975. The rate of increase in wages was also partly attributed to a tax cut law that went into effect in May, 1975. Economic recovery was underway in mid 1975, and as expected, when the economy began to show signs of recovery, labor began to demand higher wages. The overall effect of the 1973-75 recession on wage inflation was therefore slight.

As recovery began in 1976, the nation's employment situation improved slowly from its low level of a year earlier. Unemployment declined to only 7.7 percent. This resulted from the fact that the labor force grew rapidly during the mid 1970s. This growth was particularly pronounced in 1976, undoubtly causing unemployment to remain higher than it otherwise might be (Bednarzik and Marie, 1977). The rate of increase in wages also declined slightly, by 1.2 percent to 8.1 percent from 9.3 percent a year earlier.

A continued slow recovery from the 1975 recession characterized the nation's economy in 1977 and in 1978, the unemployment rate had dropped to 6.0 percent, almost 2.5 percent below the 1975 recession high. Wage inflation remained at the same level as it was a year earlier. Relative stability in prices, wages and unemployment characterized the labor market in 1979.

At the start of the new decade, the state of the nation's economy again deteriorated. Job growth declined and unemployment surged. Housing construction and automobile sales, both of which are strongly linked to employment in other sectors of the economy also declined. The unemployment rate increased to 7.1 percent, compared with 5.8 percent a year earlier. The 1980 economic downturn resulted from a tight monetary policy, high interest rates and a resultant falling demand for new housing and auto sales. The economy continued to weaken in 1981, spreading from the construction and automobile sectors to much of the rest of the economy. By mid-1981, the nation's economy had firmly entered its seventh recession since the second world war and the third in ten years. Wage gains continued to be moderate, despite the recession.

The historical trends in unemployment and wage inflation in the U.S. economy exhibited a clear Phillips curve relationship prio to 1970. The inverse relationship between the two has virtually been reversed since (see figure 2.1). High unemployment rates accompanied by a high rate of wage inflation now prevail in the nation's labor market during period of economic downturn. This type of trend leads one to suspect that the nature of market forces that underly the U.S. economy have changed. Labor demand and supply condition alone appear to be not able to explain the behavior of wage movements in the national economy. Whether this change is permanent or temporary remains to be seen.

2.4. Wage and Price Controls

A standard policy for dealing with inflation in many capitalist economics, as well as in socialist ones, is the imposition of wage and price controls. Indeed, such a policy has been used in the United States on a variety of occasions, including one important occasion in the past twenty years — from 1971 to 1974. In their fights against inflation, neither the Carter nor the Reagan administrations have sought to use such a policy although it has been proposed a number of times by members of the left wing of the Democratic party.

The influence of wage stabilization policies within the U.S. economy appears to have been studied only in the context of the national economy as a whole. The regional effects of such policies are unknown, although the effects of other national policies, such as monetary and fiscal for example, have been investigated to a limited extent (e.g. Miller, 1978). The last major occasion in which wage and price controls were implemented in the U.S. was during the Nixon Administration's Economic Stabilization Program from August 1971 to April 1974. This policy was instituted after the recession of 1970-71 had failed to significantly reduce the wage and price inflation that had been accelerating during the second half of the 1960s. The first phase of the program began with a three month freeze on wages and prices in August 1971, and it effectively halted wage inflation. The second phase lasted from November 1971 to January 1973, during which a 5.5 percent wage increase standard was used and all settlements affecting more than one thousand employees had to be reported. Controls were designed to influence heavily unionized firms, and those which were either small or already paid a relatively low average wage were exempted. The effects on union negotiated wage increases were noticeable greater than on others (Darby, 1976; Vroman and Vroman, 1979). In the third phase, from January to June 1973, controls were self-administered and there was shift from the application of a uniform standard to an individual review system. The fourth and final phase, from June 1973 to April 1974, was characterized by a steady decontrol on an industry by industry basis.

After the initial freeze, both wages and prices began to creep gradually upward until a strong acceleration took over in 1974 and 1975. Vroman and Vroman (1979) conclude that the long-run effect of the program on wage inflation was negligible and that the intention of inducing a spread in wage stabilization from unionized to non-unionized sectors of the economy largely failed. The regional effects of this program do not appear to have been investigated. It is interesting to note, however, that the graphs of wage inflation in Martin's study of 24 metropolitan areas from the northeast region of the U.S. suggest that the program was effective in most of these places, and particularly in its early stages (Martin, 1978). It is also apparent that once the controls were lifted in 1974 wages rose very rapidly.

2.5. Regional Change in the National Economy

During the last twenty years, there has been a fundamental change in the regional structure of the national economy. Employment opportunities, for example, have shifted from the Northeast and North Central regions to the Southern and Western regions of the nation. In 1960, 29.3 percent of the nonagriculture employment was located in the Northeast; in 1975 the percentage had declined to 24.5 percent. For the North Central region the decline was from 29.7 percent to 27.8 percent. In contrast, the South's figures increased from 25.7 percent in 1960 to 30.2 percent in 1975. The West also increased, from 15.2 percent to 17.5 percent. However, even with these employment shifts, the regions in the north still accounted for more than one half of all U.S. employed individuals in 1975.

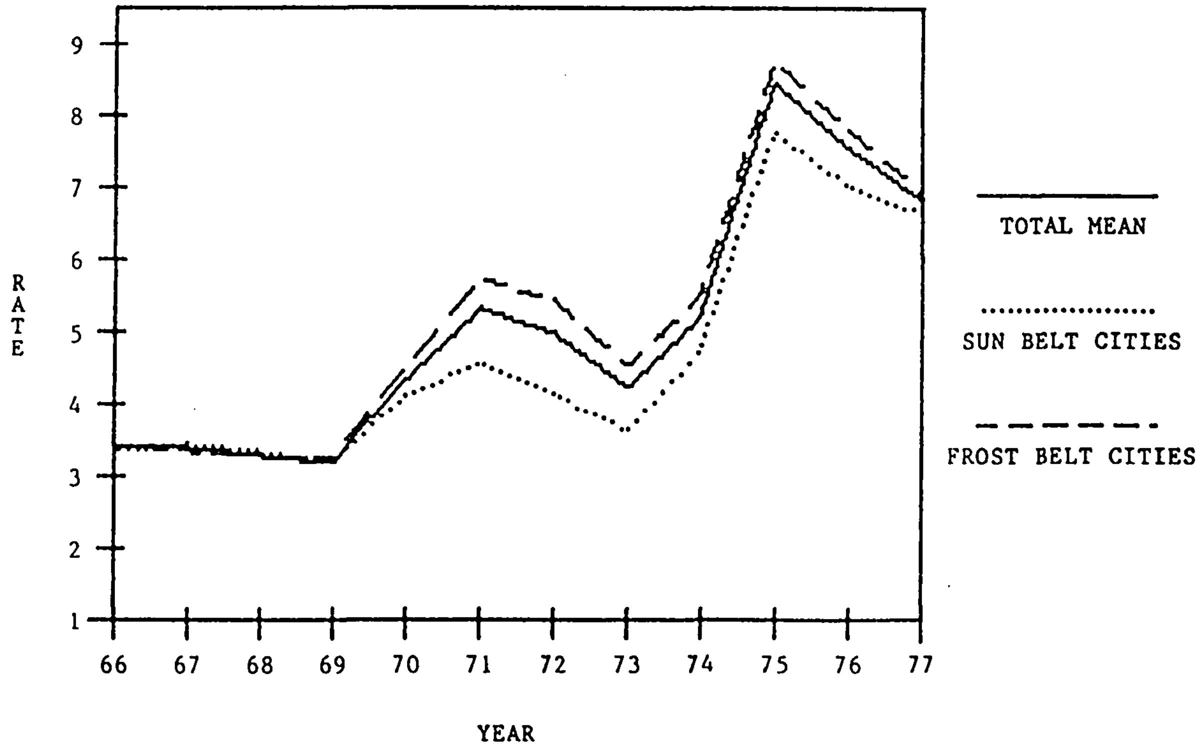
Northern regional economies have experienced a slower rate of employment growth than in other regions. Declining employment opportunities in the North have been attributed to the closure of some firms and the relocation of others. Conversely, in the South the primary cause of increasing employment has been expansion of existing firms, and the rapid growth of government, wholesale, retail and other service industries.

The United States is now popularly divided into two major regions, namely the Sun Belt and the Frost Belt. It is commonly suggested that those American states that are located south of latitude 37 , namely North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas, New Mexico, Arizona, and the southern portions of Nevada and California are classified as Sun Belt. Those states that are located north of this latitude are named Frost Belt. By no means homogeneous in character, each region nevertheless possesses some economic attributes which are generally present within, but generally absent without.

As far as population is concerned, the Sun Belt has been characterized by both metropolitan and non-metropolitan in-migration during the 1970s, whereas regions in the Frost Belt, with the exception of the Rocky Mountain States and upper New England, have exhibited out-migration in one of either of these two categories (Morrill, 1979). Maximum population growth rates during this period have occurred almost entirely in metropolitan centers and suburbs within the Sun Belt, but largely in areas ranging from small cities to rural in the Frost Belt. During the period 1960-75 the growth of population in the southwest and southeast averaged about 26 percent, while it was only 13 percent in the upper midwest and northeast. Movement to the south accelerated after the late 1960s, and has involved proportionally more professional or retired people with greater than average education and income. Perhaps the most important change from our point of view, however, has been that of the structure of the Sun Belt's economy relative to that of the Frost Belt. As Rees has suggested, there now appears to be occurring a fundamental realignment of the traditional core-periphery relationship in the United States, involving a regional shift in the industrial structure of the national economy (Norton and Rees, 1979; Rees, 1979). The states within the Sun Belt averaged the highest growth rates of manufacturing employment in the country over the period 1960-73. States in the upper midwest and northeast, on the other hand, showed an absolute loss. Overall employment growth has been greatest in areas along the southern part of the Atlantic and Gulf Coastal belt, in Tennessee and northern Georgia, in the south-central area of Oklahoma and Texas, and in Arizona and the Rocky Mountain states (Beyers, 1979).

Figure 2.2 shows a regional comparison of trends in unemployment. From 1965 to 1969, the difference between Sun Belt and Frost Belt were relatively small. A gap, however, has developed since 1970; the Frost Belt also has consistantly shown a higher average unemployment rate. It appears that the downward trend in unemployment during the expansionary period of the mid- and late 1960s benefited both regions. The cyclical repercussions of the following recessions were felt more in the Frost Belt cities than in the Sun Belt ones. When the national economy experienced its fifth postwar recession, the Frost Belt was hit harder than the Sun Belt. Between 1969 and 1971, the average unemployment rate in the Frost Belt rose from 3.2 percent to 5.8 percent, which has far above average for the nation. The Sun Belt unemployment rate rose from 3.2 percent to 4.6 percent, which has below the national average. Unemployment also rose considerably in the Frost Belt during the 1974-75 recession while the Sun Belt experienced a smaller rise. The consistantly lower unemployment rate in the Sun Belt since 1969 has been attributed to its limited role in durable goods manufacturing, especially primary and fabricated metals; the relative stability of its important nondurable goods industries such as textile and food processing; the growth of industries in its service-producing sector (Gellner, 1974); and the growth of energy industries in the southwestern states, particularly in Texas, Oklahoma and Louisiana. The rapid economic growth and a sharp increase in population in the Sun Belt indicate a reversal in the long standing pattern of migration to the Frost Belt. The Sun Belt has experienced a business boom and a low level of unemployment. Nevertheless,

Figure 2.2. TRENDS IN UNEMPLOYMENT BY REGION



average hourly wages of manufacturing workers in the Sun Belt have remained lower than their counterparts in the Frost Belt (see Figure 2.3). It appears that the excess demand for labor in the Sun Belt has not pushed up wages. Figures 2.4 and 2.5 show the trends of unemployment and wage inflation since 1966 for each regions. The parallel trends of the two were clearly exibited for both regions from 1970-76. This led one to suspect the existence of the inverse relationship between unemployment and wage inflation in the labor markets.

The industrial growth of the Sun Belt has taken place due to the relocation of industry from other parts of the country, the attraction of branch plants, and the location there of new, growing industrial sectors (Watkins and Perry, 1977). Labor intensive, low wage industries in particular have been induced to move to the Sun Belt, attracted by, among other things, the lower wages which have traditionally existed there. Most of these industries are characterized by low growth rates and are not regarded as the major reason for the overall industrial growth in the region. Branch plants have also been attracted to the Sun Belt, but the extent of their growth inducing effects is questionable. It is the attraction and development of new and innovative industrial sectors which is the most significant aspect of the growth in the Sun Belt. Industries of this type are represented by electronics, computing equipment, chemicals and plastics, aerospace products and scientific instruments. The fact that these are high technology sectors has been stressed by Rees, who has argued that the economy of the north has been unable to initiate

Figure 2.3. AVERAGE HOURLY WAGE EARNINGS BY REGION

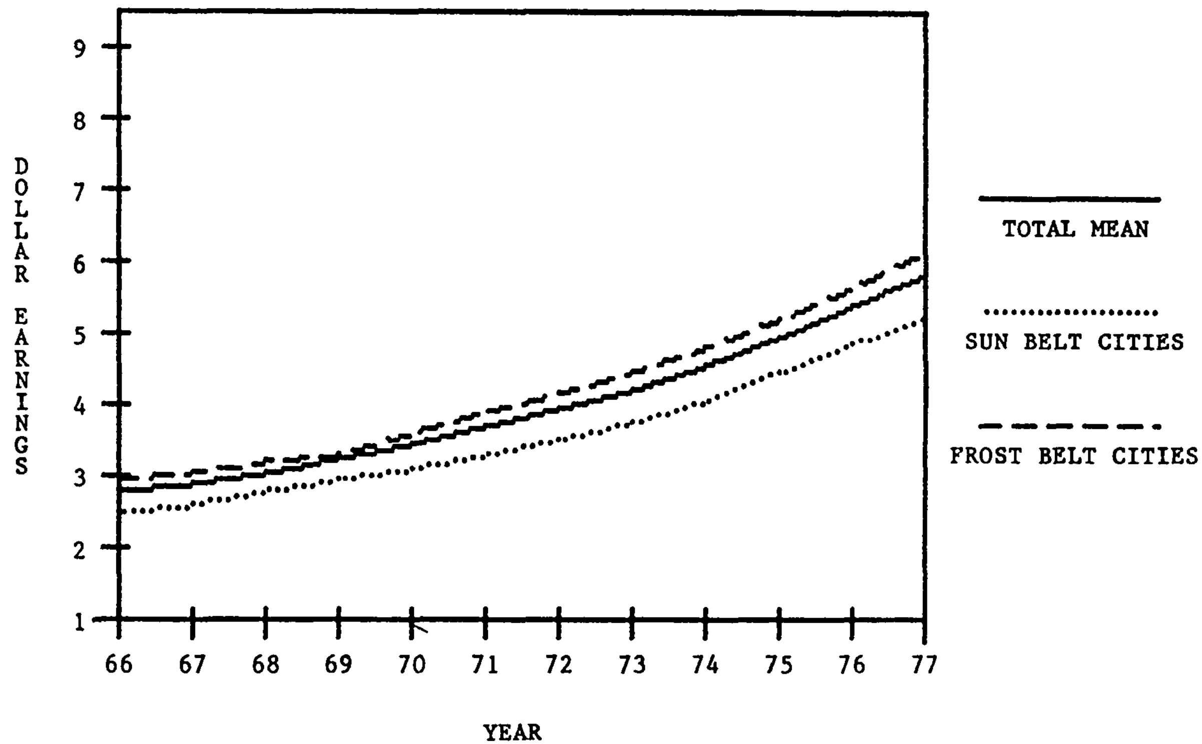


Figure 2.4. UNEMPLOYMENT AND WAGE TRENDS IN THE SUNBELT

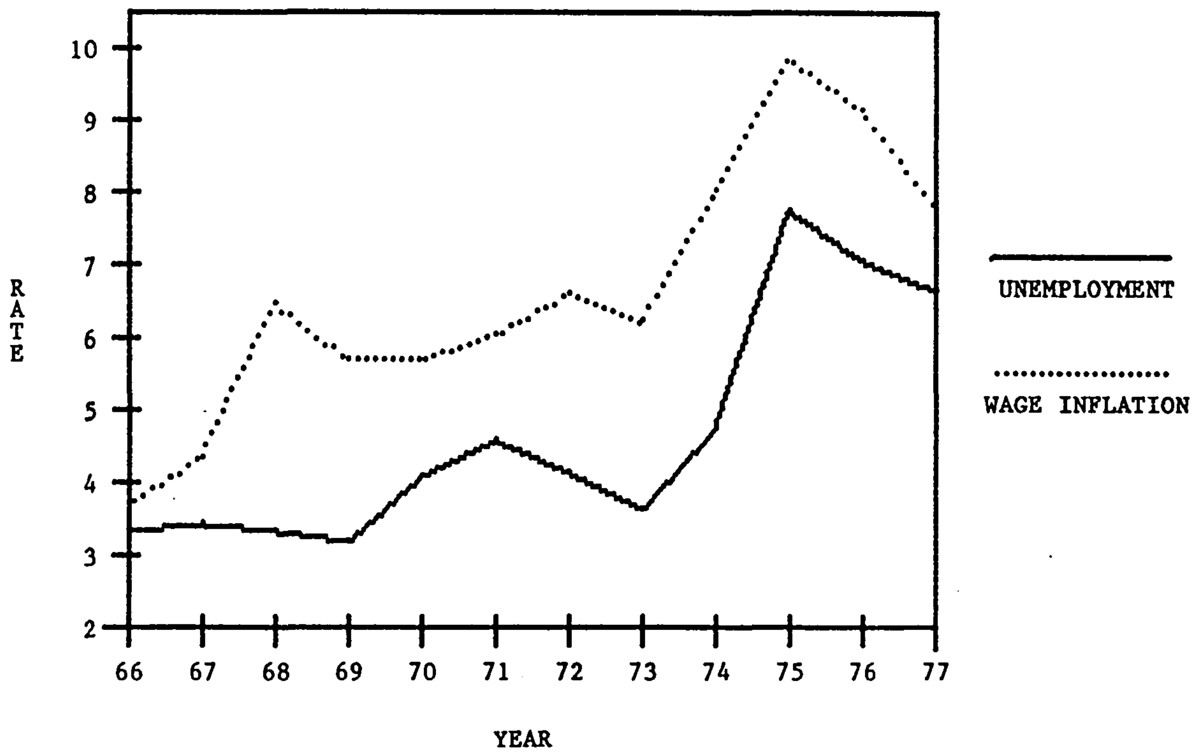
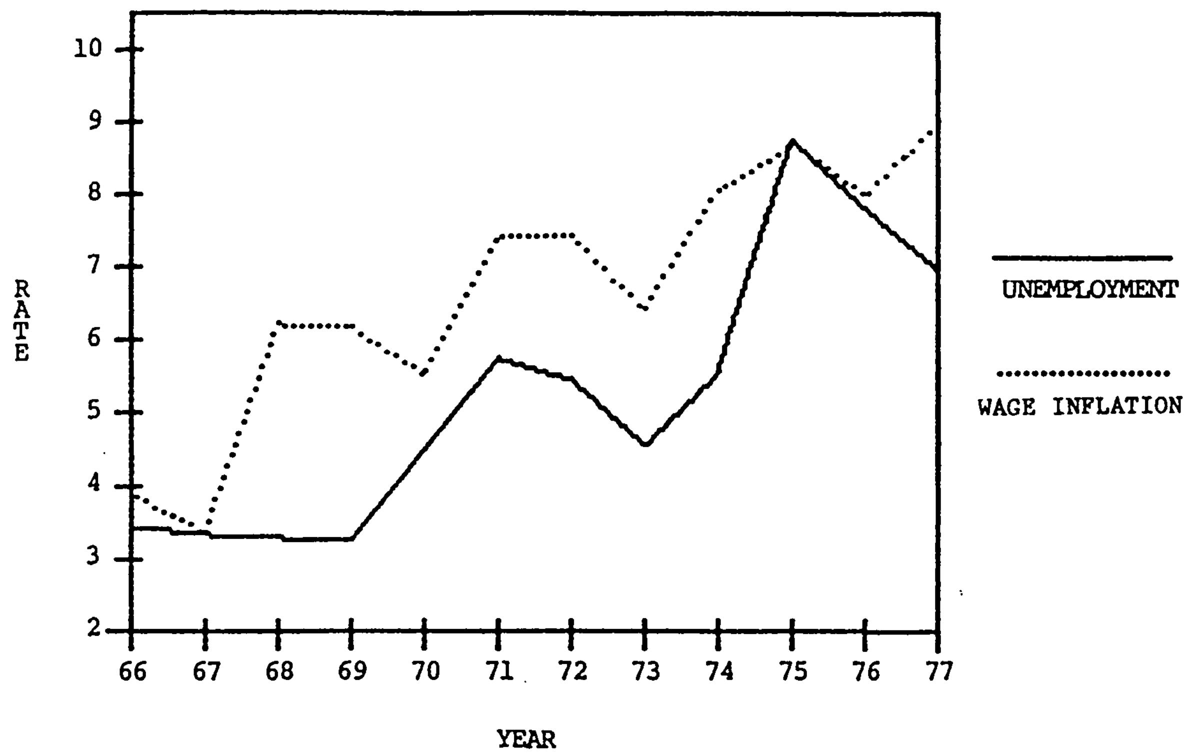


Figure 2.5: UNEMPLOYMENT AND WAGE TRENDS IN THE FROST BELT



new product cycles to replace the mature or old industrial sectors of that region (Norton and Rees, 1979; Rees, 1979). The Sun Belt has been able to adapt to the changing needs of the national and international economy and is now the national leader in capital accumulation (Watkins and Perry, 1977). These shifts have resulted in a Sun Belt economy that is becoming increasingly export based, with national markets which are tied more to final demand than intermediate producers. The reverse is the case in the north's economy, which is also having to compete increasingly with international imports (Beyers, 1979).

The original stimulus for this regional development is currently under debate. There is one train of thought, however, which strongly suggests that federal fiscal and monetary policy over the years, and particularly over the past twenty, has been one of the main stimuli. Miller, for example, has shown that, over the period 1960-75, the regional pattern of federal monetary policy impacts and interregional net flows supported a rate of growth in nominal personal income that was less in the northeast than in the rest of the country (Miller, 1978). Federal spending has also been regionally biased over the years. The Sun Belt has been a persistent net gainer in federal per capita spending with respect to per capita taxes and a relative leader in federal employment. Some have argued that this attention given to the Sun Belt in the past has largely been due to the strength of the southern congressional delegation and to presidential electoral politics. If this is the case, then it seems likely that the Sun Belt will continue to benefit from federal spending for similar reasons;

the power of the southern congressional delegation, particularly from energy-rich states, continues to increase, and the role of the south in presidential politics remains important. Federal spending in this region has been of three main types; one, investment in and development of urban infrastructure; two, military; and three, special projects such as Cape Canaveral in Florida and the Space Center in Houston. Federal involvement such as this has either directly stimulated a demand for industrial products, or indirectly so by encouraging the private sector to take advantage of the new infrastructure and further invest in the region.

There is also little doubt that the existence of a relatively low waged and largely non-unionized labor force has made the Sun Belt attractive to many industries. The average weekly earnings of industry workers in the southeast and southwest are the lowest in the country, and the proportion of the labor force that is unionized is far lower in the Sun Belt states than it is elsewhere. Furthermore, most states in the Sun Belt, unlike those in the Frost Belt, possess right-to-work laws which are designed to inhibit unionization. Many areas within the Sun Belt have also made explicit efforts to attract industry by offering tax breaks and various other financial incentives (Business Week, 1976). Lastly, there is no doubt that some areas of the Sun Belt how have developed to the point where they possess self-generating agglomeration economies, for example Houston and the Dallas-Fort Worth area, which is itself an attraction to many industries (Norton and Rees, 1979).

These developments have lead to a situation in which personal incomes and earnings have grown more rapidly in the Sun Belt than in the Frost Belt since the beginning of the 1960s, together with a substantial growth in services and retail markets (Business Week, 1976; Beyers, 1979). Some have even suggested that the long-standing wage gap between north and south has now closed (Coelho and Ghali, 1971). The regional shift in economic development continues nonetheless.

Chapter 3

CONCEPTUAL FRAMEWORK

3.1. Introduction

The purpose of this chapter is to provide a theoretical background for the analysis to follow. Specifically, it presents a discussion of the contribution of two distinct lines of research related to the present study, namely the analysis of spatial aspects of wage inflation within the U.S. urban system. One of these has been conducted largely by economists, and is concerned with specifying the relationship between excess demand for labor and changes in the wage rates for labor. The other, undertaken by geographers and regional scientists, with identifying the manner in which economic impulses are transmitted through urban systems. These two will be discussed in turn.

3.2. The Wage Change-Unemployment Relationship

When the excess demand for labor is high, wage rates tend to rise more rapidly than when it is low (Fisher, 1926). Although studied for some time, this relationship was brought into prominence by Phillips and by Lipsey (Phillips, 1958; Lipsey, 1960). In his original paper Phillips (1958) states the basic hypothesis underlying his work: that the excess demand for labor is related to the rate of change in money wages, and that the unemployment rate can be used as a proxy for this excess demand (see Figure 3.1). This hypothesis was subsequently developed by Lipsey and by Hansen (Lipsey, 1960; Hansen, 1970). The status of the Phillips curve has been heightened in recent years, because it deals with the important trade-off between desirable policy goals of price stability and full employment.

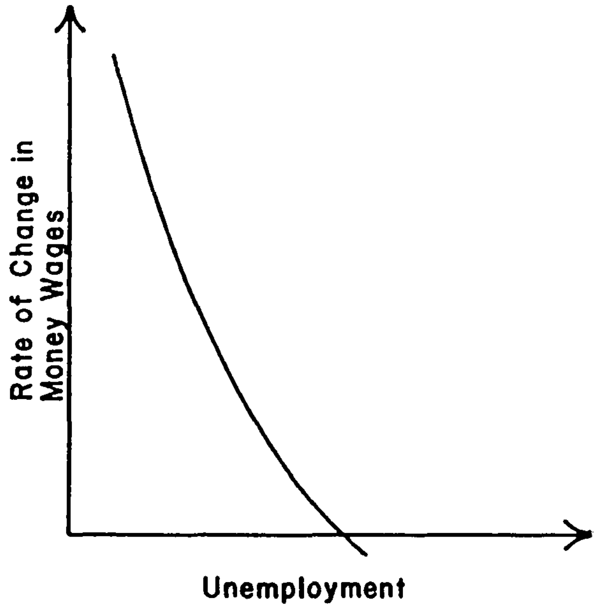


Figure 3.1 Phillips curve

The excess demand for labor is more realistically reflected in the creation of new job vacancies, but because of the difficulties involved in measuring these such demand has usually been represented by the reciprocal of unemployment. In a given institutional arrangement, as indicated by Hansen (1970), the vacancy rate is likely to be closely related to the unemployment rate. This argument provides the justification for the use of unemployment rates for study areas where no satisfactory vacancy statistics exist. Taylor (1972), however, has argued that registered unemployment can be an inadequent proxy for excess demand and that it should be supplemented by an estimate of labor hoarding. Hyman and Palmer (1978) have suggested that the rate at which vacant jobs are filled can be used as a leading indicator of change in the level of unemployment and of change in the duration of unemployment. In any given labor market, then, the change in wage rates will be inversely related to the unemployment rate or positively related to the reciprocal of the unemployment rate. The overall balance of vacancies and unemployment in the various submarkets of an economy is determined by aggregate demand. When the latter is high, there will be fewer submarkets with an excess supply of labor and more with an excess demand for labor. The reverse is the case when aggregate demand is low. Aggregate demand, in principle, is itself subject to control by overall monetary and fiscal policy (Holt, 1969; Tobin, 1972).

The relationship between the change in wage rates and unemployment has been empirically evaluated on numerous occasions in the United States, Britain, and in other countries (e.g. Hancock, 1966; Parkin, 1973; Kaliski, 1964; Reuber, 1964; Modigliani and Tarantelli, 1973; Watanabe, 1966; and Koshal and Gallaway, 1971). Most studies have been concerned with the use of time series data (e.g. Flanagan, 1973; Godfrey and Taylor, 1973), but some have used cross-sectional data (e.g. Smith, 1972). In addition, other research has been devoted to the examination of regions (Kaliski, 1964; Thirlwall, 1970; Cowling and Metcalf, 1967; Metcalf, 1971; Thomas and Stoney, 1972); metropolitan areas (e.g. Albrecht, 1966; Kaun, 1965; Kaun and Spiro, 1970; Ross, 1962; Smith and Patton, 1971; Marcis and

Reed, 1974; Reed and Hutchinson, 1976; King and Forster, 1973); or industries (e.g. Schultze and Tryon, 1965; Kuh, 1967; Lipsey and Steuer, 1961; Perry, 1964; and Pierson, 1968). In most cases, the coefficient for unemployment or its reciprocal has had the correct sign, has been statistically significant, and has accounted for a substantial proportion of the variance in wage rate changes.

3.3. Modifications of the Phillips Curve

3.3.1 Measuring Wage Changes

This relationship has been subject to several modifications, of which four types will be discussed here. The first of these is concerned with the manner in which the dependent variable is measured. Some researchers have used average weekly wage rates, others average hourly earnings, the standard rate of union labor, and total hourly compensation. There is little discussion of which should be used or whether the same set of explanatory variables should be employed irrespective of the choice of dependent variable. The rates of change in these variables may not be equally good measures of inflationary pressure. Some authors have pointed out that hourly earnings are a better proxy of the price of labor than are the more commonly used weekly wage rates, since they did not take overtime earnings in account and are not biased by the number of hours worked (Godfrey and Taylor, 1973). Whatever measure is used, most researchers appear to agree that quarterly data are the most appropriate for estimating the Phillips relationship. Annual data are considered to be too aggregate to capture the temporal changes inherent in the relation, whereas monthly data are considered to be too fine of a scale to capture trends which often take some months to be brought into effect.

In defining the rate of change in the dependent variable for quarterly data, three measurements have been commonly used:

First central differences

$$(\dot{W}/W)_t = (W_{t+1} - W_{t-1})/2W_t \tag{3.1}$$

One quarter differences

$$(\dot{W}/W)_t = (W_t - W_{t-1})/W_{t-1} \tag{3.2}$$

Four quarter differences

$$(\dot{W}/W)_t = (W_t - W_{t-4})/W_{t-4} \tag{3.3}$$

Where $(\dot{W}/W)_t$ is the proportionate rate of change of the average wage in the labor market. The one quarter differences variable tends to amplify any "noise" in the data and may exhibit marked seasonality (Martin, 1978). The first central difference and fourth quarter rate of change variable may introduce serial correlation into the error terms of the model. Hanham and Chang (1981) and Martin (1978) have both adopted equation (3.3) in their wage determination models by arguing that an annual adjustment of wages is the norm in the manufacturing sector.

3.3.2. Measuring Unemployment

The second modification is concerned with the way in which the exogenous variable, the unemployment rate, is measured and with determining the form of its relation to wage rate changes. Following the lead of Phillips and Lipsey, almost all researchers use the unemployment rate in the wage equation as a proxy for excess demand. However, the credibility of reported unemployment statistics themself have been questioned by some (Simler and Tella, 1968; Taylor, 1970; and Mackay and Hart, 1974). Recorded unemployment fails to take into account two important components of labor utilization, namely hidden unemployment and underemployment. The former of these two refers to those people who do not participate in the labor force and are, therefore, not recorded as officially unemployed. To correct this, Simler and Tella (1968) constructed a measure of the full-employment participation rate of secondary workers and then measure the deviation from this rate to construct a proxy for unreported unemployment of those workers. Adding this to the wage equation they obtained a better fit and eliminated the possibility of overestimating inflation. The latter, underemployment, refers to those in the labor force who are employed, but underutilized. It frequently occurs as a result of the lag adjustment of inputs of labor to fluctuations in output (Brechling and Wolfe, 1965), and is reflected in the pro-cyclical movement in the output/employee ratio (Taylor, 1970). Taylor constructed a measure of this hoarded labor and tested it's usefulness, together with the other two components of unemployment, recorded and hidden. He found that hoarded can be the most effective predictor of wage rate changes in the United States (Taylor, 1970). Mackay and Hart (1974) have suggested the use of future unemployment rates as an alternative measure of hoarded labor. They argue that the employer's policy of hoarding labor is a lagged response to changes in excess demand. Unemployment, therefore, could be entered into the wage equation with a temporal lead, and they found that this gave a good empirical fit.

Following the lead of Lipsey (1960), some researchers have included the rate of change in the unemployment rate in the wage equation as a proxy for cyclical changes in the dispersion of unemployment. Although Lipsey and other researchers offer little theoretical or empirical support for this, one would expect it to perform well in a regression. However, except for a few studies (e.g. Gordon, 1977), most find the rate of change of unemployment insignificant (e.g. Lipsey and Steuer, 1961; Bhatia, 1961; Kaliski, 1964; Watanabe, 1966; Hines, 1968; Archibald, 1969; Metcalf, 1971; and Archibald, Kemmis and Perkins, 1974).

Lipsey also argues that because unemployment never can become less than zero, it must approach zero as excess demand approaches infinity. Lipsey concluded that the Phillips curve should be nonlinear in form. This theoretical argument has been widely accepted and empirically justified. Furthermore, from a statistical standpoint the parameters in the non-linear formulation can be easily interpretated as elasticities, which allow analysis of the proportionate impacts of changes over time of the independent variables upon the dependent variable. However, it is probably just as commom, and empirically justifiable, to incorporate unemployment in the model in a linear form.

Some researchers have found the rate of wage inflation to be independent of unemployment, regardless of its specification (e.g. Lipsey and Steuer, 1961; France, 1962; Brown and Berry, 1963; Kaliski, 1964; Eagly, 1965; Bodkin, 1966; Kuh, 1967; Taylor, 1970; Godfrey, 1971; Koshal and Fallaway, 1971; Thomas and Stoney, 1972; and Martin, 1978). The results seem contradictory and inconclusive. It is not possible at this point to conclude with confidence that unemployment is insignificant in explaining wage inflation, because this insignificant relationship might be due to the use of a proxy for excess demand, temporal instability of the coefficients, existence of multi-collinearity among independent variables, the choice of statistical technique, and the type of data being used (for example, quarterly data have been suggested as being better than annual data so as to reflect the cyclical activity in Phillips curve behavior).

3.3.3 <u>The Inclusion of Further Exogenous Variables</u>

The third modification is concerned with identifying further factors which may influence changes in wage rates, either independent of the level of unemployment and/or the rate of change of unemployment (i.e. factors affecting the intercept of the original relationship) or by means of interaction with it (i.e. factors affecting the slope of the original relationship). Eight types of variables appear to have been most commonly used at the aggregate or national scale in this context.

(1) Wage expectation. The stability of the Phillips relationship has been challenged by neoclassical monetarists, especially Friedman (1966, 1968, 1977), Phelps (1965, 1967, 1968, 1970) and Mortensen (1970). According to their thesis, there is no money illusion in the wage adjustment mechanism. In essence, their natural unemployment rate hypothesis suggests that there exists an equilibrium in the

economic system, in which the actual inflation rate is perfectly anticipated, that the wage adjustment mechanism responds fully to such perfectly anticipated inflation, and the unemployment is at its natural rate (i.e. independent of the inflation). Only at the level of the natural rate of unemployment is there no pressure for wages to rise. This natural rate hypothesis can be summed up by the following form of the Phillips curve equation:

$$(\dot{W}/W)_t = f(U_t) + (\dot{W}/W)_t^e \qquad (3.4)$$

Where $(\dot{w}/w)_t^e$ denotes the expected rate of wage change. If e=1, the expression implies that if, for example, expected wages increase by 5%, the Phillips curve will be shifted upward by the same amount. We thus obtain a long-run vertical Phillips curve.

Under the adaptive expectation theory, the expected wage differential which firms establish at recruiting time depends negatively on aggregate unemployment and positively on the aggregate vacancy rate relative to the firm's vacancies. Initially employees experience an unanticipated or unperceived increase in the rate of wages and thus adjust their job-search behavior. As a result of this, unemployment falls. However, when employee perception of the real wage adjusts eventually to the actual average wage, they will have to readjust their job-search behavior and unemployment will have reverted to its natual rate. It appears that any trade-off that is detected between the change in the rate of wages and unemployment is purely temporary and illusory. Based on the natural rate and adaptive expection hypothesis, the only way that an economic policy could lower the unemployment rate to its natural level permanently is by accelerating prices.

(2) Price change and price expectations. Price change and expectation variables are designed to represent previous and expected price inflation that may be taken into account in wage bargaining (e.g. Archibald, 1969; Archibald et al, 1974; Brinner, 1977; Flanagan, 1973; Godfrey and Taylor, 1973; Johnston and Timbrell, 1973; Martin, 1978; Perry, 1970; Thomas and Stoney, 1972). Most research fails to give reasonable theoretical justification for including this variable in the wage equation. When a reason is given the most common one is that increases in the rate of inflation will make workers and unions more militant as they attempt to catch up on lost purchasing power from previous contracts (e.g. Lipsey, 1960). Until recently researchers used expectation as the rationale, on the grounds that price changes are anticipated and thus independent of excess demand for labor. However, such an explanation presents a major difficulty because the price expectation of employee and employer are not recorded. Most of the empirical work which has used the adaptive approach is based on the assumption that all individuals formulate price expectations on the basis of the same, stable weighted average of past inflation rates. Several criticisms have been raised to question this adaptive expectations formulation. Firstly, there is doubt that a price expectations formulation can be adequately represented solely by past price changes. Secondly, the distributed lag in the expectation formulation appears too long and there is no theoretical basis to determine how long current price expectations are

significantly influenced by price changes in the past. Thirdly, it is likely that individuals will hold different price expectations. Lastly, price expectations may well incorporate additional factors than simply previous price expectations. According to this formulation, if the price expectation coefficient equals unity, then a long-run Phillips curve exists; conversely, if the coefficient does not equal unity, then no such equilibrium relationship exists. This corresponds to those of the accelerationist or natural unemployment rate school of thought. Thomas' (1974) study of U.K. wage inflation, however, showed a price change coefficient of less than unity, and Summer (1972) also found that the coefficient varied in a highly unstable manner from period to period. It appears that the price change and expectation variables may be some source of instability in the determination of wage inflation.

(3) Union power. The most common theoretical justification for including this variable is that an increase in union power or militancy should bring about an increase in wage rates. However, one should be aware that increasing union power in an area will discourage other firms from locating there and also force some existing ones to relocate to non-unionized areas. As a result, the unemployment level may increase and drive wages down. Despite the theoretical ambiguity of the role of unions in the wage determination process, four main variables have been used as a proxy for union militancy, with varying success. They are: (a) a subjective index based on a five point rating of union pushfulness (Dow and Dicks-Mireaux, 1958); (b) a dummy variable that assumes the value zero during periods of conscious

restraint by unions and a value of one otherwise (Klein and Ball, 1959); (c) the rate of change of the unionized labor force (Hines, 1969, 1971; Ashenfelter, Johnson and Pencavel, 1972); (d) measures of strike activity, such as the number of strikes beginning in any period relative to the number of unionized labor (Ashenfelter, Johnson and Pencavel, 1972), and the total number of strikes (Taylor, 1972; Godfrey, 1971). However, as Purdy and Zis (1974) point out, most of these studies have suffered from an inadequate theoretical framework for analyzing trade union behavior, and have ignored the role of employers' resistance in the bargaining process. Also, as suggested by Zis (1977), the relationship between wage rates and strike activity is highly unstable and it does not provide a source of continuous inflationary pressure. Therefore, one should include this variable in the wage equation with caution.

(4) Product/market power. This variable is designed to represent the extent to which the product and market for an industry is concentrated in a small number of firms (e.g. Allen, 1968; Hamermesh, 1972; Levinson, 1960; Bowen, 1960; and Greer, 1975). A common theoretical justification for including this variable is that unions will organize in industries where product/market power exists. Wages therefore tend to rise above what they would be in a competitive economy. It has been suggested that the changes in wages are directly related to an industry's concentration ratio (Allen, 1968; and Greer, 1975). Some researchers have suggested that wage increases that originate in the more concentrated industries or larger plants tend to spill-over into less concentrated industries or smaller plants (e.g. Maher, 1961; and

Masters, 1971). Contrary results, however, have been documented by Phelps (1970) and Hamermesh (1972), who found that product and labor market power have no overall effects on wage inflation.

(5) Productivity. Some authors have used productivity as an explanatory variable on the grounds either that it is a determinant of labor demand (e.g. France, 1962; Kuh, 1967) or that it provides an improved proxy for excess demand (Vanderkamp, 1972; Taylor, 1970). Archibald et al (1974) have developed a more explicit argument that the use of productivity as an additional variable in the linear equation is inconsistant with theory, unless its role is to improve the proxy measure of excess demand. Productivity need to be regarded neither a rival explanation nor as an intruder, but as a means of reducing the error of measurement of excess demand.

(6) Profit. Profit occasionally is used as an explanatory variable. The reason for including it is that unions are likely to bargain for increased wages when a firm's profitability remains consistantly high over time (e.g. Kaldor, 1959; Lipsey and Steuer, 1961; Eckstein and Wilson, 1962; Bhatia, 1962; Schultze and Tryon, 1965; Hamermesh, 1970). One should include this variable in the wage equation with care when the unemployment variable is used because of the possible multi-collinearity problem.

(7) Governmental policy. Governmental policy can, for example, be designed to hold down wages and prices (e.g. Wallback, 1971), or to set minimum wages (e.g. Uri and Mixon, 1978). The effectiveness of such policy on wage inflation has been studied by Bodkin et al (1967), Brechling (1970) Smith (1972) and many others. Although their results

have varied and have indicated little consistency in successive periods, they have concluded that incomes policies have generally succeeded in shifting the wage equation in a favorable manner; i.e. that in the long run the Phillips curve becomes vertical. This conclusion has been questioned by Lipsey and Parkin (1970), Burrows and Hitiris (1972), Gofrey (1971) and Thomas and Stoney (1972). They have been concerned with testing the hypothesis that the wage equation has been stable throughout the entire sample period regardless of whether such a policy was in effect; i.e. policy on or policy off. Lipsey and Parkin (1970) and Parkin (1972) studied the effectiveness of post-war incomes policy in the United Kingdom and concluded that, (a) an incomes policy reduces wage inflation at low levels of unemployment and increases wage inflation at high levels of unemployment, and (b) there is no trade off between wage inflation and unemployment during periods of incomes policy. Wallis (1971) used the same set of data, but allowed for the feedback between wage and prices in the estimated equation, and found that incomes policies appear to have been rather more effective than claimed by Lipsey and Parkin. Godfrey's (1971) results, using an alternative method which takes account of the simultaneous equation problem and of auto-correlated errors, contradict those of Lipsey and Parkin and suggest that the unemployment variable is insignificant regardless of whether such a policy is operating or not. Taylor (1972) and Thomas and Stoney (1972), in their test of the impact of incomes policy on wage inflation in the United Kingdom, also found no evidence to support the Lipsey-Parkin conclusions.

(8) Unemployment disparity. The dispersion of unemployment refers to the distribution of the excess demand for labor among labor markets, a variable designed to test the aggregation hypothesis (Lipsey, 1960). This introduces an important concept from a geographical standpoint, since it acknowledges the possibility that the state of the national economy is not independent of the economic performance of its constituent geographical regions. The aggregation hypothesis suggests that a more even distribution of demand for labor between regions could dampen wage inflation in the aggregate without reducing the level of total employment. Several researchers have tested this hypothesis for industrial and/or geographic labor markets by using the variance of unemployment as a measure of dispersion. For example, Archibald (1969) included dispersion in a wage model and found that, for both the United Kingdom and the United States, the extent of dispersion was positively and significantly related to aggregate changes in wage rates. Thirlwall (1969) and Thomas and Stoney (1972) also found a similar relationship for both the pre-war and post-war period in the United Kingdom. According to Thomas and Stoney (1972) unemployment dispersion exerted an upward pressure on the aggregate rate of wage change of more than two percent in the post-war period and of more than four percent in the pre-war period. But Hines (1971) and Archibald et al (1974) do not come to such a conclusion. Kaliski (1964), using a modified version of Archibald's model, revealed a quite different result which suggested that the rate of change in national wage rates would be reduced by increasing the disparities of regional unemployment. Gordon (1972) found the dispersion coefficient

to be highly unstable and sensitive to the coefficient for expected inflation. The argument for the inclusion of this variable is based on the questionable assumption that identical Phillips curves exist for each region. Most empirical research has shown that this is not the case. Although the existence of a positive relationship between changes in the wage rate and the variance of regional unemployment has been demonstrated, the casual mechanism underlying this relationship remains a topic for debate.

3.4. Spatial-Economic Transmission Mechanisms

3.4.1. Labor Market Interdependence

The geographical contribution to the examination of the relationship between wages and the demand for labor focuses on the interdependence between and interaction amongst the individual geographic labor markets that comprise the national economy. Although studies of this problem have of necessity been concerned with measuring the relationship between the two main variables at a disaggregated level, not all of the studies at this level have been concerned with the interdependencies between markets. Kaun and Spiro (1970), for example, fitted a modified Phillips curve to data for each of thirty Standard Metropolitan Statistical Areas, and obtained a fairly high explained variance in wage rate changes for several of these. None of their explanatory variables, however, measured the interdependence between cities.

The work of Brechling (1974), King and Forster (1973), Martin (1978), Weissbrod (1976), Reed and Hutchinson (1976) and Hart and MacKay (1976) has provided some initial guidance for modelling efforts designed to explore the way in which the spatial dimension influences this economic activity. King and Forster (1973) have suggested three types of interaction models that apply to spatial interdependence relationships: these are regional effects, leading submarket effects and distance effects models. Regional effects models are designed to estimate the contribution of regional levels of unemployment in explaining local wage rate changes. For example, Albrecht (1966) used state unemployment rates, Marcis and Reed (1974) used the lagged average regional wage in order to explain wage rate change in individual cities. Leading submarket models are based on the assumption that changing wage rates in a submarket are dependent on prior changes occurring in another submarket. Recently, Hart (1981) tested the wage-spread hypothesis and found that wage bargains in urban labor markets are in part determined by market conditions elesewhere. He suggested that under a milti-directional wage-change transmission system there exists a difference in the strength of transmission among labor markets. Markets with the highest proportion of leading wage occupations may be expected to exert the greatest impact on other markets. He also suggested that regional wage differences have been narrowed due to the multi-plant wage transmission mechanism. Cowling and Metcalf (1967) attempted to test the separate effect of each region's unemployment rate on earnings change. They rejected the wage spill-over hypothesis, in which wage increases filter down to the high unemployment regions from regions of low unemployment, and instead suggested that there is a tendancy for wages in various markets to move together regardless of local labor market supply-demand conditions. A different mechanism has been suggested by Thomas and Stoney (1972) and by Marcis and Reed (1974), namely that the transfer should operate only from high demand to low demand sectors. The leading sectors are supposed to possess low unemployment which dominate wage changes in the entire system. Hart and MacKay (1977), however, suggested that the wage-change transmission process is not unidirectional and they found evidence of interactions between the national leading regions and subnational leading regions. Reed and Hutchinson (1976) define leading and following submarkets based on the rank-size rule and suggest that there is a transmission of money wage rates downward through the tiered structure from high order urban labor markets to lower order ones. Weissbrod (1976) also argues that it is the migration of workers from the low wage, low order urban centers to the high wage, higher order urban centers that generates the diffusion of wage changes through the urban hierarchy. He concluded that changes in relative wage inflation occurs simultaneously in centers of a similar size and then diffuses to their subordinate cities. The high degree of correlation between the rates of change of regional wages could also lead one to argue that there may be a filtering up process. The causal mechanism behind such a transmission remains to be uncovered, although it could be detected by the use of cross-spectral analysis (e.g. Bassett and Haggett, 1971).

In another study, Thirlwall (1970) examined Cowling and Metcalf's (1960) wage spill-over hypothesis, together with his own national bargaining hypothesis, and found that the rate of change of national wages is highly correlated with the rate of change of regional wages. However, Hart and Mackay (1976) rejected the national bargaining hypothesis and argued that there were no evidence to substantiate this hpothesis based on regional wage differences during pre-war and post-war Britain, during which time regional wage differences have narrowed. Most researchers agree that these two hypotheses are not mutually exclusive. However, Elias (1975) has argued that the wage spill-over hypothesis would lead to a lagged adjustment from regions of high demand to those of low demand, whereas the national bargaining hypothesis involves instantaneous adjustment of wages across all regions. A more comprehensive adjustment model which tries to bring together migration, unemployment and wage change has been suggested by Brechling (1974). His approach is based on a neoclassical adjustment mechanism together with a multi-market approach. He argued that low employment regions in some cases have low wages, and thus it seems most implausible that these regions should set the pace of wage changes for the country as a whole. He suggested that a leading sector should be the one with the highest relative earnings and he therefore adopted an approach that was based explicitly on a theory of migration. In his dynamic market interdependence model, Brechling argues that interregional differences in wage structure is the major determinant of labor migration amongst regions, and in turn that the wage structure is shaped by actural or potential mobility of labor. Reed and Hutchinson (1976), also suggested that migration flows are likely to have greatest impact on wage changes through their effect on unemployment in the long run, and that it is primarily union bargaining forces that cause interurban wage change transmission in the short term. Wachter (1976) and Ross and Wachter (1973) suggested that relative wage spread is dominated by the high wage, highly unionized sectors during periods of economic dowturn but by the low wage, less unionized sectors in periods of economic expansion, as these industries respond more quickly to changing market conditions. Their findings have reinforced the notion of a multi-directional wage transmission process. Martin (1978) has extended the national bargaining and wage diffusion hypotheses and has argued that wage bargaining is likely to take place on an industry-wide or multi-plant basis, resulting in pronounced interconnection between different labor markets. He thus included the relative wage factor in his wage structure determination model to detect the effect of institutional forces on regional wage behavior. Hanham and Chang (1981) successfully incorporated a similar variable in their model of metropolitan wage adjustments in the Sun Belt.

Finally, distance effects models are designed to explicitly incorporate the effect of the distance separating submarkets upon changes in wage rates within each submarket. King and Forster (1973), in a rare application of this approach, employed a measure of potential wage rates changes as a means of representing this effect, and found that it could improve the explained variance of wage rate changes in a system of cities considerably beyond the contribution of the unemployment variable.

There are problems of both a theoretical and empirical nature involved in using these varied approaches to modelling wage rate changes within geographic submarkets. Not least among these are the definition of the labor submarkets and the identification and measurement of links between submarkets. An alternative method of incorporating the interdependency between submarkets in a model of wage rate change is suggested by research on the wage diffusion and the transmission of economic impulses through urban systems. Research on the transmission process has relied heavily on the concept of diffusion, while models of fluctuations in economic activity have largely been derived from regional business cycle theory. This research has been carried out mostly by geographers and regional scientists respectively, and aspects of it that have some bearing upon the present research will be discussed next.

3.4.2. Subnational Business Cycles

Since McLaughlin's (1930) paper first appeared more than a half century ago, the subnational business cycle theory has been developed and tested on numerous occasions. It was, however, a series of papers published by Vining (1945,1946,1949) that firmly established the concept in economics. Vining assumed that regional business cycles are transmitted through the major export industries of each regional economy. The cycle reflects, or in some way exaggerates, the national industrial impulses transmitted to it. Vining derived three generalizations from his model: (1) the greater the dependence of a region upon other regions for its consumer goods, the greater will be the relative change in income for a given relative change in "investment" or total offset expenditures; (2) the less the short-run elasticities of demand for the goods and services, the greater the relative change in the "investment" or total offset expenditures of the region for a given relative change in nation income; and (3) the greater the short-run elasticity of demand for the region's exported goods, the greater the cyclical sensitivity of the region. There were, however, empirical difficulties in measuring the short-run income elasticity of demand for a region's export. During the infancy stage of regional business cycle theory, most researchers used either industrial composition or industrial diversification as a proxy for short-run income elasticity of demand for the region's export goods. The former proxy is based on the assumption that industries react similarly to national business cycles. As Isard (1957) notes, a regional business cycles is a composite of its industries' business cycles, appropriately weighted. Obviously, purely regional factors were ignored. The latter assumes that: (1) there is a fairly equal balance in the ratio of durable to nondurable goods manufacturing; (2) the regional industrial structure is similar to the nation's; and (3) industries in the region's industrial structure are weighted equally (Richardson, 1969). The earliest empirical tests of regional differences in business cycles used industrial composition as a proxy for the measurement of the short-run income elasticity of demand for a region's exports (e.g. Vining, 1945, 1946, 1949; Bort, 1960). More recent analyses have used unemployment rates as an indicator of regional cyclical fluctuations (e.g. Brechling, 1967; Harris and Thirlwall, 1968; Thirlwall, 1966,1974; Bassett and Haggett, 1970; Casetti et al, 1971; Van Duijn, 1975; King et al, 1969; Jeffrey, 1974; Jeffrey and Webb, 1974; Clark, 1978).

In addition to industrial composition and industrial diversification, Kinder (1946), and Neff and Weifenbach (1949) suggested that urban growth is another factor that influences regional business cycles. They argued that fast growing cities would tend to have shorter cycles because of competitive advantage. Such cities usually originate innovations, and they tend to enter a business downturn later, and have a earlier recovery during the economic expansion phase of business cycles. Not all earlier studies found urban growth, industrial composition and industrial diversification significant variables in explaining the amplitute and timing of regional business cycles. For example, Garbarino (1954) in his study of the relationship between city size and unemployment rate found that larger cities tend to have higher unemployment rates than smaller ones. He also found that industrial composition was not significant. In another study, Rodgers (1957) also found no evidence to support the correlation between his industrial diversification index and deviation in employment.

In a study of regional business cycles of manufacturing employment in 33 states, Borts (1960) concluded that: (1) there are long-lasting differences among states in the severity of cyclical fluctuations, which are in part due to differences in industrial composition; (2) the differences in regional response to national business cycles have diminished over time because of greater industrial diversification within states and because of milder cycles; (3) there exists a well-marked pattern of transmission of cyclical impulses among and within states, and the differences in cyclical severity are greater than predicted by industrial composition differences alone; and (4) cyclical stability is positively related to economic growth. States that experience slow growth tend to show greater cyclical fluctuations than those of faster growing states. This last finding is in contrast to the findings of Neff and Weifenbach (1949) and to Cho and McDougall (1978). Mitchell (1951) also found that cyclical instability tends to be associated with declining or slow growth industries and is most pronounced when such industries are concentrated locally. The relationship between industrial diversification and cyclical instability was also investigated by Thompson (1965). He found that increasing population size is usually related to greater industrial diversification and diversification leads to a situation whereby national factors increase in relative importance, such that the regional response closely approximates the national pattern.

Brechling (1967) used an econometric approach to separate regional economic fluctuations into three components: a national cyclical, a structural and a regional component. This approach was also adopted by Thirlwall (1966), Harris and Thirlwall (1968), Van Duijn (1975), King et al. (1969, 1972), Jeffrey and Webb (1974) and Clark (1978). This model can be simply specified as:

$$U_{it} = a_i + b_i U^*_{t+k} + e_{it} \qquad (3.5)$$

Where U_{it} is the unemployment rate in region i, time t; U^*_{t+k} is the national unemployment rate, time t+k; a_i and b_i are region specific parameters; and e_{it} is an error term. Parameters b_i measures the strength, direction and significance of the impact of national unemployment on regional unemployment in the short-run. If b_i is greater than 1, this represents a region which is cyclically sensitive. If b_i is less than 1, the region is considered to be cyclical less sensitive. Thirlwall (1966) applied a similar model to regional and national unemployment in the United Kingdom, and found that the degree of sensitivity of regional unemployment in response to national unemployment in the short run is partially attributable to regional differences in industrial composition. He concluded that the other major factor affecting the regional cyclical sensitivity must be due to regional factors. In another study of interregional variations in cyclical sensitivity to unemployment in the United Kingdom, Harris and Thirlwall (1968) reached a similar conclusion. They found that intra-industry factors are to better explain cyclical sensitivity than inter-industry factors. They suggested that such regional cyclical patterns are attributable to three factors: (1) regional variations in the ratio of branch plants and parent plants. (It is more likely that branch plants will be forced to shut down or reduce production during economic downturn which will result in lay-offs or hiring freeze); (2) regional variations in the proportion of workers who are geographically or occupationally immobile; and (3) regional variations in labor hoading during economic slowdown. Cho and Mcdougall (1978) also suggested that the severity of regional cycles seem to be differ among regions. Their results support the industry diversification hypothesis. Diversified regions exhibit cyclical patterns similar to the nation in terms of both frequency and severity. Specialized regions appear to be more volatile in their behavior.

Regional differences in industrial composition alone explain only some of the the regional differences found in business cycles. Bort (1960), Breching (1967), Thirlwall (1966) ,Harris and Thirlwall (1968), King et al. (1969, 1972), Jeffrey (1974), Jeffrey and Webb (1972), Bannister (1976), Casetti et al. (1971), King and Forster (1973), King and Clark (1978) and Clark (1978) have also considered the role of interregional linkages. Given a developed system of urban centers, attempts have been made to identify how economic impulses are transmitted through the system. As shown in Figure 3.2, these impulses may be generated outside or inside the system. The former, national impulses, result from the impact of national cyclical forces on the levels of economic activity within the center. Changes in national monetary and fiscal policy, trends in consumer saving as opposed to spending, changes in business psychology with respect to investment and international variations in demand are examples of these types of forces.

Impulses generated from inside the system result from regional forces. Starting in a particular region, such impulses are transmitted through the system by means of import-export ties amongst the economic activities of the centers. They could result from the differential response on the part of particular regions to national cyclical forces, or from regional factors such as plant closures, local strikes and local changes in investment and consumption patterns.

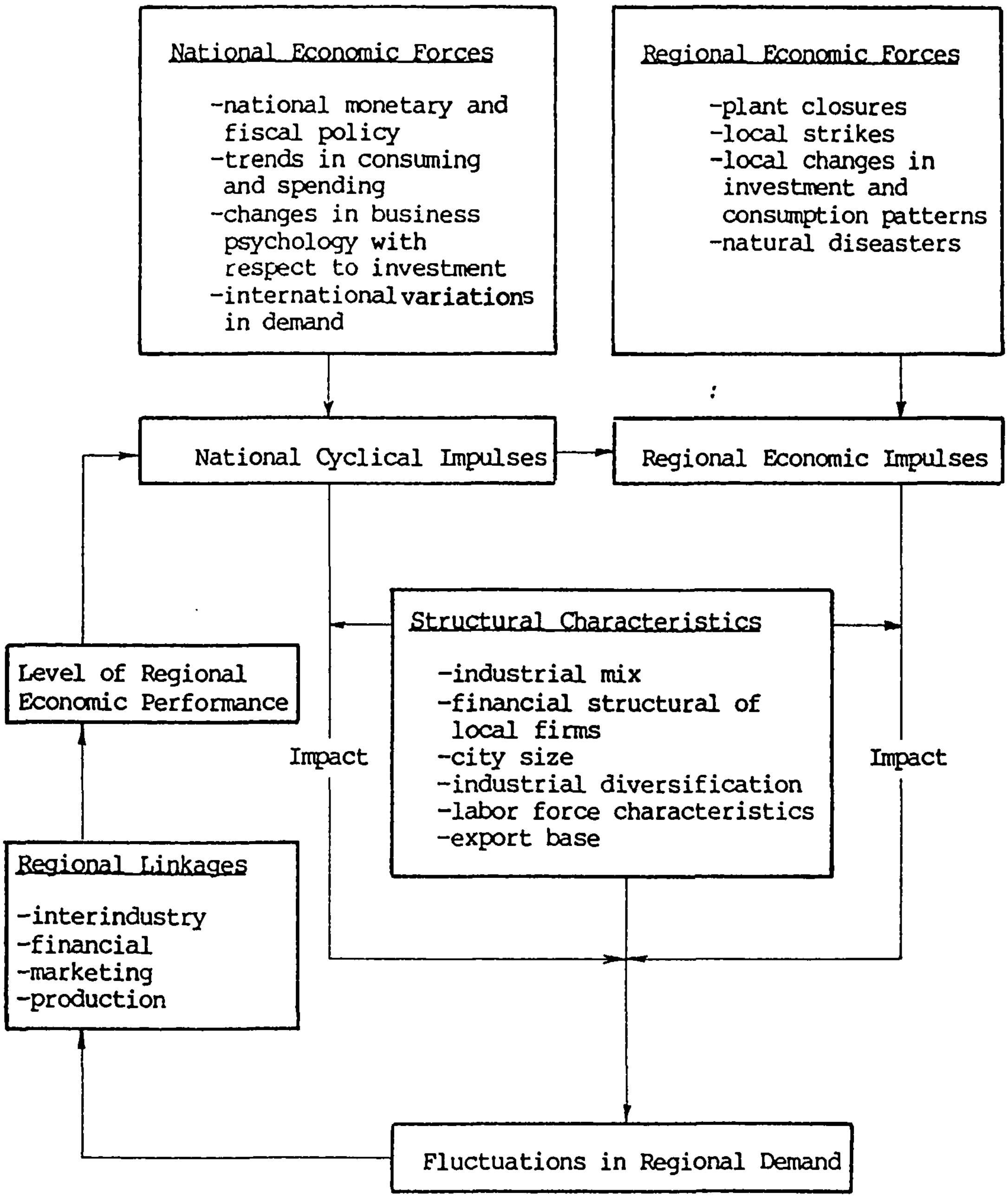


Figure 3.2. Economic impulses in an urban system

Both national and regional impulses will be reflected in cyclical fluctuations of economic activity within each center of the system. The intensity of the impact of any of these upon local economies will depend not only upon industrial mix and export base characteristics, together with their growth performances and competitive advantage, but also upon the relative geographic location of these centers. Researchers in this field have show that there do exist regional sub-systems characterized by distinct cyclical fluctuations in economic activity as a response to regional impulses transmitted through sub-system.

This transmission mechanism has been extended into more advanced space-time forecasting methods using mixed autoregressive-moving average equations (e.g. Curry, 1971; Cliff and Ord, 1975; Bennett, 1974; Hepple, 1975; Bassett and Haggett, 1971; Haggett, 1971; Bartels, 1976). A major concern with this research is with identifying differences in the timing of regional business cycles. For example, Bassett and Haggett (1971) used lag correlation and spectral analysis methods to identify leading areas in a planning region. They hypothesized that fluctuations of economic activity in the leading areas would be used as a leading indicator for the lagging areas. Using Bristol as the reference point, Bassett and Haggett found that several areas consistently lagged Bristol by up to six months. By studying the autocorrelation and cross-correlation functions of regional time series (e.g. Clark, 1978) or by using spectral and cross-spectral analysis (e.g. Bassett and Tinline, 1970; Cho and McDougall, 1978), it is possible to detect the structure of interregional relationships.

Chapter 4

COMPONENTS OF UNEMPLOYMENT IN THE U.S. URBAN SYSTEM

4.1. Introduction

In this Chapter, the generation of national, structural and regional impulses and their impact on the urban economy are discussed and then are used to formulate a conceptual model for the study of economic interactions within an urban system. This is followed by an attempt to operationize the model, using a measure of unemployment as an index of economic performance.

4.2. Economic Impulses in an Urban System

The interdependence of economies within an urban system has long been observed. This results from variations in factors such as industrial mix and export base characteristics. It is assumed, therefore, that for a given developed system of urban economies, once short term economic impulses are introduced they will be transmitted through the system (Bannister, 1976; Casetti et al., 1971; Jeffrey et al., 1969; King et al., 1972; King and Clark, 1978). Such impulses may be generated outside or inside the system, as was discussed in the previous Chapter. National impulses result from the impact of national cyclical forces on the levels of economic activity within an urban economy. Changes in national monetary and fiscal policy, trends in consumer saving as opposed to spending, changes in business psychology with respect to investment and international variations in demand are examples of these types of forces. However, such national forces have an uneven spatial impact. For example, federal monetary controls will affect growing regions, which are likely to be engaged in heavy private and public borrowing and investment, quite differently from more stable regions. Fiscal policies, such as capital investment credits, will tend to have different patterns of incidence among regions, according to their industrial composition (Alonso, 1975).

Impulses generated from inside the system result from regional or local forces. Starting in a particular location, such impulses are transmitted through the system by means of import-export ties amongst the economic activities of the centers. They could result from the differential response on the part of particular economies to national cyclical forces, or from local and regional factors such as plant closures, strikes and changes in investment and consumption patterns.

Both national and regional impulses will be reflected in cyclical fluctuations of activity within each economy of the system. The intensity of the impact of any of these upon local economies will depend not only upon industrial mix and export base characteristics, together with their growth performances and competitive advantage, but also upon the relative geographic location of these centers. Researchers in this field have shown that there do exist regional sub-systems characterized by distinct cyclical fluctuations in economic activity as a response to regional impulses transmitted through the sub-system.

The unemployment rate in an urban center (U_i) has most commonly been used as an index of local economic activity. The unemployment rate is divided into three components; these are national (N_i), regional (R_i) and structural (S_i). At any given time t the unemployment rate in center i is therefore equal to

$$U_{it} = S_{it} + N_{it} + R_{it} \tag{4.1}$$

Before the impact of national and regional impulses can be estimated, structural unemployment should be accounted for. This type is largely caused by long-term dislocations in labor market functioning, which are themselves created by such things as changes in technology and final demand and in changing geographic patterns of industry and population. To allow for the fact that structural unemployment may be changing through time, S_{it} is assumed to be a quadratic function of time; hence

$$S_{it} = a_i + b_i t + c_i t^2 \tag{4.2}$$

The national component is defined as

$$N_{it} = d_i U_t^* \tag{4.3}$$

Where U_t^* is the national unemployment rate. The parameter d_i is a measure of the center's sensitivity to these national impulses. The regional component is defined as

$$R_{it} = \sum_{j=1}^{n} K_{ij} F_{ijt} \tag{4.4}$$

Where F_{ij} refer to n different regional impulses and K_{ij} are parameters reflecting the center's sensitivity to these various impulses. By substituting equations (4.2), (4.3) and (4.4) into equation (4.1), an urban center's unemployment rate is fully defined as

$$U_{it} = a_i + b_i t + c_i t^2 + d_i U_t^* + \sum_{j=1}^{n} K_{ij} F_{ijt} \tag{4.5}$$

In practice, it is not possible to predefine the regional impulses, F_{ijt}, but they may be inferred by factor analyzing the residuals $(U_{it}-\hat{U}_{it})$. The predicted value $\hat{U}_{it}$ is obtained by estimating the parameters of the following equation,

$$\hat{U}_{it} = a_i + b_i t + c_i t^2 + d_i U_t^* \tag{4.6}$$

Results of this type of research in the United States (using data for the period 1960-65) have shown that cities in the North East part of the country generally had consistently high structural unemployment, cities in the Mid-West consistently low structural unemployment, Appapachian cities had declining structural unemployment and cities in the West tended to have increasing structural unemployment (Casetti et al., 1971). As far as their response to national impulses, cities in the Mid-West, Appalachia and west coast were strongly influenced by such factors, whereas those in the remainder of the country tended to be less so (King et al., 1972). They also found that the most cyclically unstable cities were concentrated in three areas: in a belt running from Saginaw, Michigan, to Altoona, Pennsylvania; in the Tennessee valley; and in the Pacific North-West. Other cities such as Minneapolis-St. Paul, Terre Haute, Fort Wayne, Fresno and Worcester also exhibited a high sensitivity to national impulses. Cyclical stability characterized the cities of the Atlantic seaboard, the deep south, the Great Plains and the Mountain states. Strong regional forces were identified in the West, Texas, Mississippi valley, Appalachia, New England, Michigan, Upper Mid-West, East Coast and the Mid-Atlantic areas (Jeffrey, 1974). The same model has been applied to the Australian regional system (Jeffrey and Webb, 1972). There was found that economies of regions dominated by major urban centers tended to be cyclically unstable, strongly influenced by national forces. Those centers experienced decreasing levels of structural unemployment. Urban centers dominated by rural activity tend to be cyclically stable, and experienced increasing levels of long term structural unemployment.

4.3 Model Estimates for SMSAs, 1964-78

The unemployment data used in estimating the model were collected for each SMSA listed in Table 1.1 by month for the period July 1964 to December 1976 and by quarter for the period from the first quarter of 1977 to second quarter of 1978 (U.S. Department of Labor). The monthly series then were transformed to quarterly data. Finally, dummy variables were used to seasonally adjust the series.

The annual time series behavior of unemployment in each metropolitan area and in the nation is shown in Figure 4.1. Most cities possess a similar overall pattern of cyclical movement, although the amplitude of these fluctuations varies considerably from center to center. A high level of amplitude in general tends to be associated with smaller centers and/or with those that have a high level degree of industrial specialization. It is apparent from an inspection of the graphs that the impacts of recession were generally less in centers with more diversified industrial structures.

The coefficients of equation (4.6) were estimated for each SMSA by the Cochrane-Orcutt iterative regression technique, to adjust for the presence of first-order serial correlation. The results are shown in Table 4.1. The Durbin-Watson statistics range from 1.43 to 2.48, and

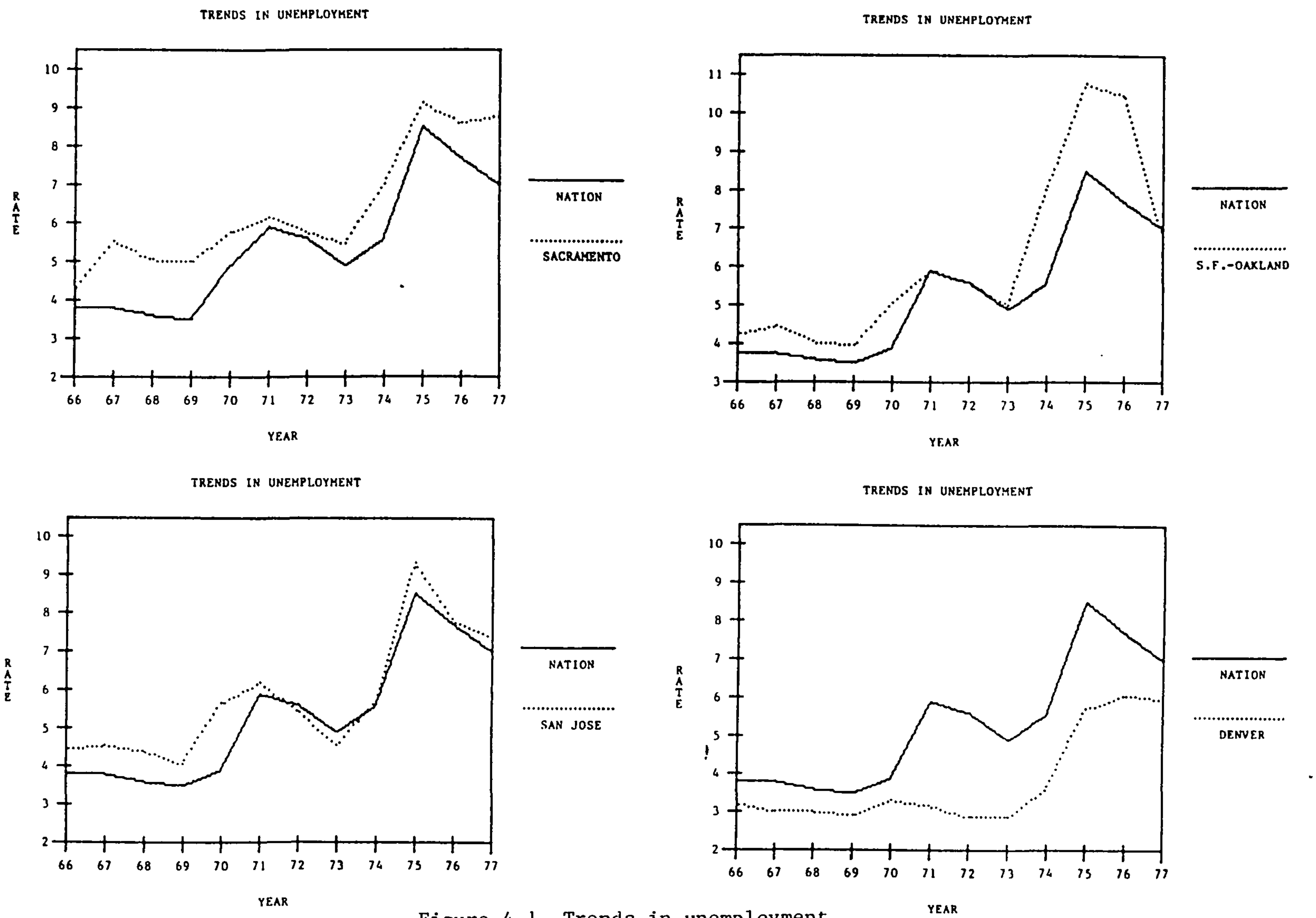
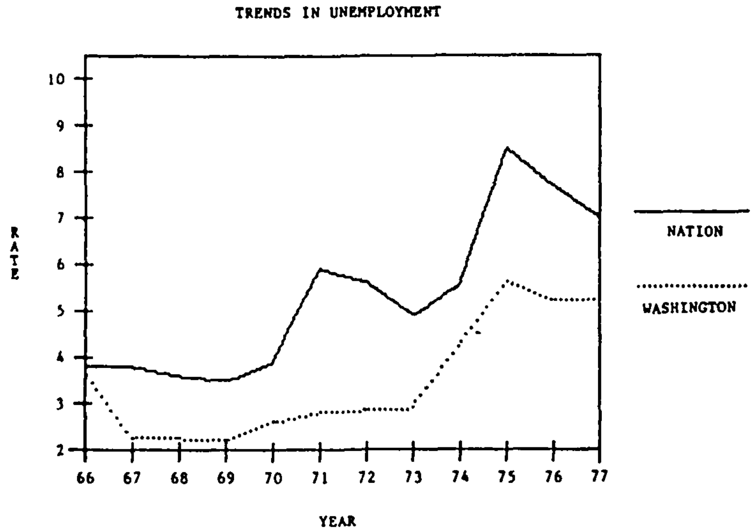


Figure 4.1. Trends in unemployment


TRENDS IN UNEMPLOYMENT
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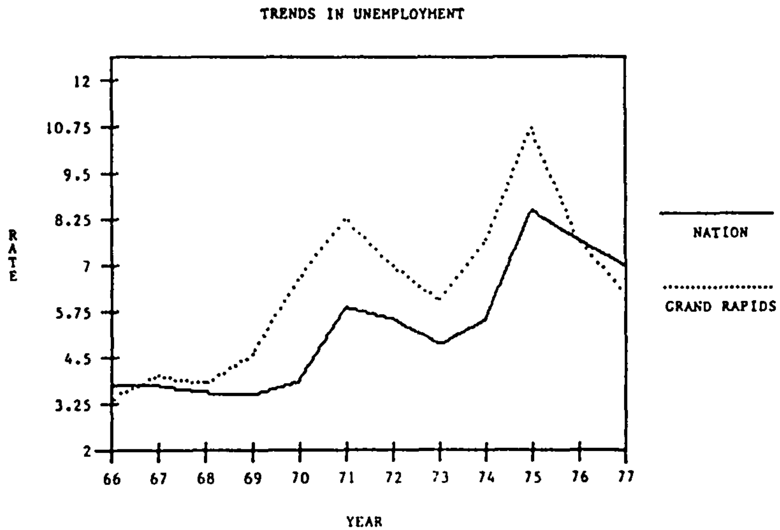
NATION
WASHINGTON


TRENDS IN UNEMPLOYMENT
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YEAR
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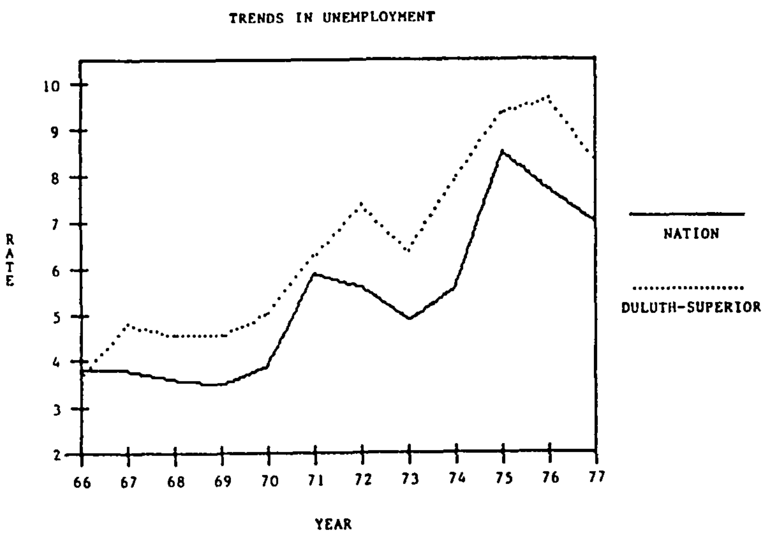
NATION
GRAND RAPIDS


TRENDS IN UNEMPLOYMENT
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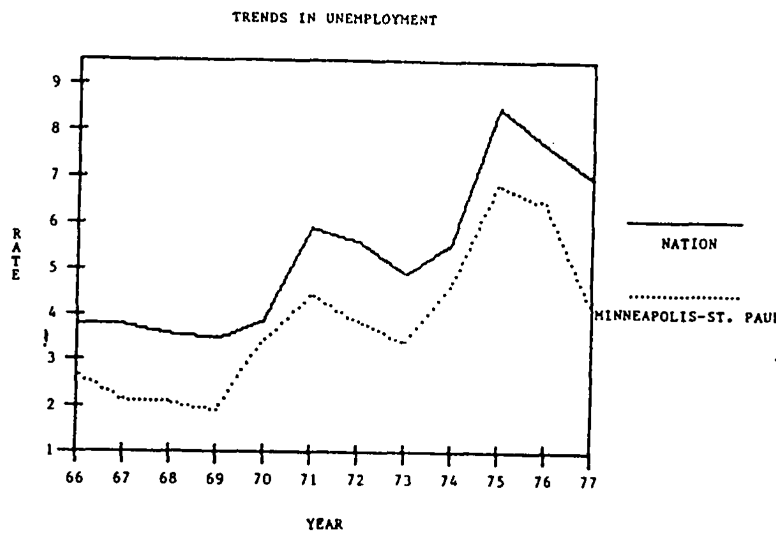
TRENDS IN UNEMPLOYMENT
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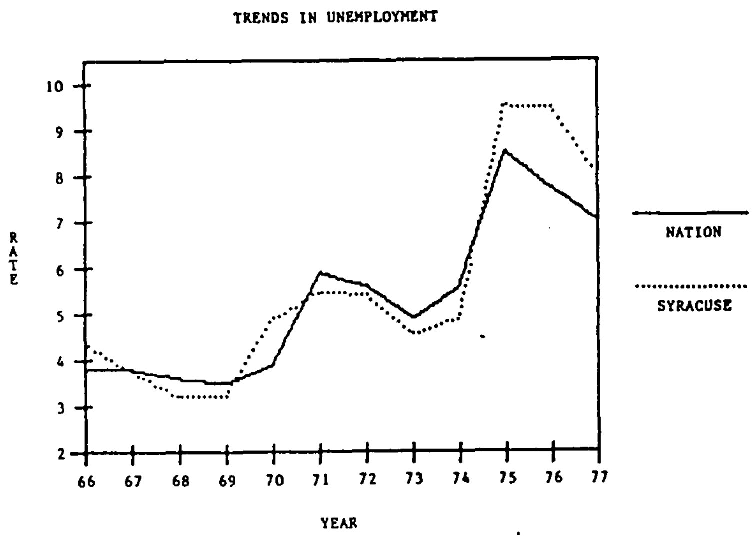
TRENDS IN UNEMPLOYMENT
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NATION
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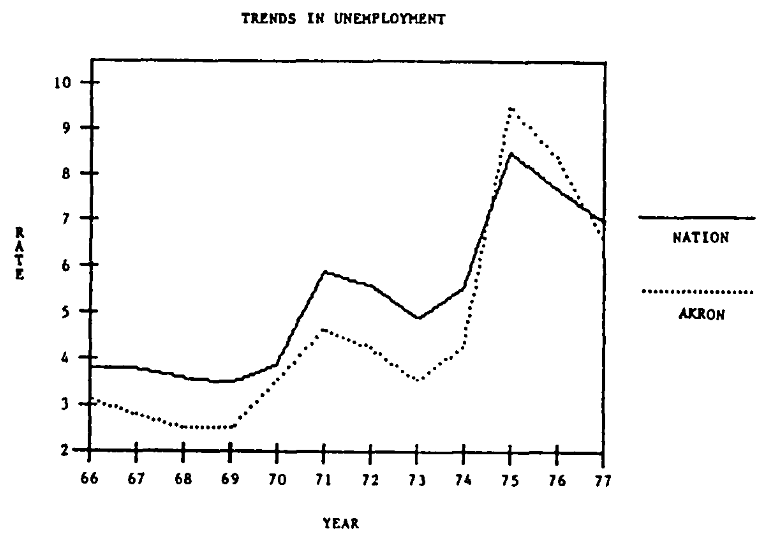
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YEAR
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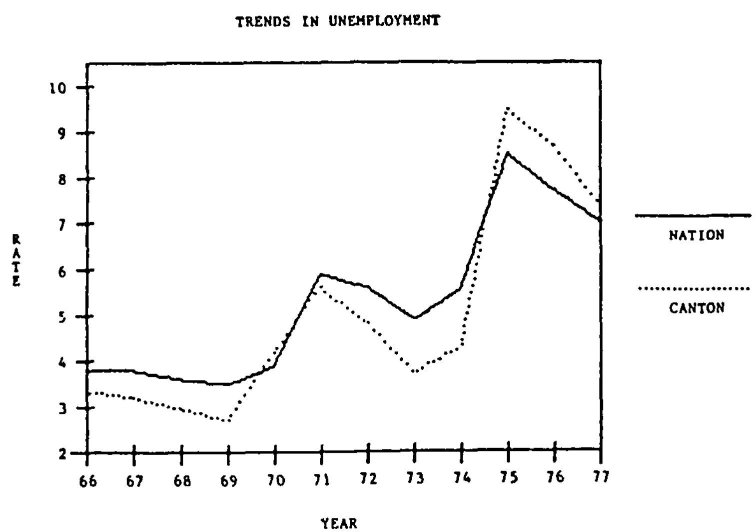
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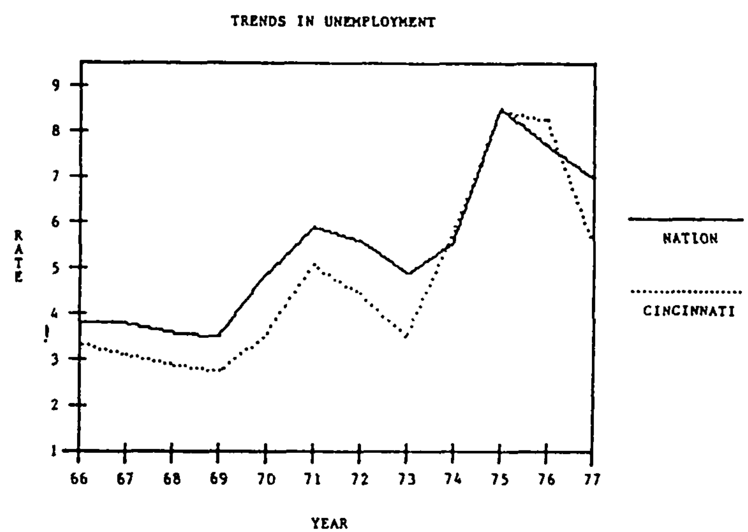
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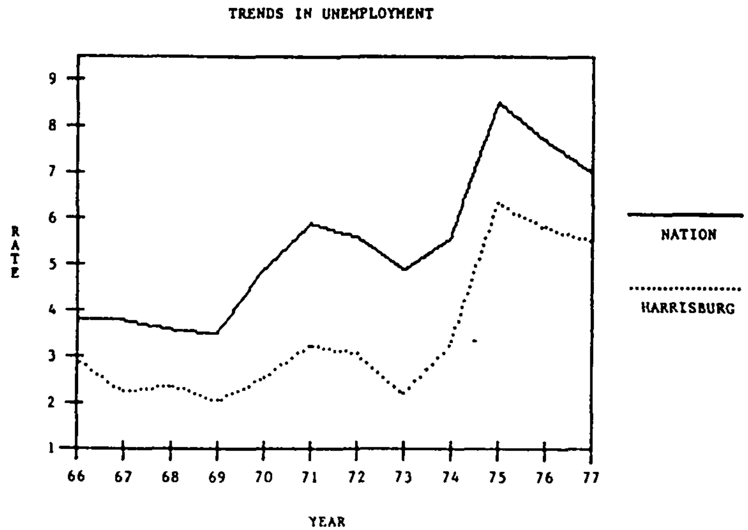
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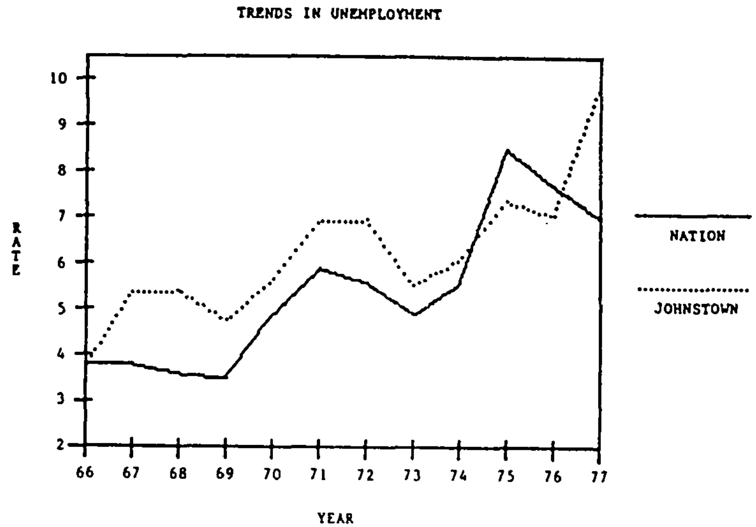
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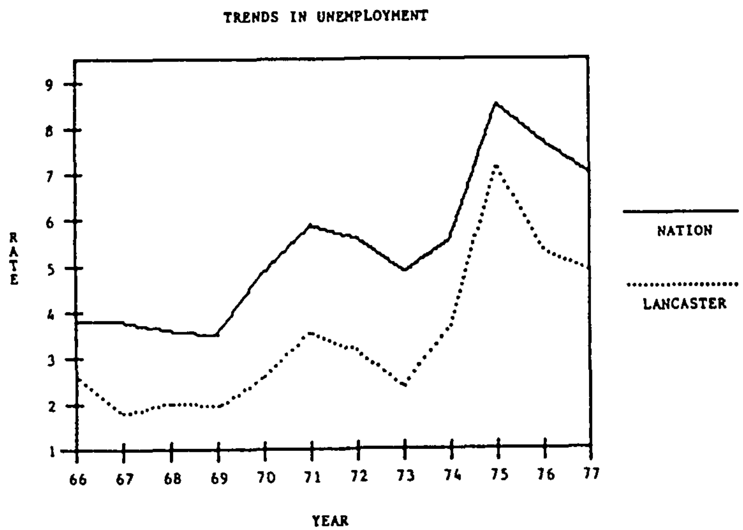
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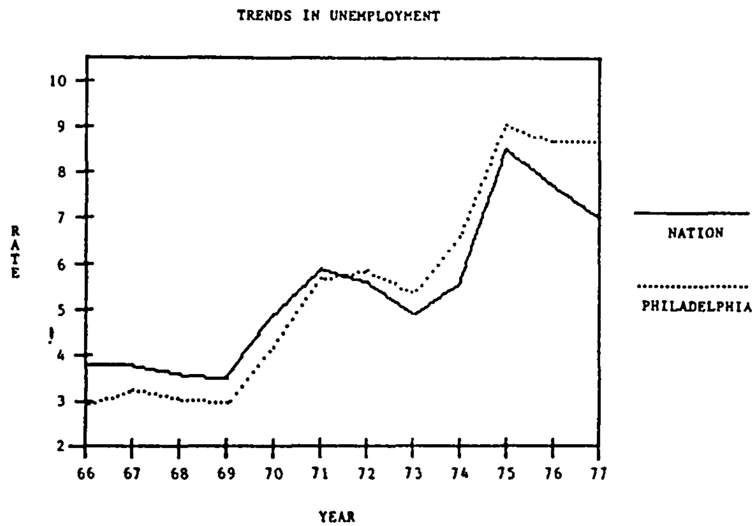
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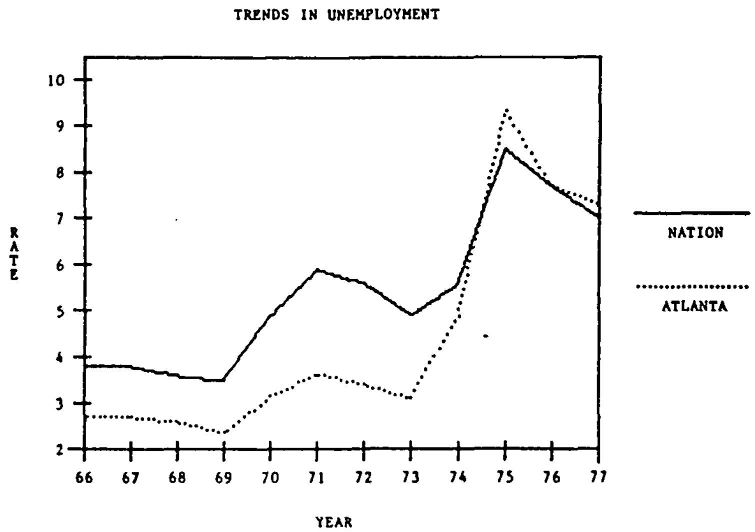
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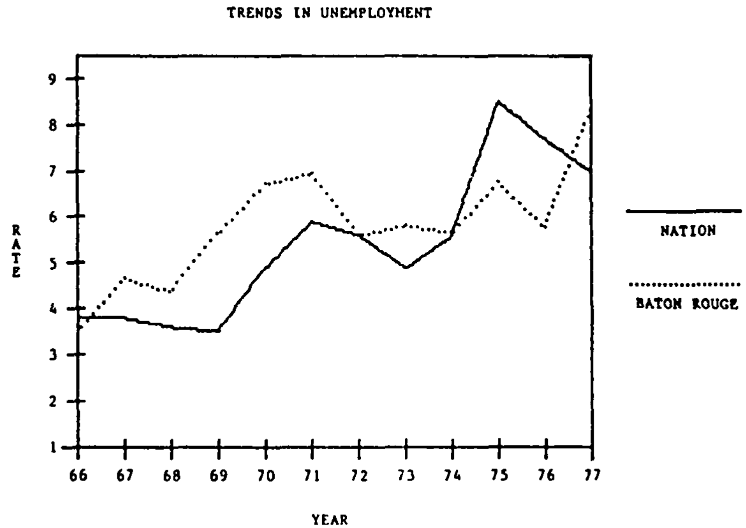
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NATION
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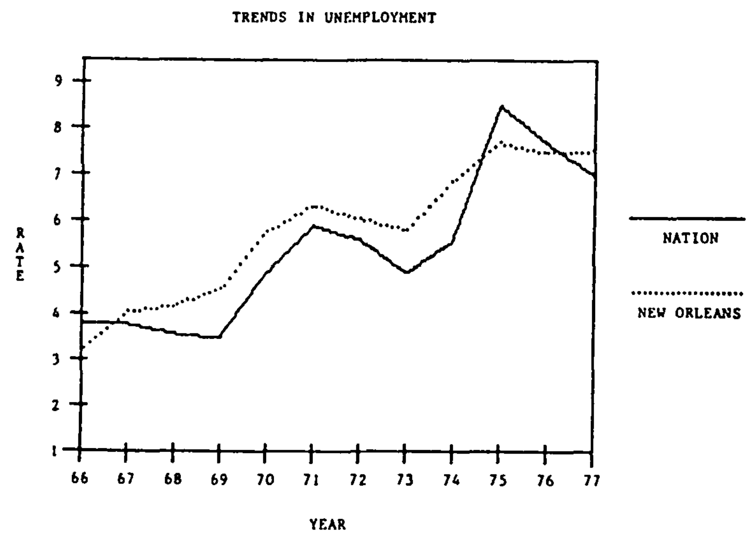
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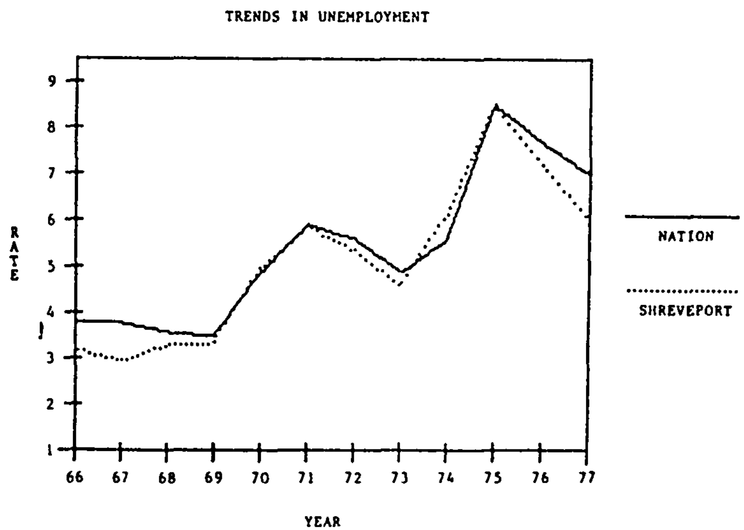
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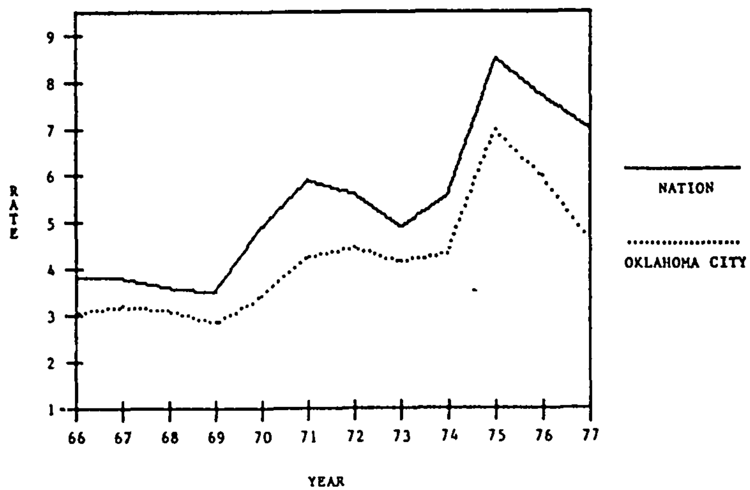
TRENDS IN UNEMPLOYMENT



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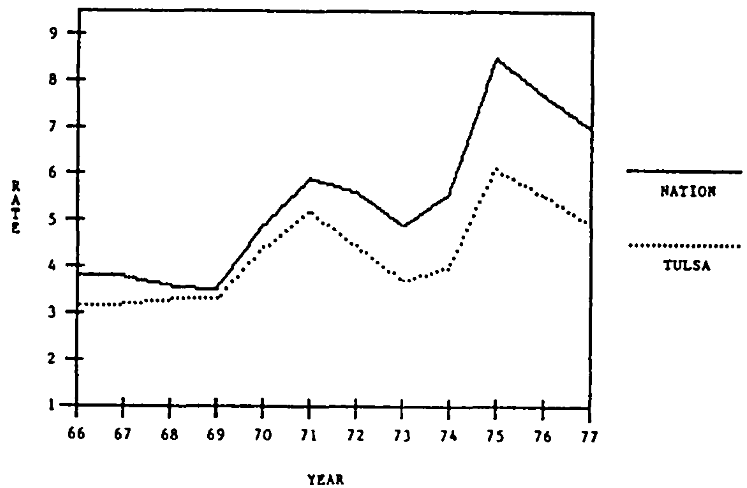

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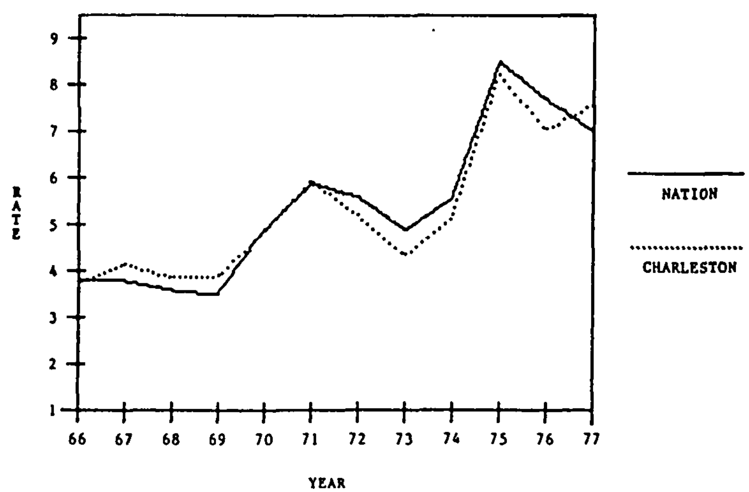

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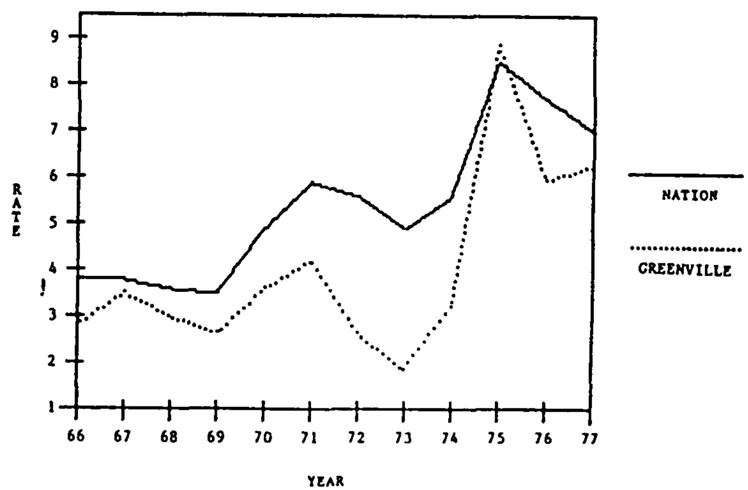

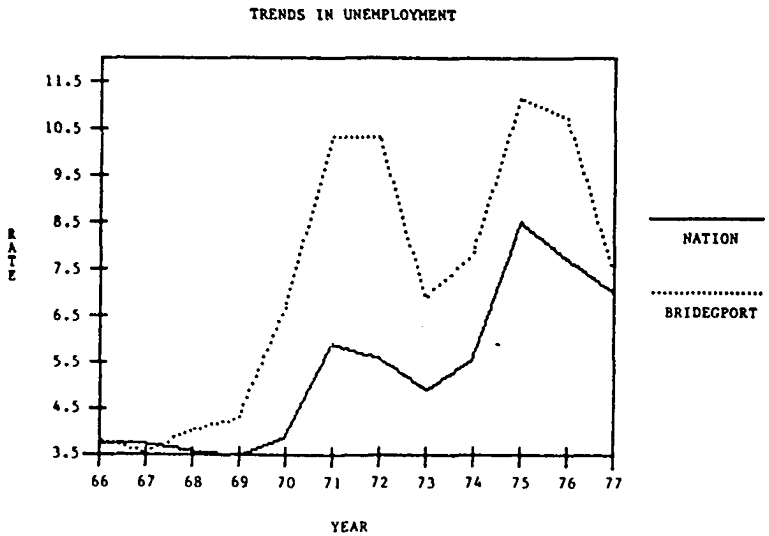
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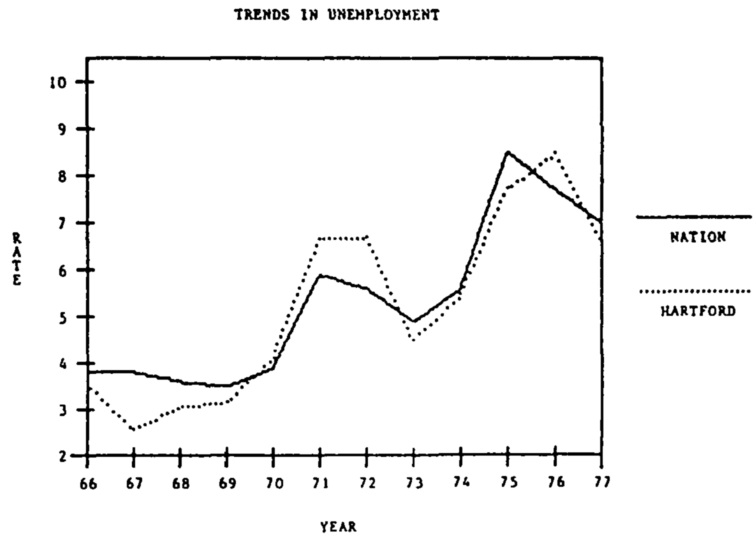
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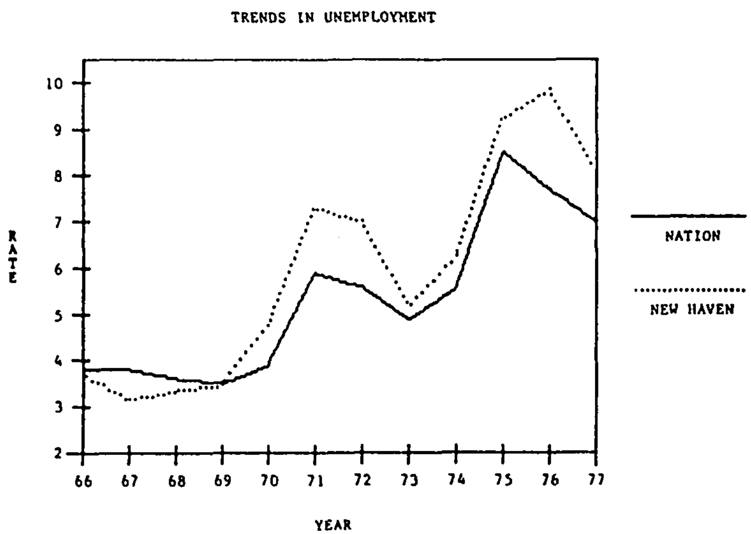
NATION
HARTFORD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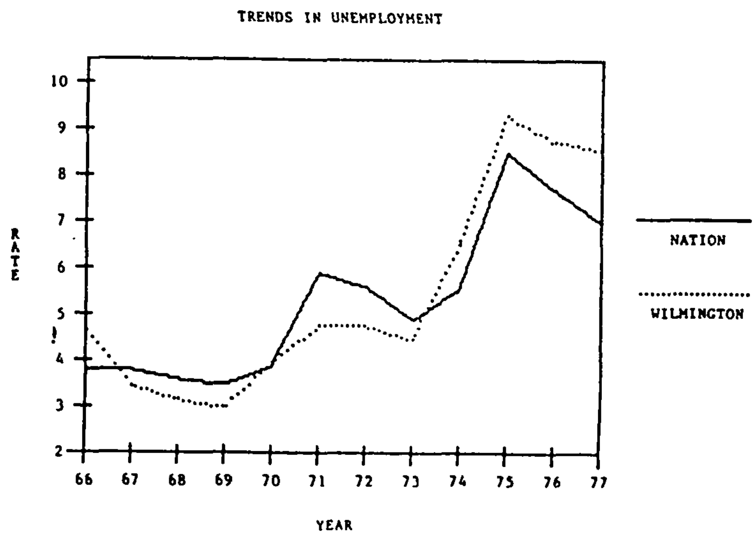
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NATION
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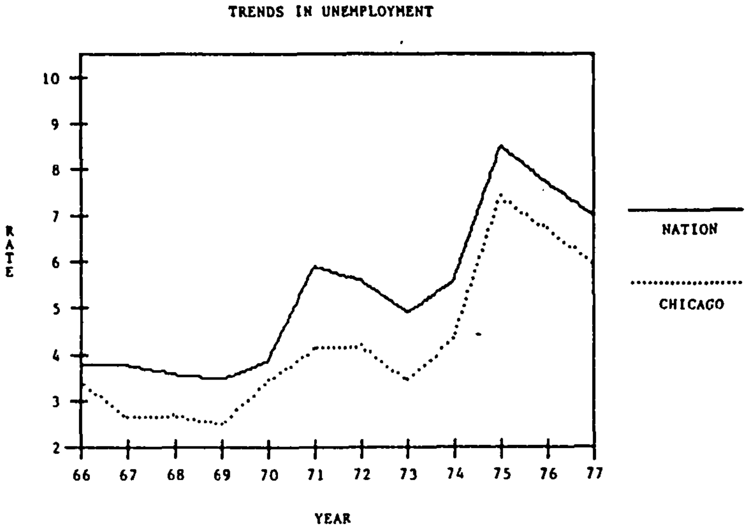
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YEAR
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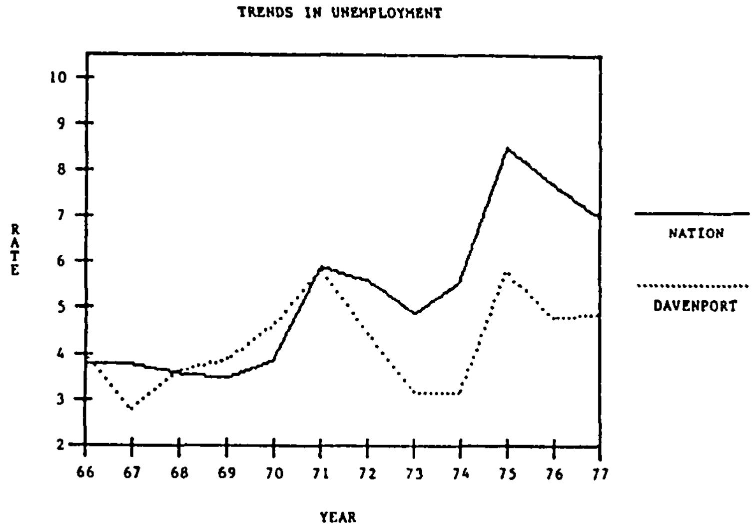
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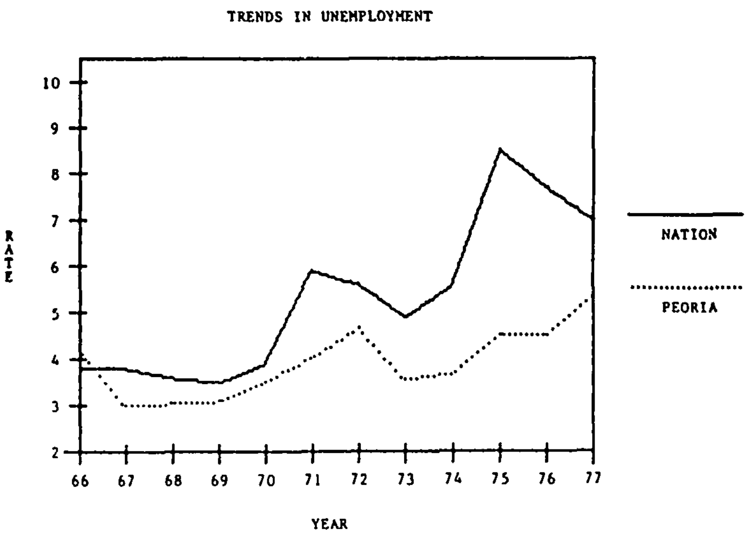
RATE
YEAR
NATION
DAVENPORT


TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
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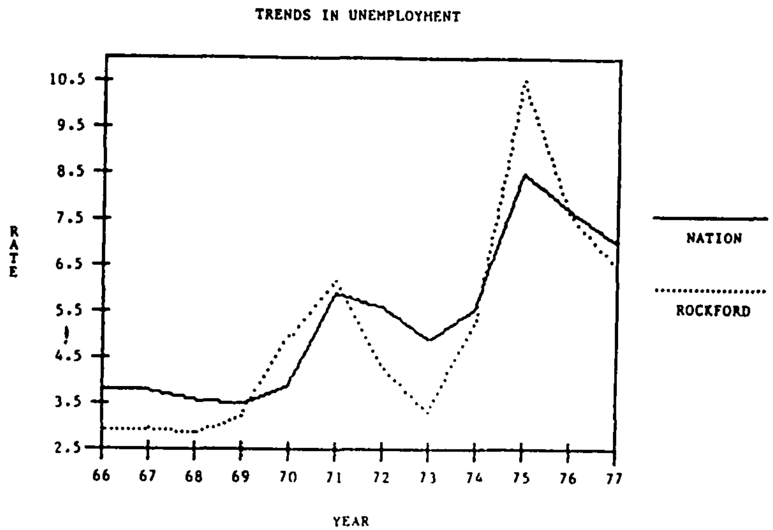
TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
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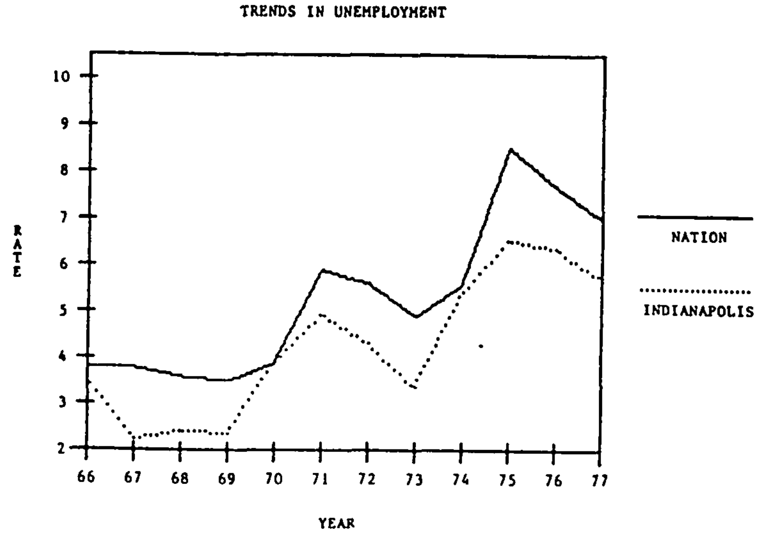
TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
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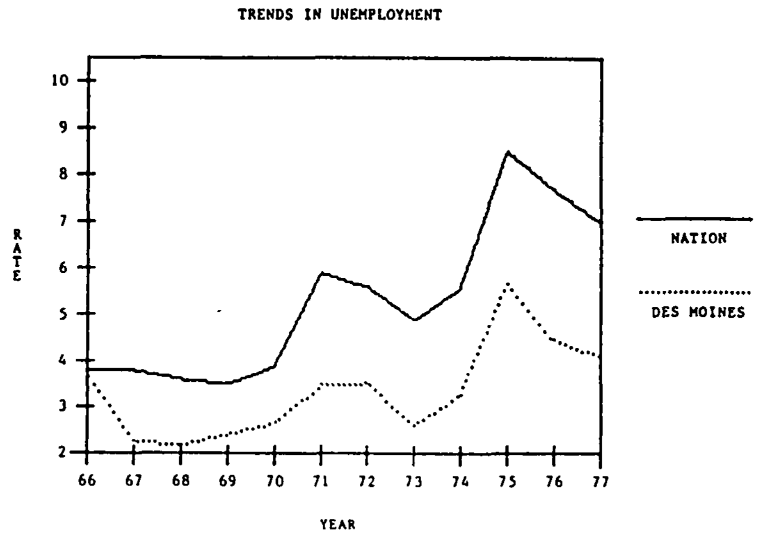
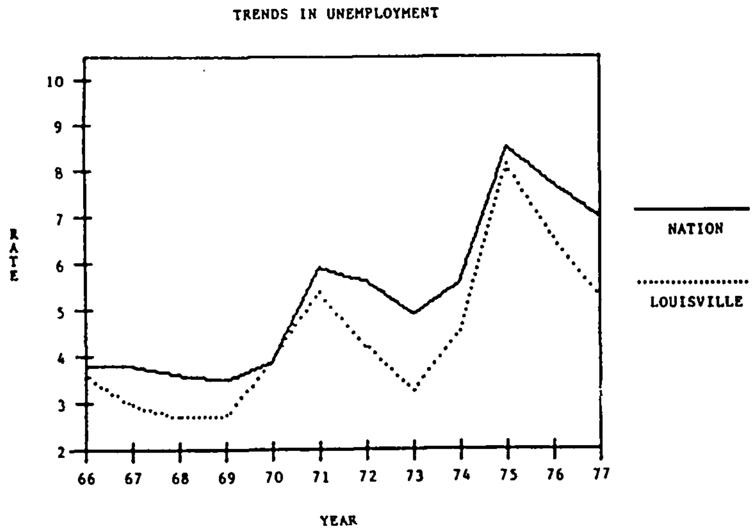

TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
DES MOINES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RATE
YEAR
NATION
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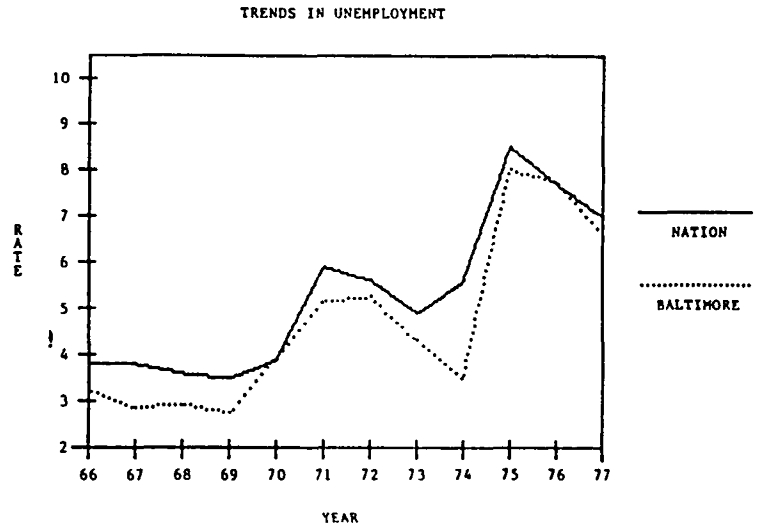
TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
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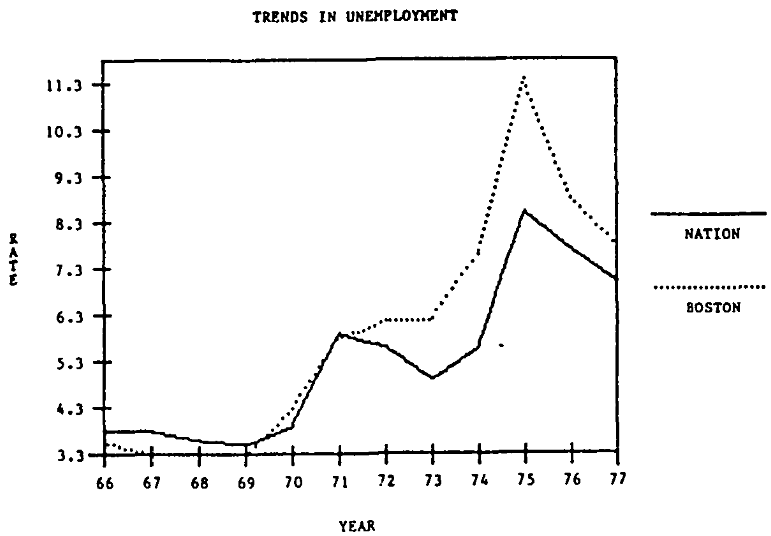
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70
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75
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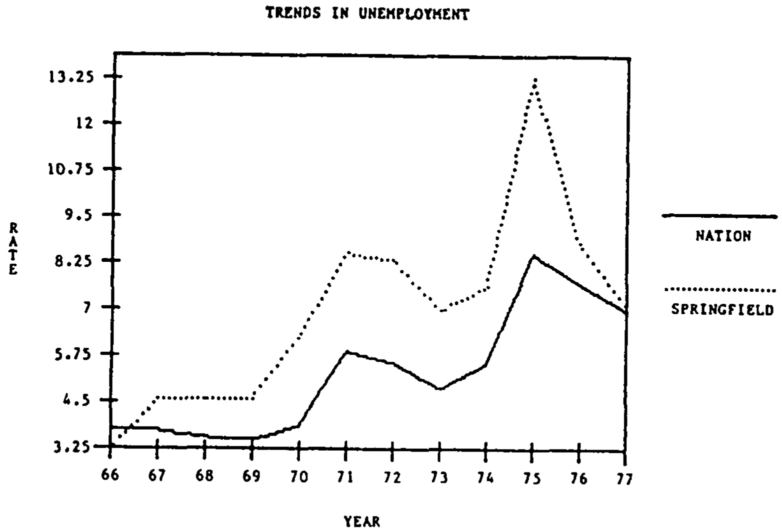
77
YEAR
NATION
BOSTON


TRENDS IN UNEMPLOYMENT
RATE
13.25
12
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9.5
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7
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70
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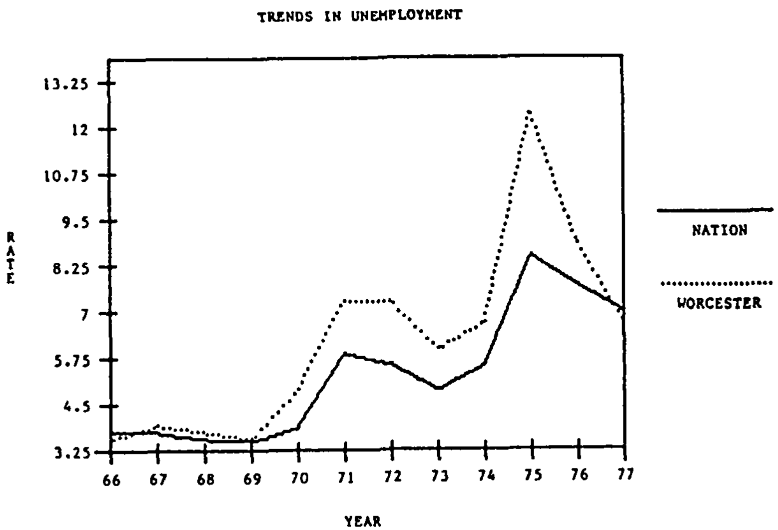
76
77
YEAR
NATION
SPRINGFIELD


TRENDS IN UNEMPLOYMENT
RATE
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8.25
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70
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72
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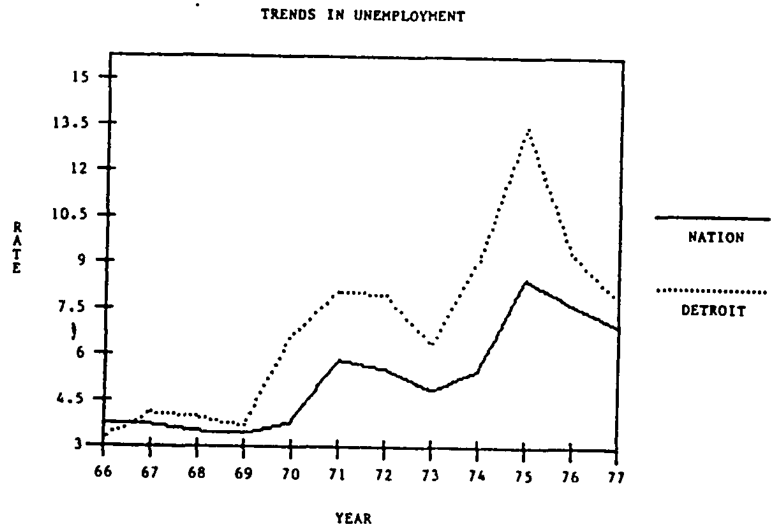
74
75
76
77
YEAR
NATION
WORCESTER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RATE
15
13.5
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7.5
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70
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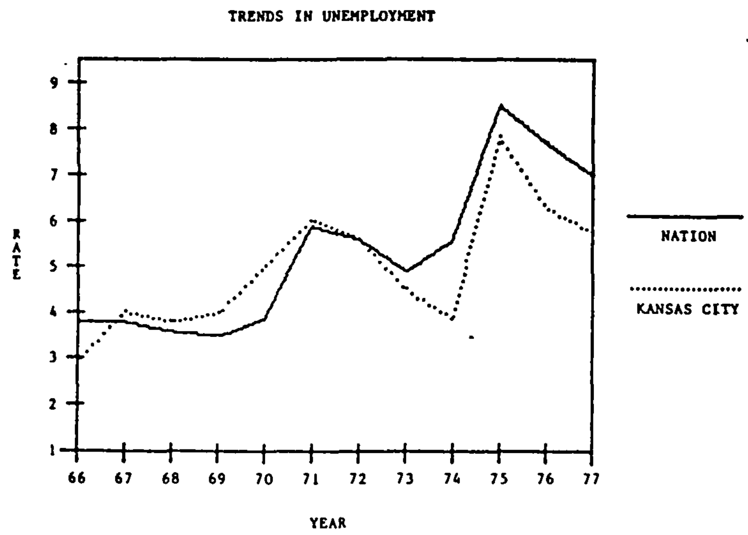
74
75
76
77
YEAR
NATION
DETROIT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RATE
YEAR
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NATION
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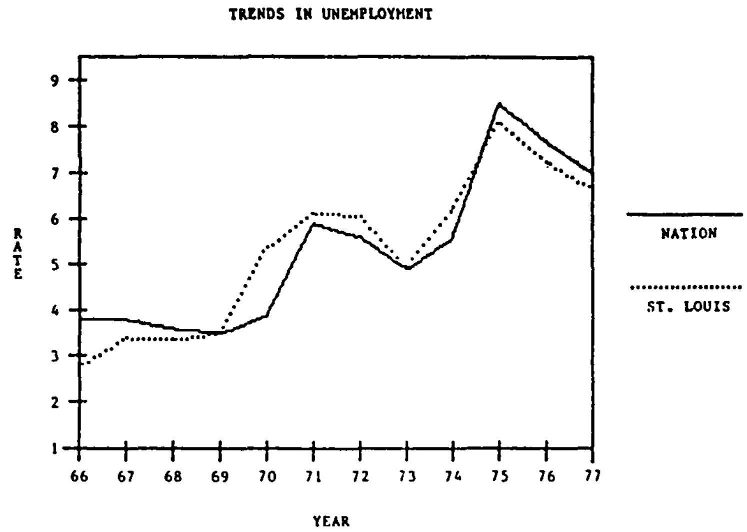
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YEAR
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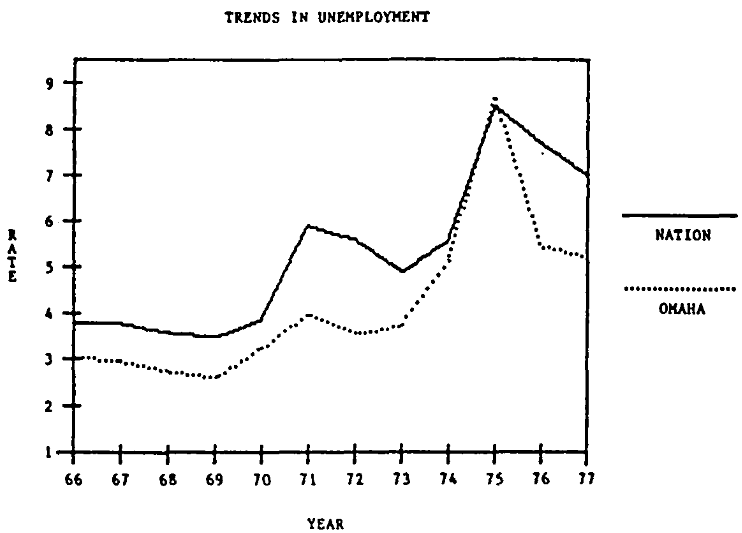
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RATE
YEAR
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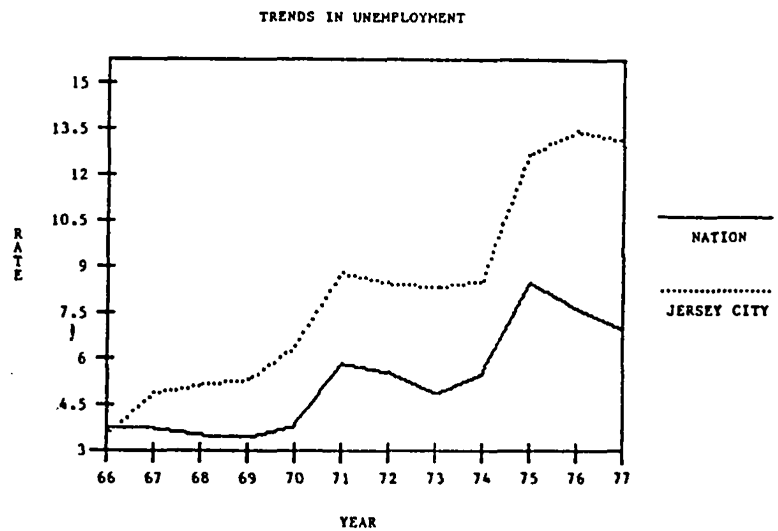
TRENDS IN UNEMPLOYMENT
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YEAR
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NATION
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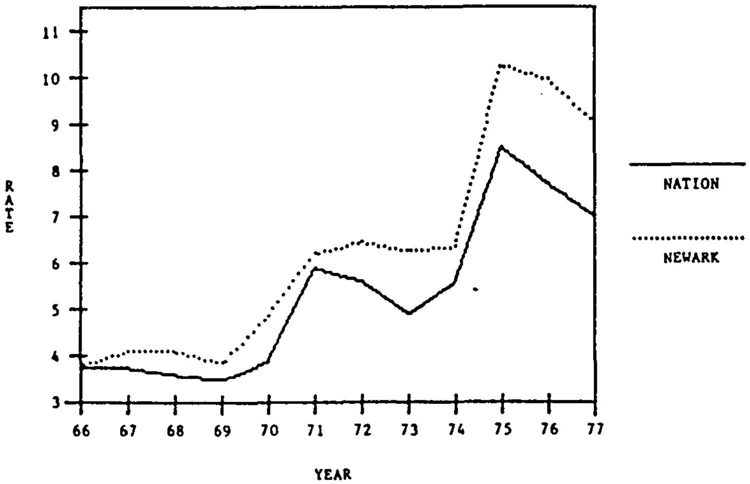
TRENDS IN UNEMPLOYMENT



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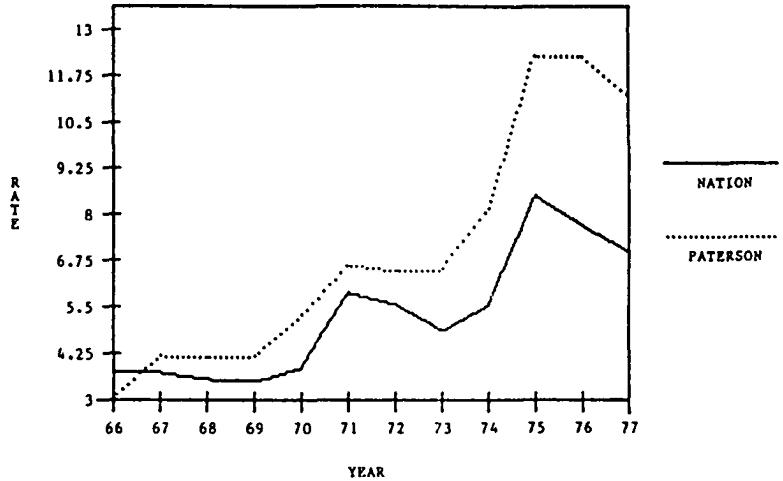

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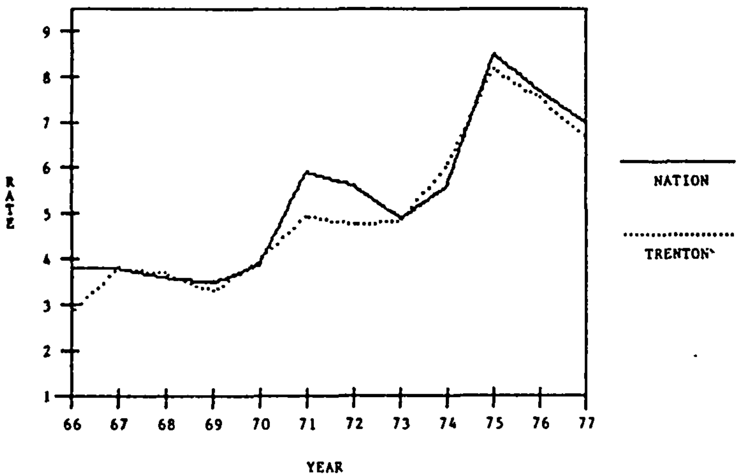

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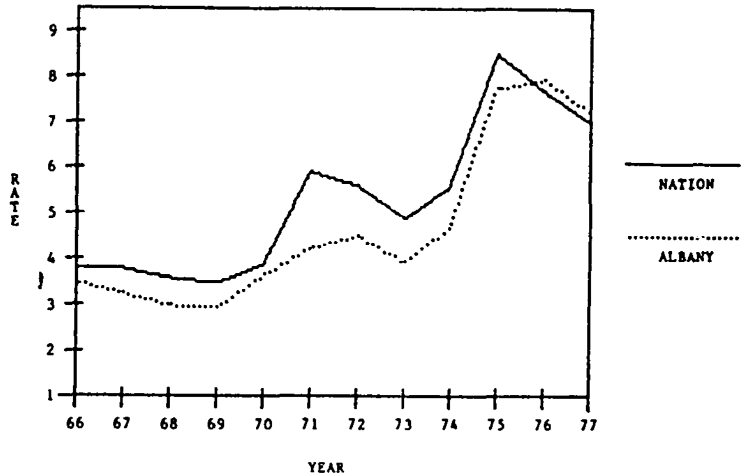

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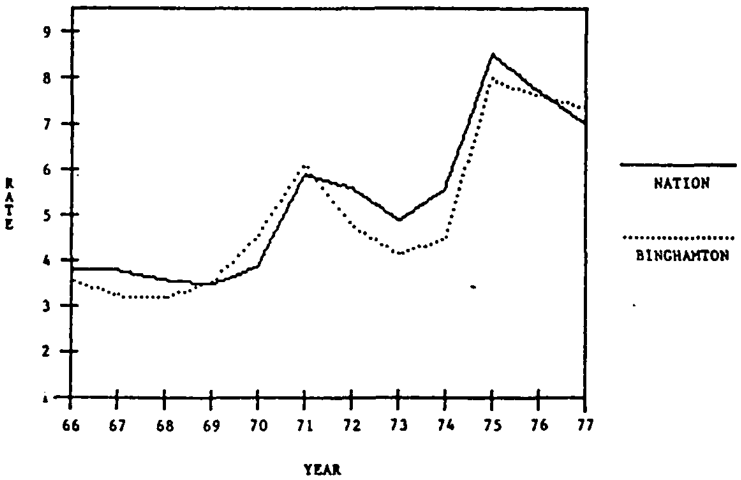

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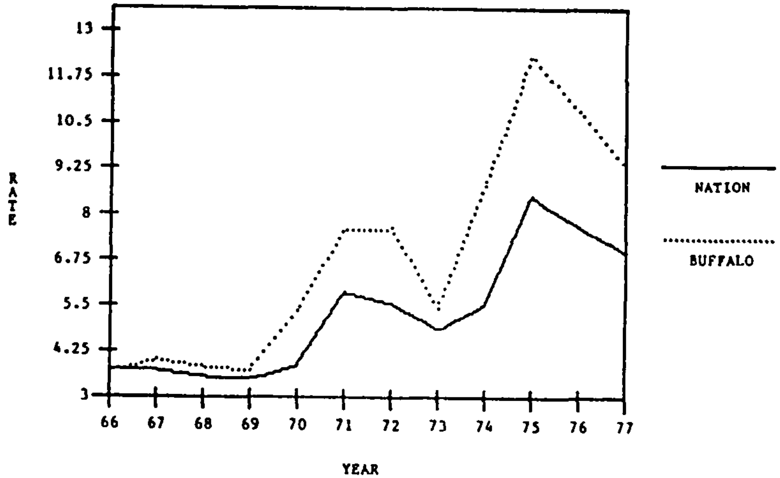

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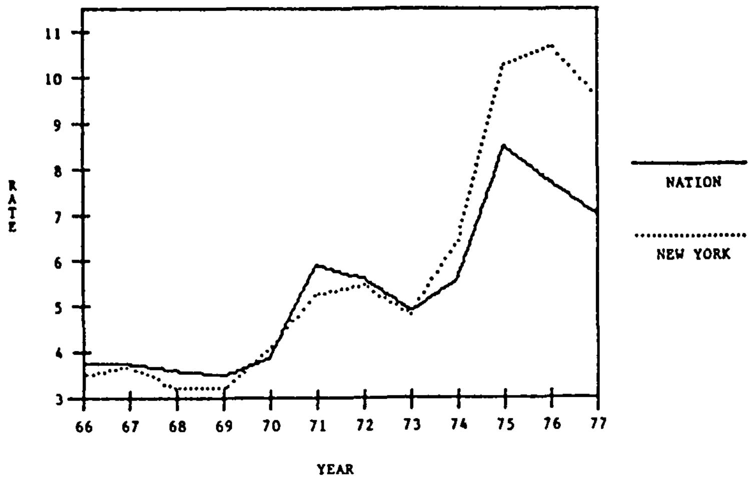

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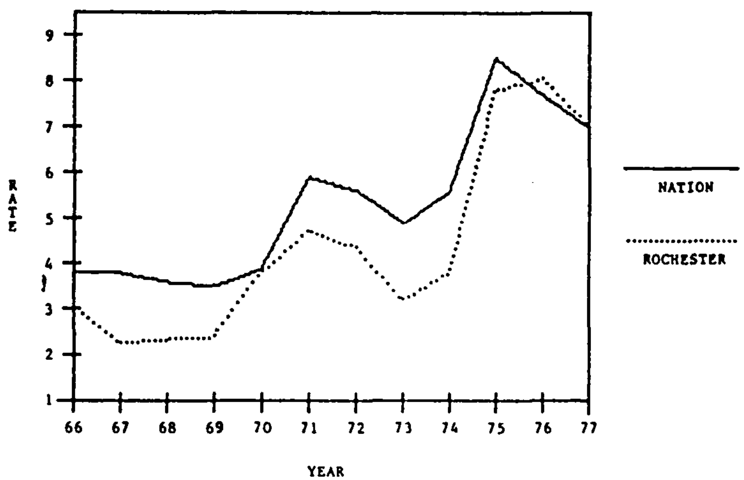

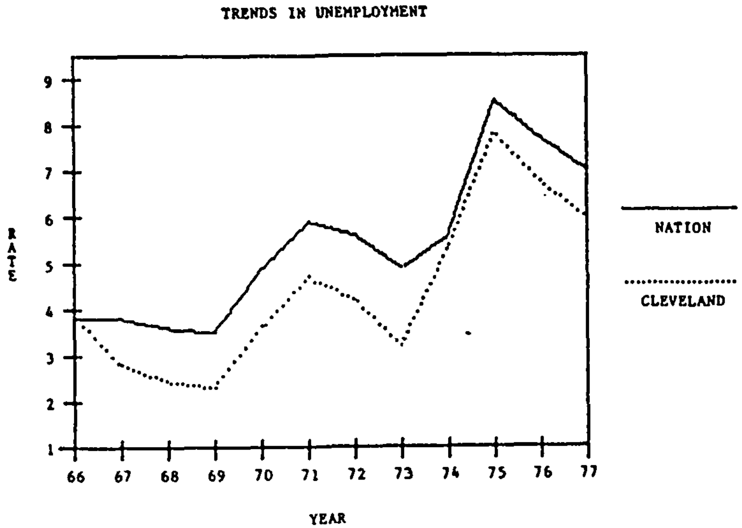
TRENDS IN UNEMPLOYMENT
RATE
9
8
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YEAR
NATION
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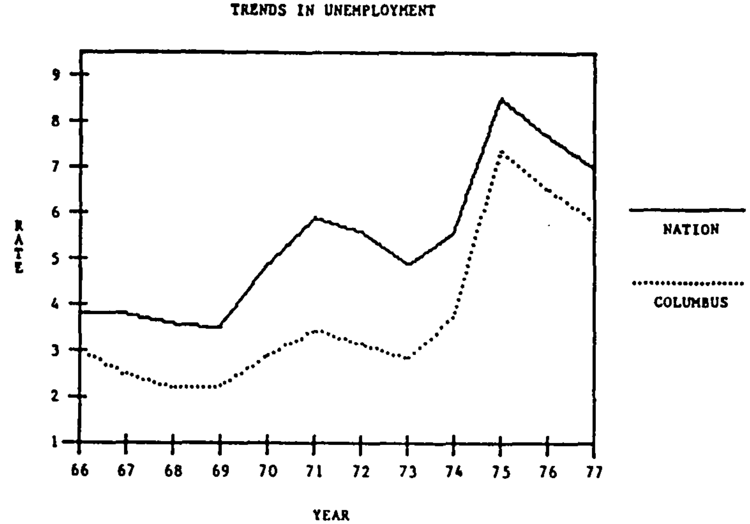
TRENDS IN UNEMPLOYMENT
RATE
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YEAR
NATION
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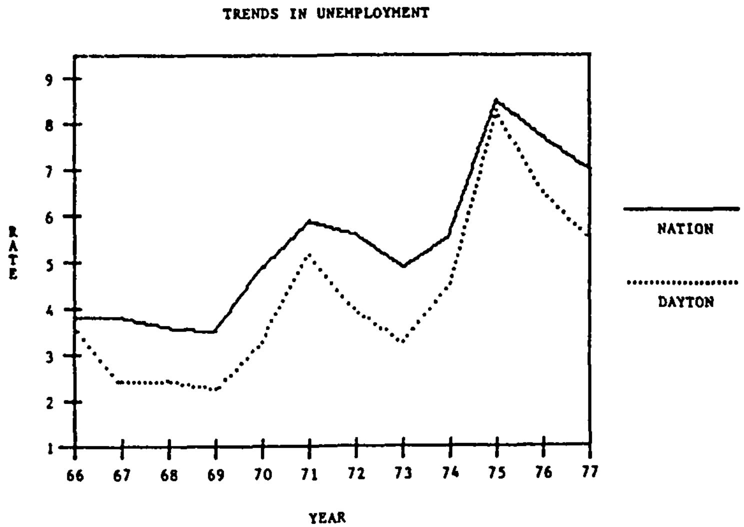
TRENDS IN UNEMPLOYMENT
RATE
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YEAR
NATION
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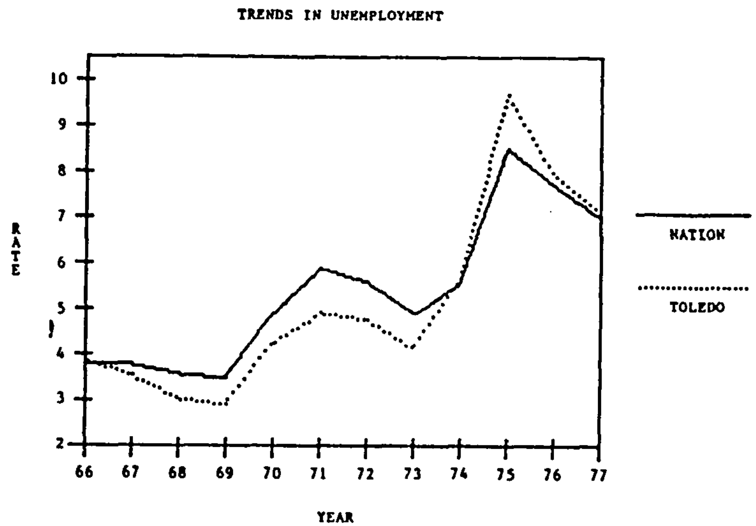
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RATE
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YEAR
NATION
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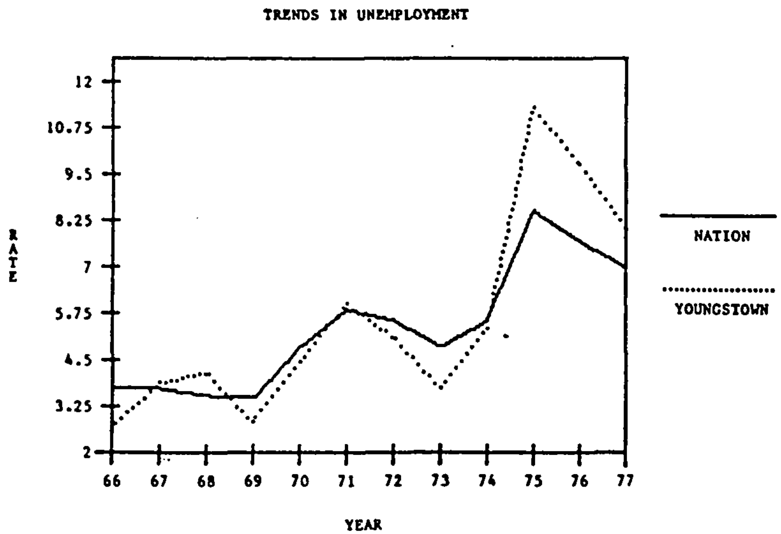
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RATE
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2
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YEAR
NATION
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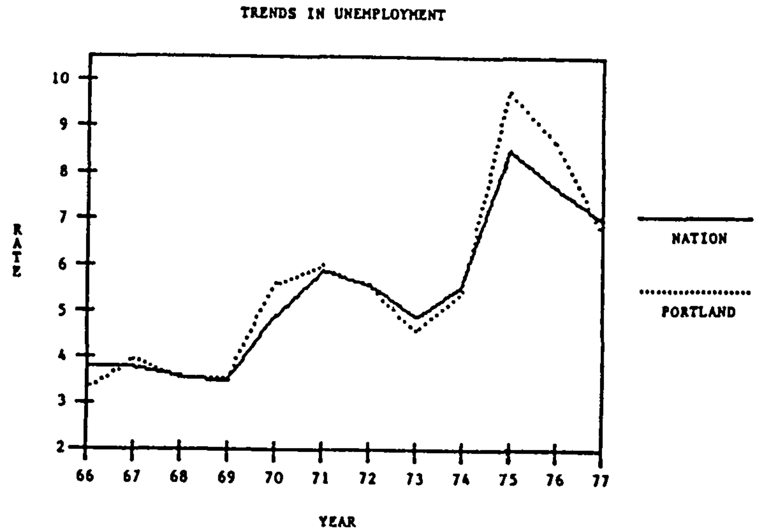
TRENDS IN UNEMPLOYMENT
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YEAR
NATION
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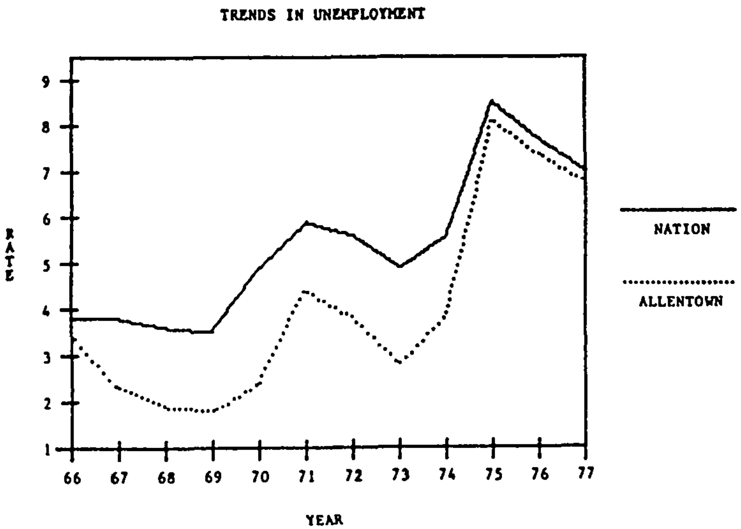
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2
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YEAR
NATION
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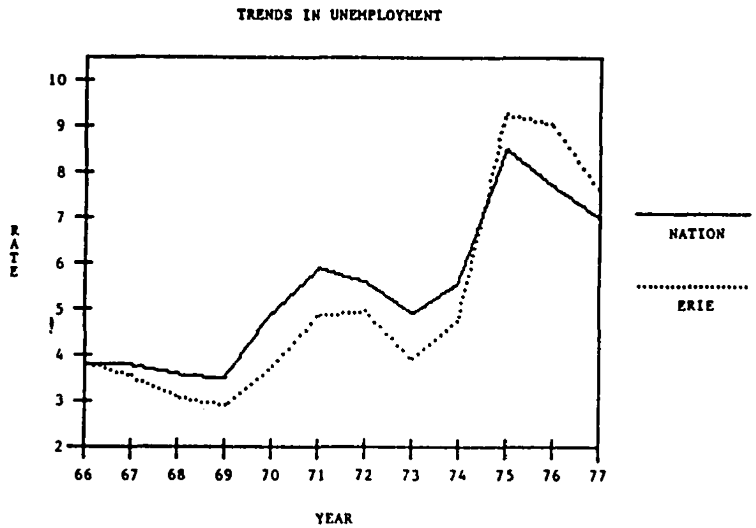
TRENDS IN UNEMPLOYMENT
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YEAR
NATION
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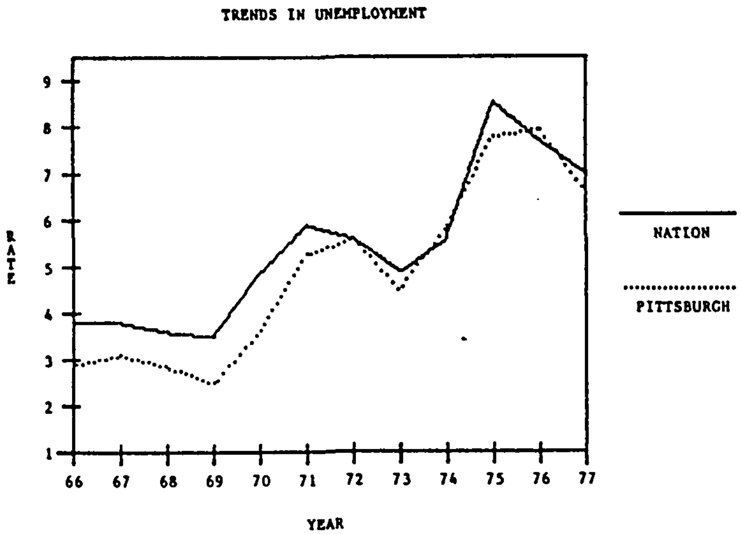
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RATE
YEAR
NATION
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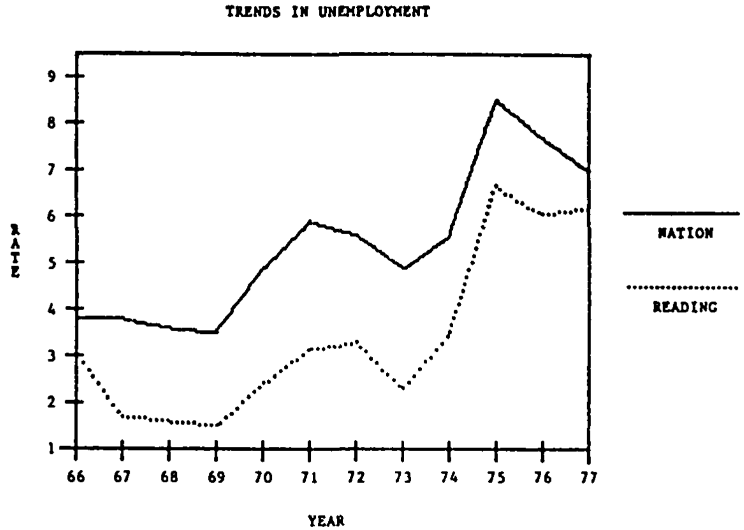
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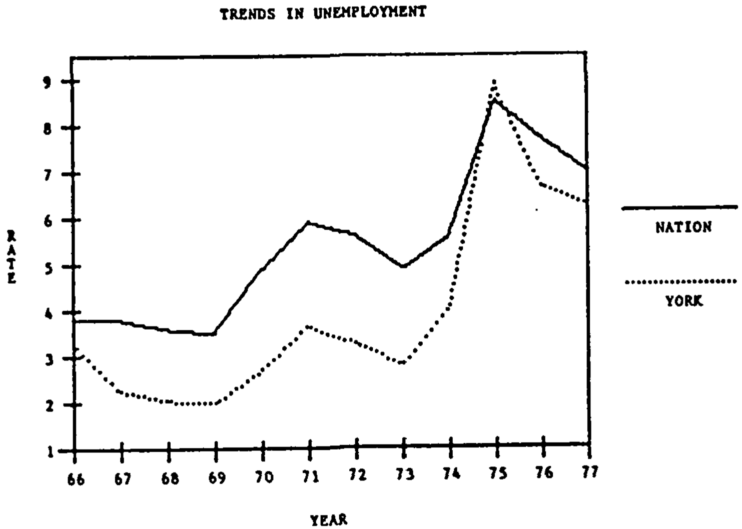
RATE
YEAR
NATION
READING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RATE
YEAR
NATION
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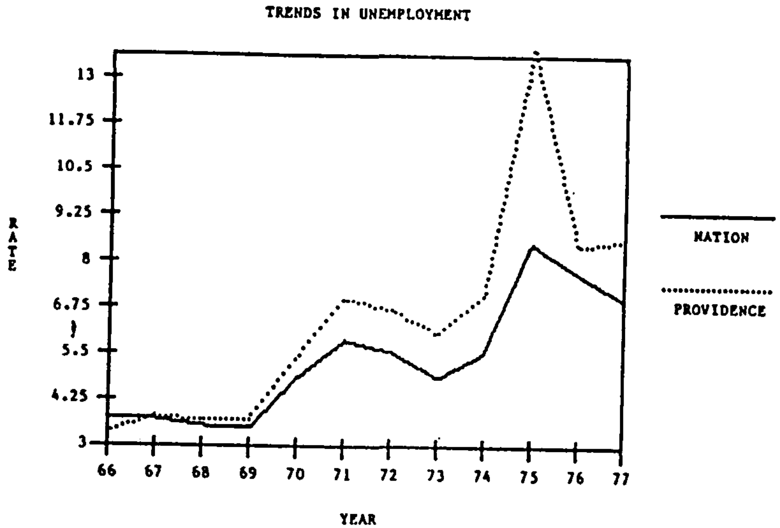
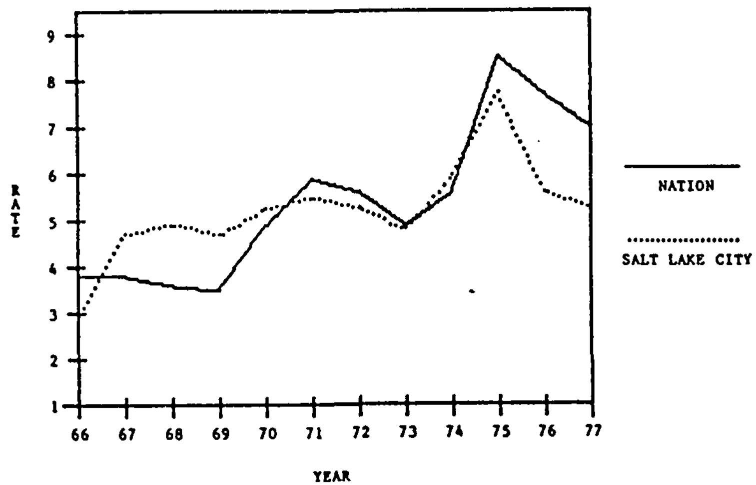

TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
PROVIDENCE

TRENDS IN UNEMPLOYMENT



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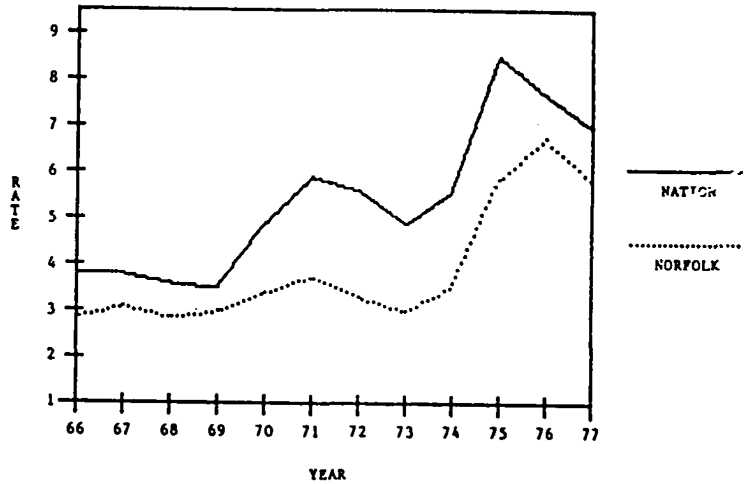

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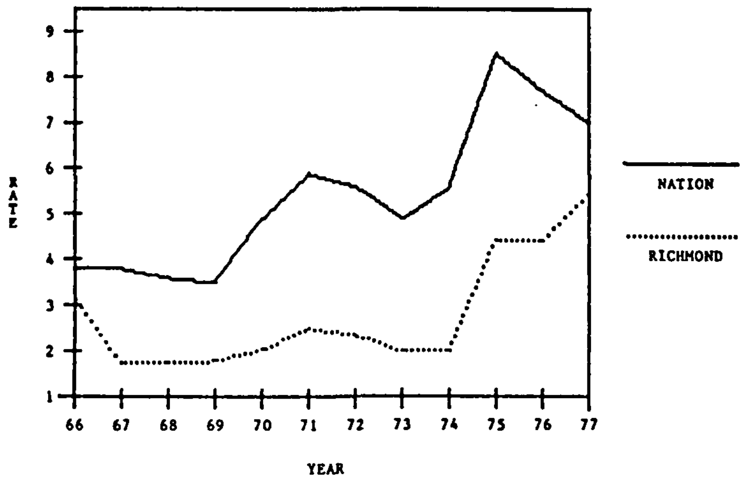

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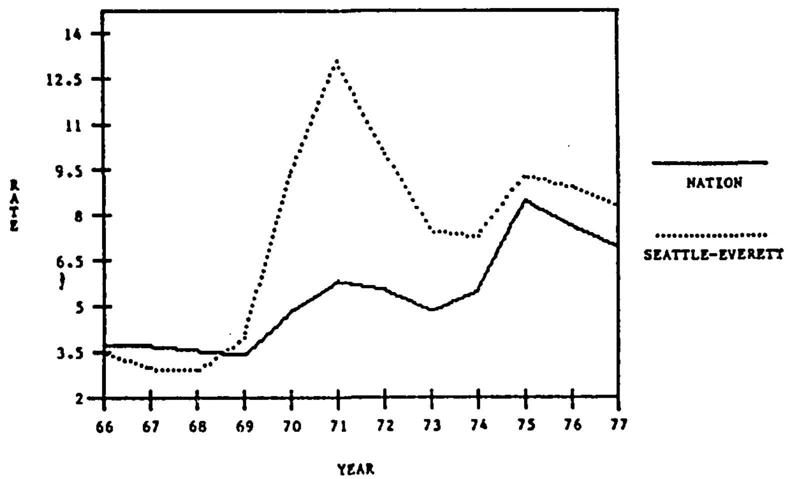

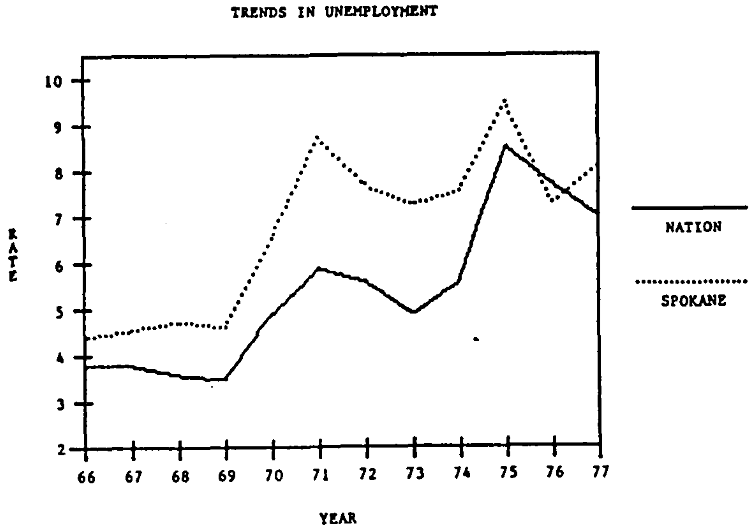
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RATE
YEAR
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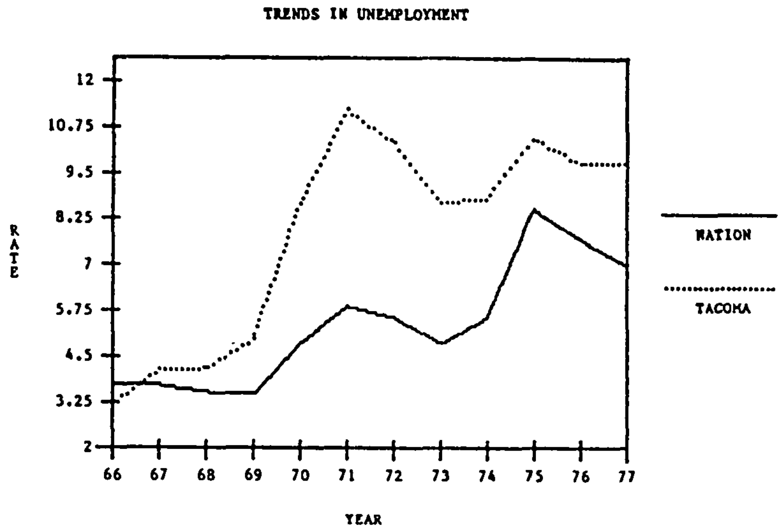
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RATE
YEAR
NATION
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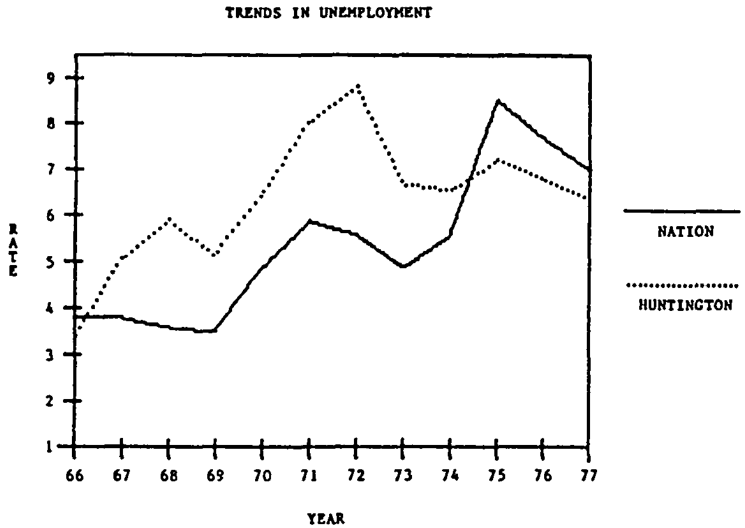
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RATE
YEAR
NATION
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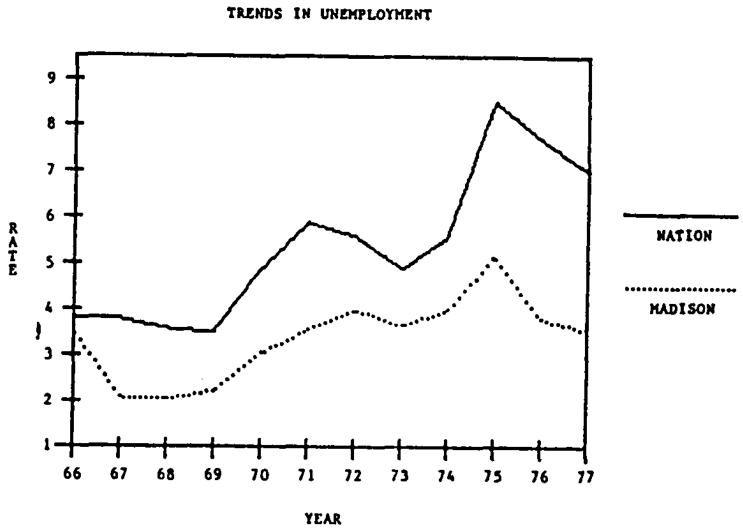
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RATE
YEAR
NATION
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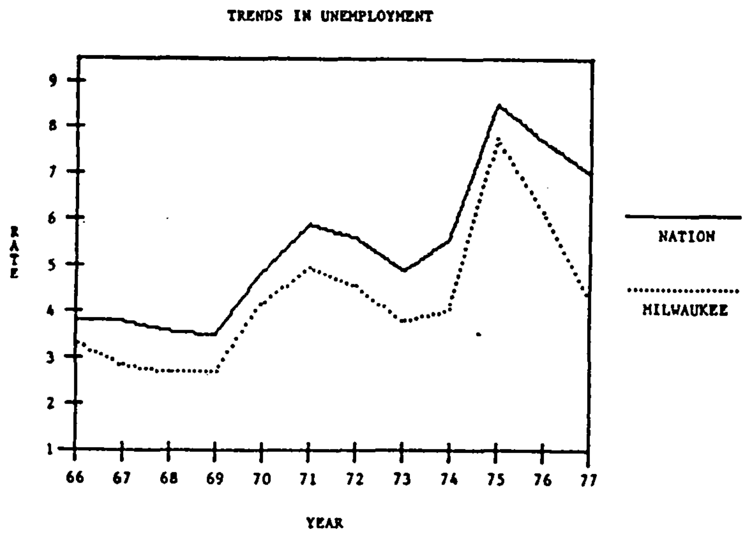
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RATE
YEAR
NATION
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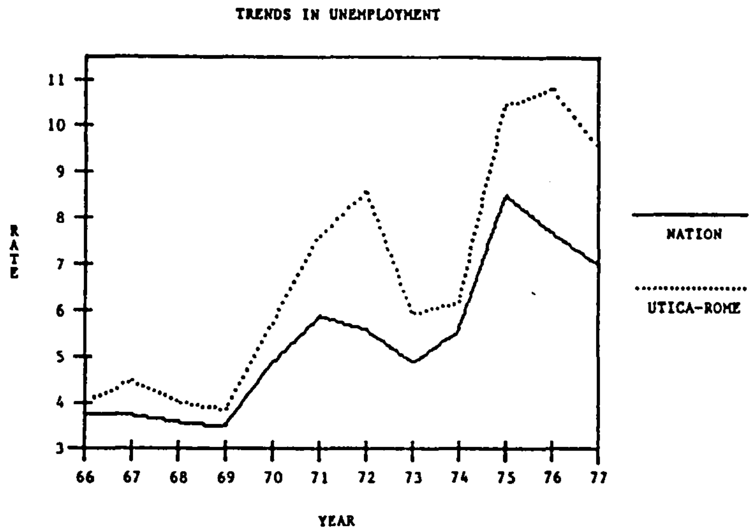
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RATE
YEAR
NATION
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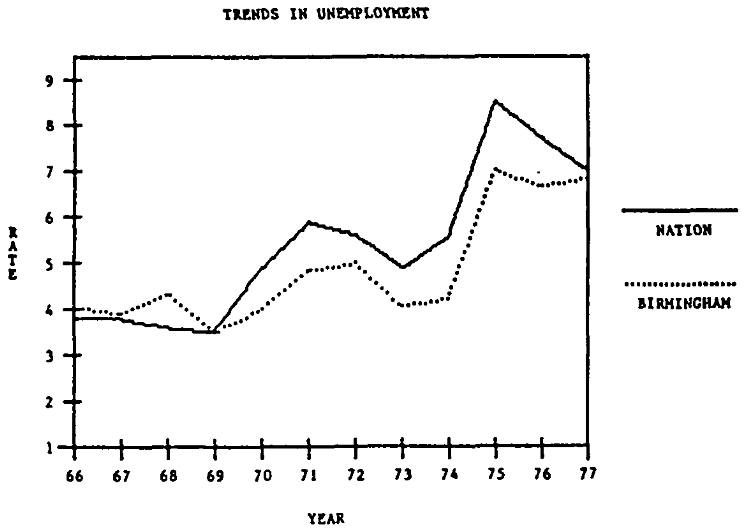
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RATE
YEAR
NATION
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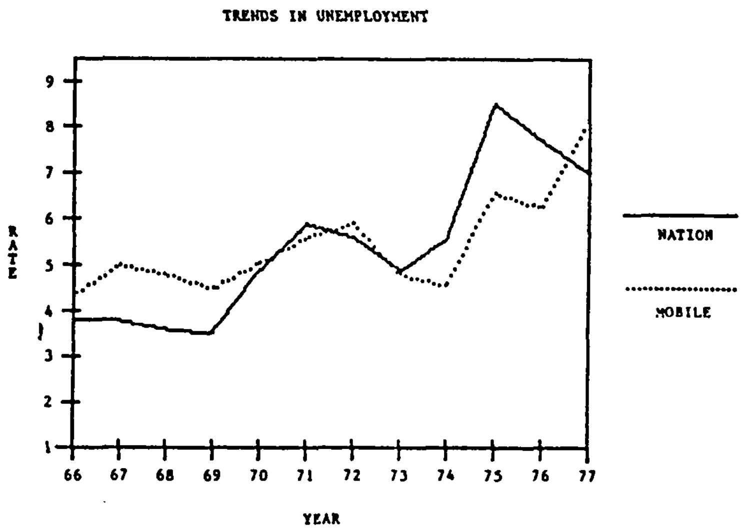
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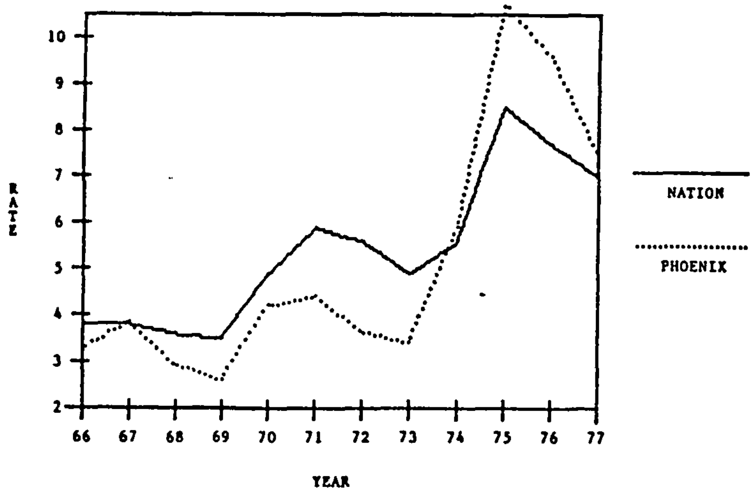
RATE
YEAR
NATION
MOBILE

TRENDS IN UNEMPLOYMENT



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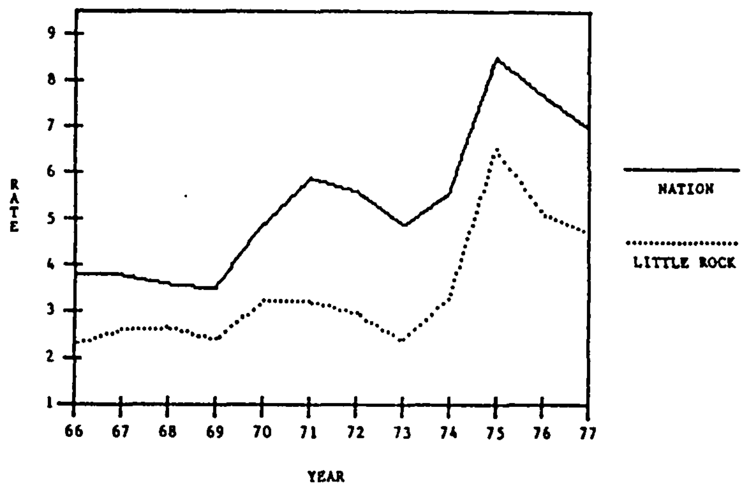

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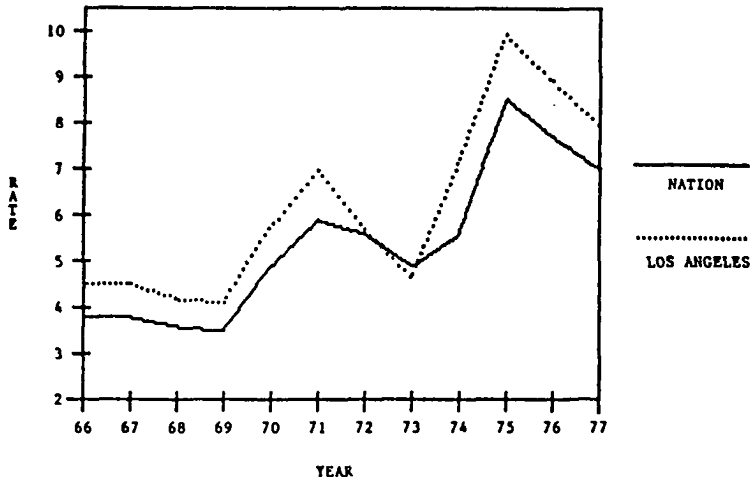

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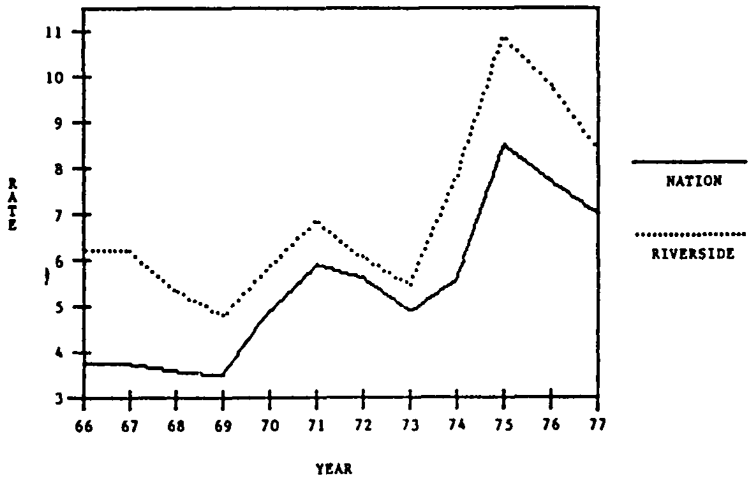

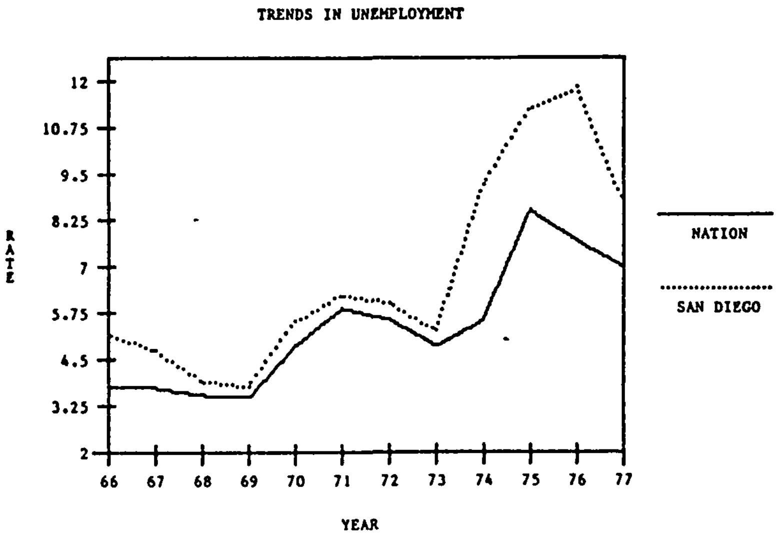
TRENDS IN UNEMPLOYMENT
RATE
12
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3.25
2
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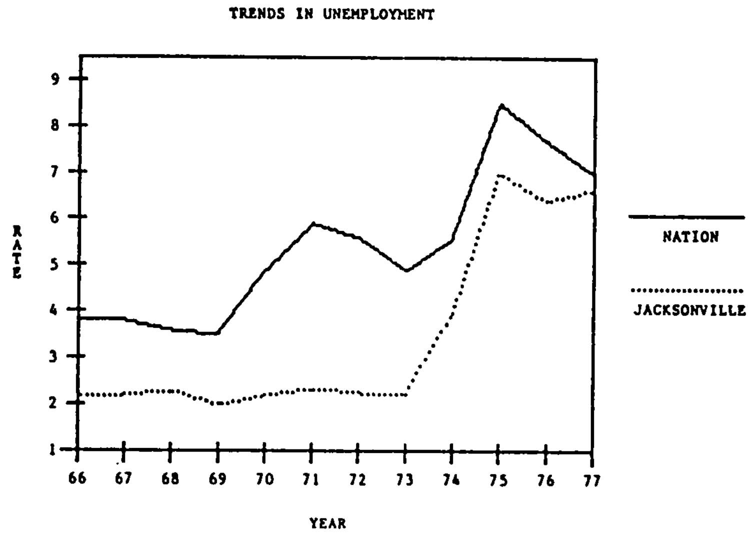
YEAR
NATION
SAN DIEGO


TRENDS IN UNEMPLOYMENT
RATE
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4
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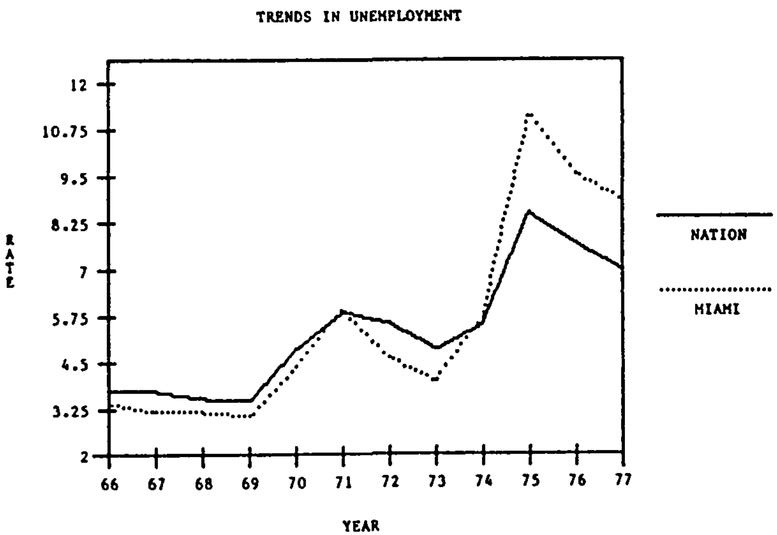
2
1
66 67 68 69 70 71 72 73 74 75 76 77
YEAR
NATION
JACKSONVILLE


TRENDS IN UNEMPLOYMENT
RATE
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3.25
2
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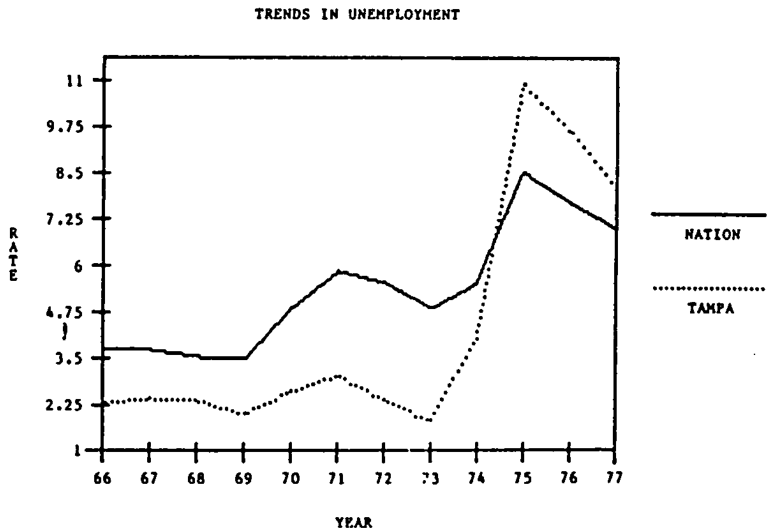
YEAR
NATION
MIAMI


TRENDS IN UNEMPLOYMENT
RATE
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3.5
2.25
1
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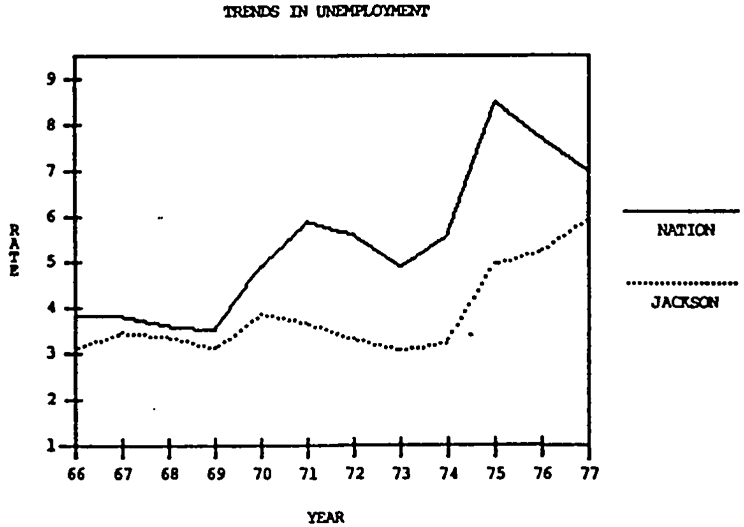
YEAR
NATION
TAMPA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RATE
YEAR
NATION
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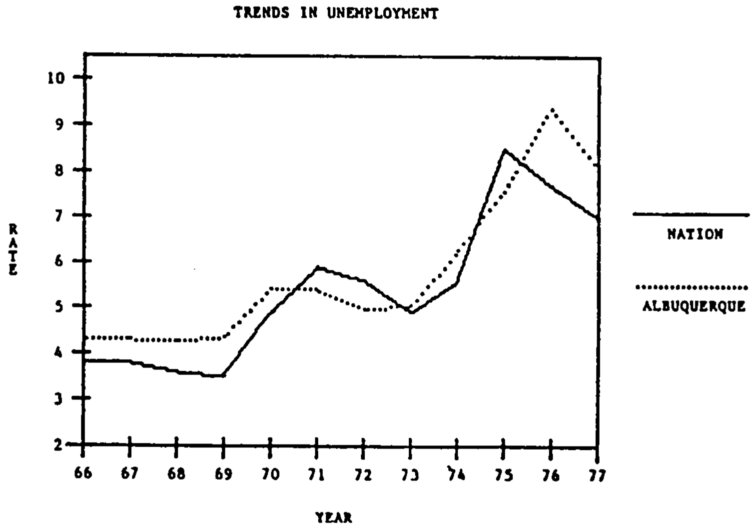
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RATE
YEAR
NATION
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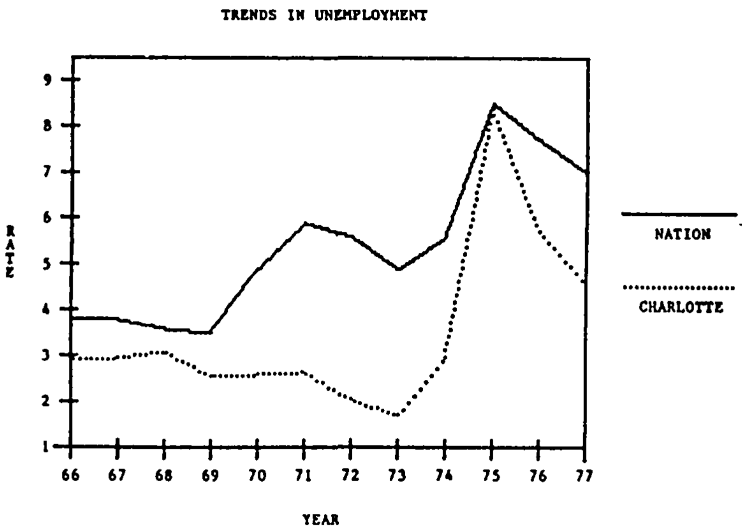
TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
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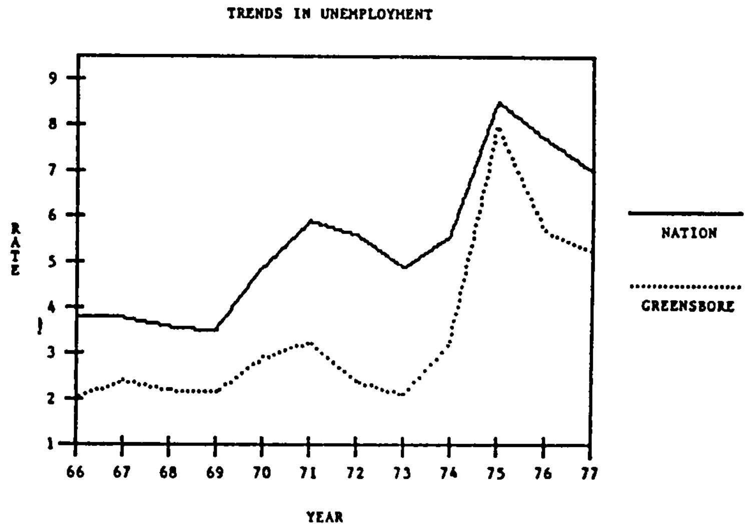
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RATE
YEAR
NATION
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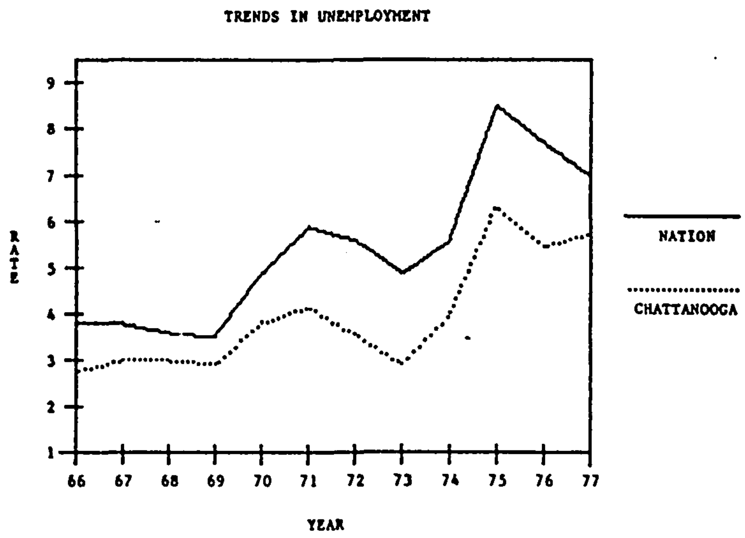
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YEAR
NATION
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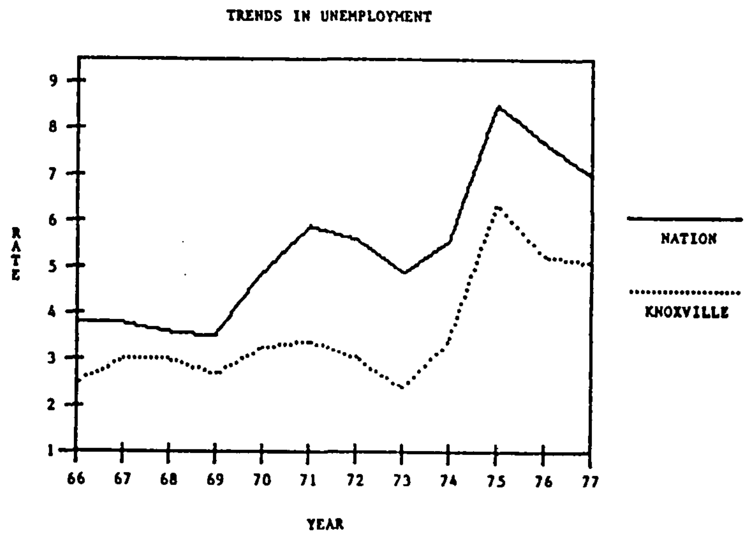
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YEAR
NATION
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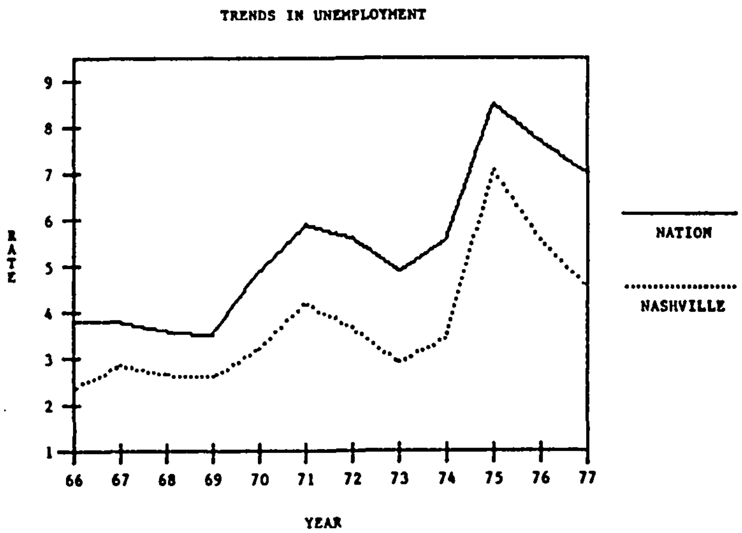
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YEAR
NATION
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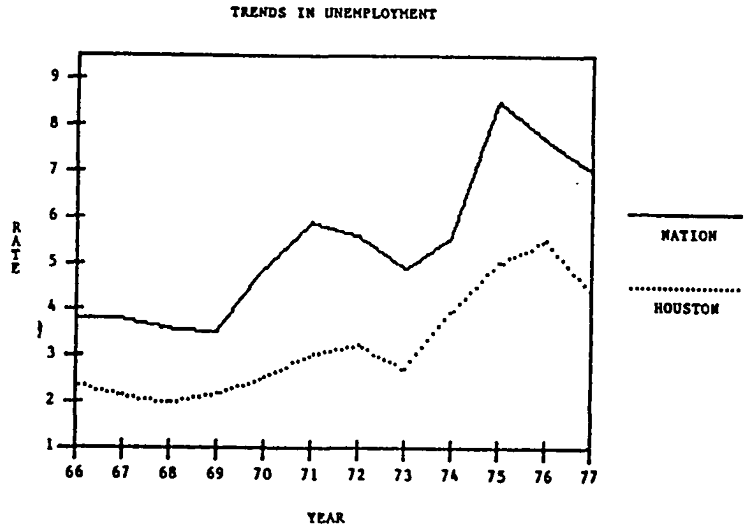
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YEAR
NATION
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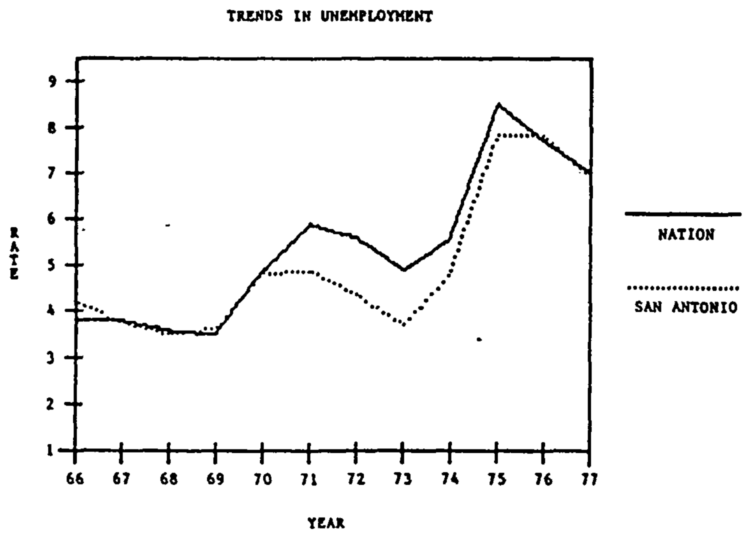
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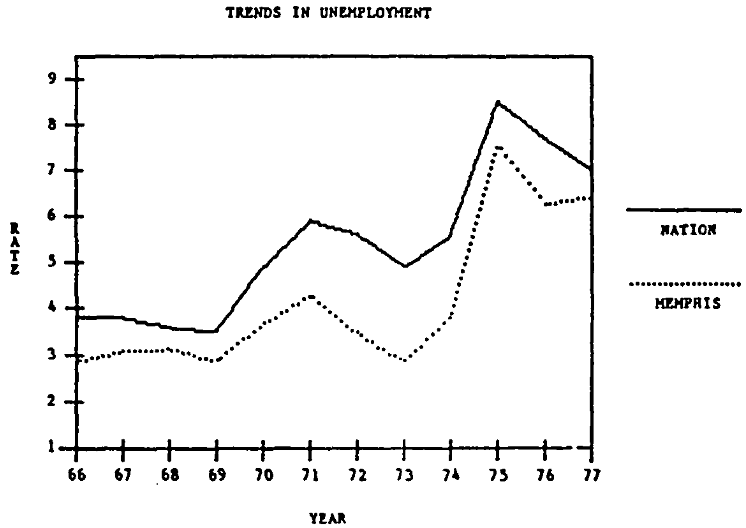
YEAR
NATION
SAN ANTONIO


TRENDS IN UNEMPLOYMENT
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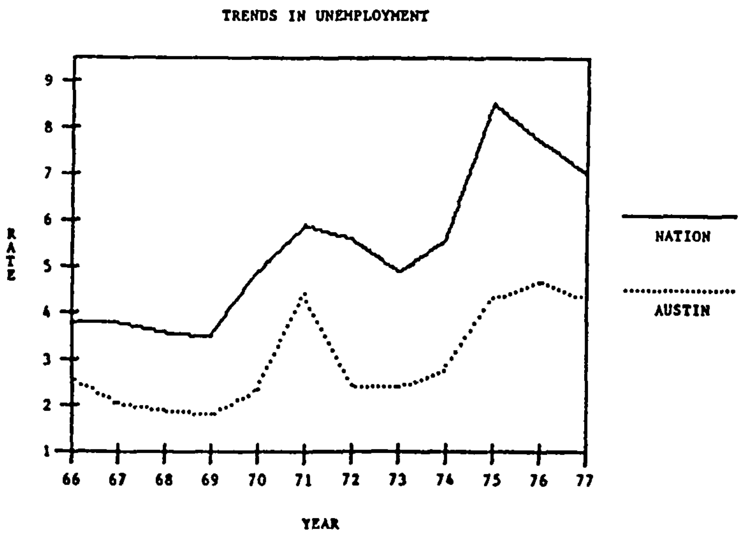
66 67 68 69 70 71 72 73 74 75 76 77
YEAR
NATION
MEMPHIS


TRENDS IN UNEMPLOYMENT
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66 67 68 69 70 71 72 73 74 75 76 77
YEAR
NATION
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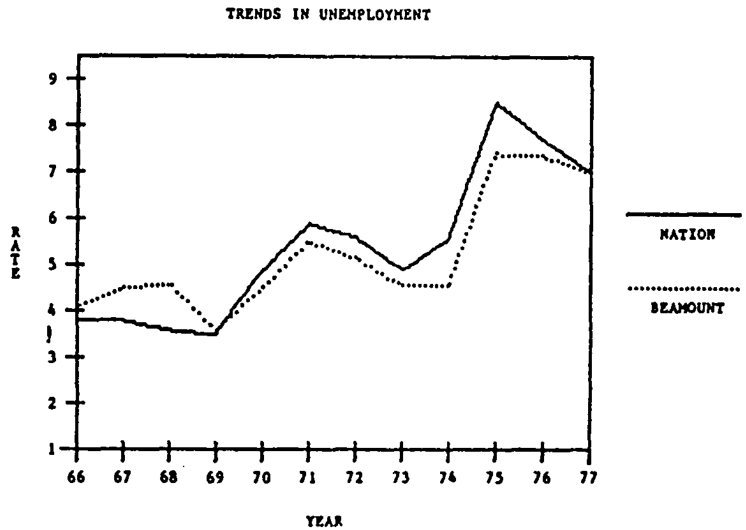
TRENDS IN UNEMPLOYMENT
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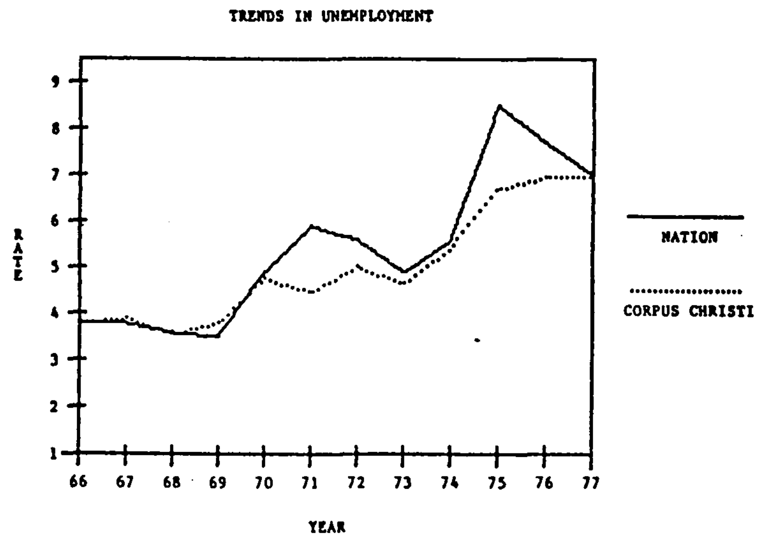
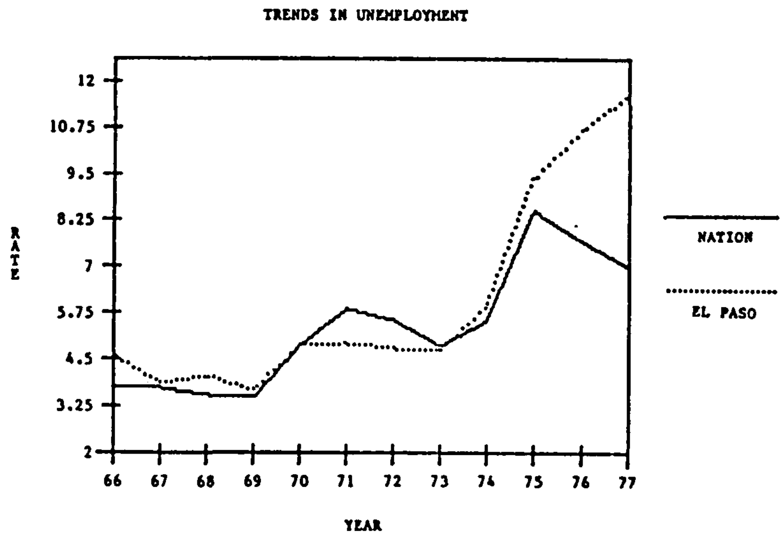
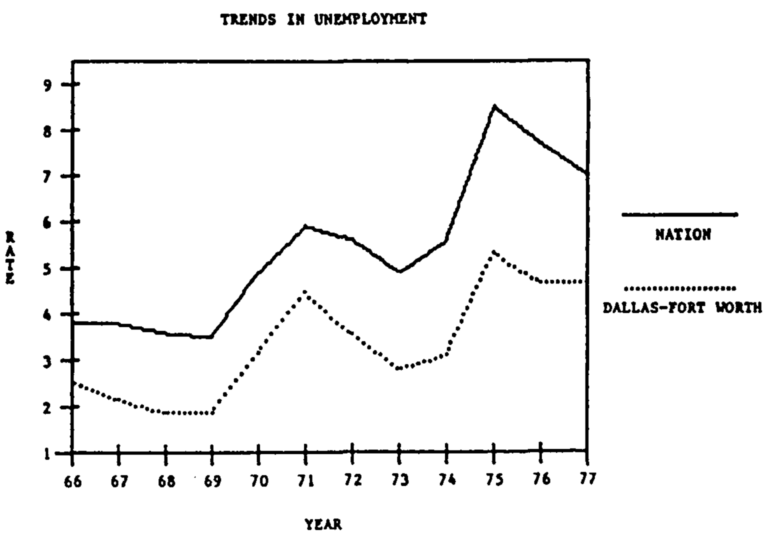
YEAR
NATION
BEAMOUNT


TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
CORPUS CHRISTI


TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
EL PASO


TRENDS IN UNEMPLOYMENT
RATE
YEAR
NATION
DALLAS-FORT WORTH

exceed the upper bound of the critical value at the 5 percent significance level in most cases. The level of explained variance ranges from as low as .63 for Peoria to as high as .97 for New York. Most SMSAs had R^2 values between .70 to .95. Only in the cases of three metropolitan areas were the values below .69. They are Peoria (.63), Johnstown (.65), and Huntington (.67). Since the R^2 values measure the extent to which the SMSA unemployment series can be accounted for by structural and national forces, the larger the R^2 the less importance which should be attributed to regional forces. For example, if the R^2 value is .63, it implies that about two thirds of the fluctuation in local economic activity can be accounted for by fluctuations in the national economy and by structural unemployment, while regional factors account for only a third. Since most equations have R^2 values above .90, the relative unimportance of regional forces is evident. As shown in Figure 4.2, larger cities in general are characterized by high R^2 values. New York and Los Angeles have values of .97 and .96 respectively, for example. Other cities linked to New York and Los Angeles also show high R^2 values. Another area of high R^2 values occurs in Florida; e.g. Miami (.96), Tampa (.96), and Jacksonville (.95). Relatively low R^2 values are associated with smaller and more specialized centers; Peoria, Johnstown and Huntington, for example.

4.3.1. <u>The National Component</u>

The d_i parameter estimated from equation (4.6) measures the sensitivity of a local economy's to national forces. Cities with a parameter greater than unity are more sensitive to national impulses,

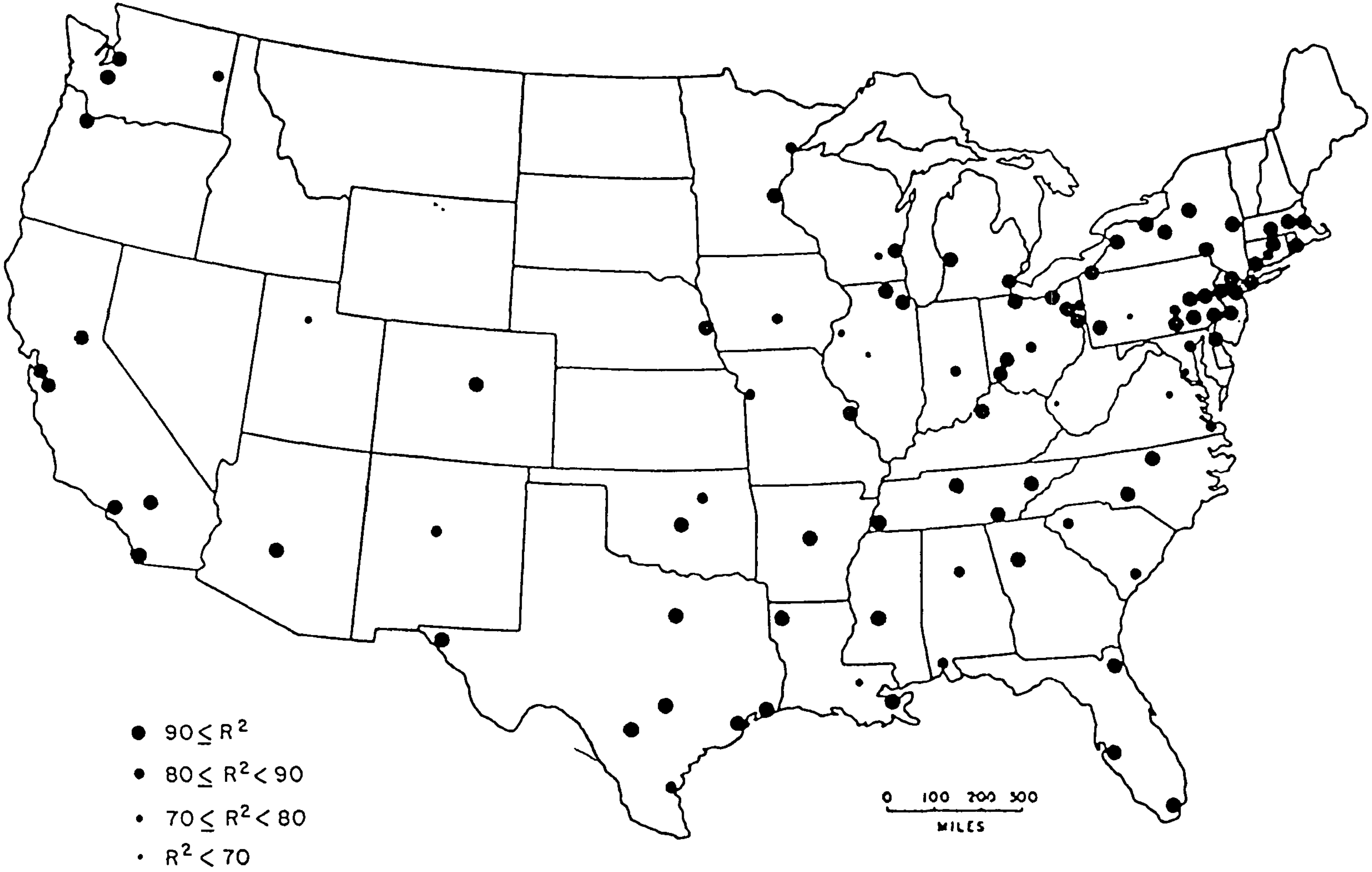


Figure 4.2. The R^2 values from equation (4.6)

and those with values less than unity are less sensitive.

Only 9 cities have parameters which are statistically insignificant at the 10 percent level, and it is clearly the most important variable in the equation. These parameters are mapped in Figure 4.3 and listed in Table 4.1. They range from a high of 1.81 for Providence to a low of .24 for San Diego, and their mean is .90. This suggests that although the national component plays an important role in these local economies, its impact varies substantially among cities. A clear regional pattern is evident. The most sensitive economies are located in four areas: Great Lakes; New England; Middle Atlantic; and South Atlantic. Traditionally these regions have had a higher proportion of their employment in durable goods manufacturing. The urban economies of the West South Central, East South Central, Great Plains and Mountain regions, which have relatively little durable goods employment, were the least sensitive to national economic activity. It appears that the degree of regional industrial diversification or specialization in the local economy is a major determinant of its response to national economic impulses.

4.3.2. The Structural Component

The coefficients of the structural component obtained from equation (4.6) measure the degree and direction of structural imbalance within a local economy. The coefficient can be regarded as a scale, in which positive values reflect the presence structural unemployment and negative ones a lack of it. The incidence of structural unemployment in the third quarter of 1964 is shown in column one, parameter ai, of Table 4.1. Of the 99 SMSAs, only 42 had

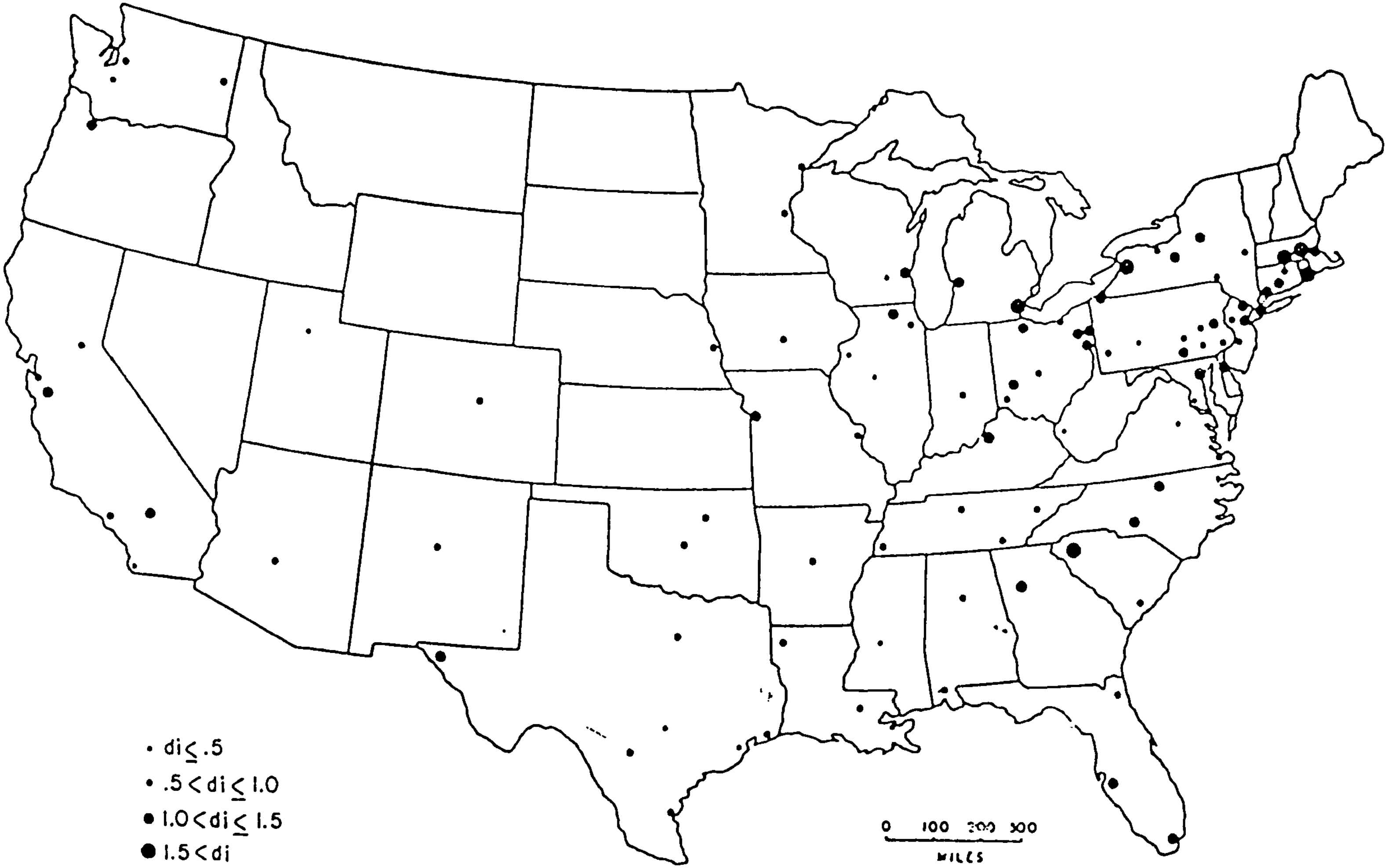


Figure 4.3. The di parameters for the SMSA's from equation (4.6)

a coefficient significantly different from zero at the 10 percent level, so that less than half of the sample was characterized by structural imbalance.

Figure 4.4 shows the distribution of the coefficient values for the third quarter of 1964, and it reveals a distinct spatial pattern. Negative values were more common in the Frost Belt, and positive values more common in the Sun Belt. Prominent exceptions in the North were Johnstown and in Illinois, West Virginia and Virginia. In the Sun Belt, cities in Appalachia and the South East tended to have negative coefficients. To clearify this pattern, the average time series of the structural component were plotted in Figure 4.5 for Sun Belt and Frost Belt cities. Two generalizations can be drawn from this graph. Firstly, for the urban system as a whole the contribution made by the structural component to metropolitan unemployment has been fairly constant during the period of 1966-1977. When viewed regionally, however, structural unemployment in the Sun Belt has declined, whereas in the Frost Belt it has increased. The change in the late 1960s corresponds well to the regional economic decline and growth which occurred in the country at the time.

The results obtained from this research are somewhat different from those of Casetti et al. (1971). In their study, large negative values were found in the Mid-West, while large positive values characterized a belt of cities stretching from Alabama, north east through the Appalachians and into New England. They suggested that the causes of excessive structural unemployment in the Appalachian and New England cities was attributable to the nature of their economic

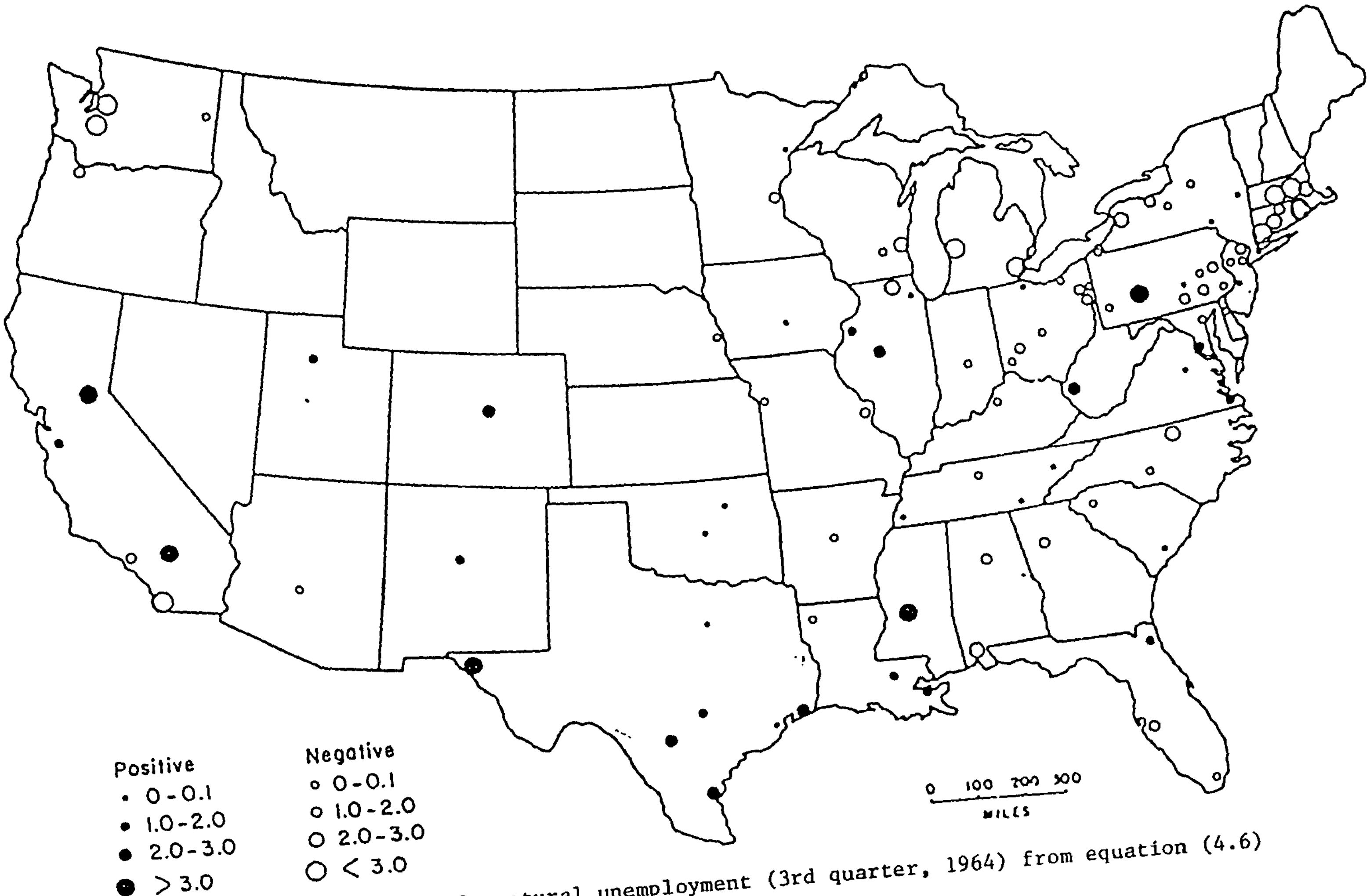
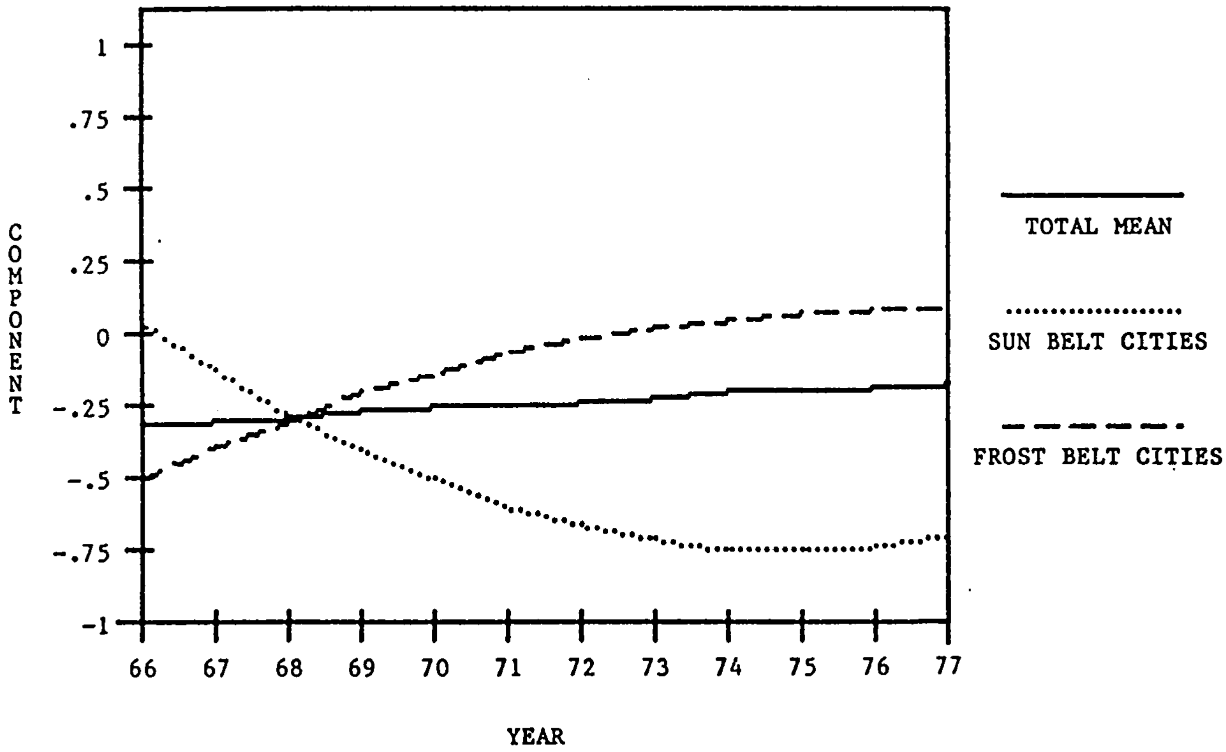


Figure 4.4. Structural unemployment (3rd quarter, 1964) from equation (4.6)

Figure 4.5. REGIONAL TRENDS IN STRUCTURAL UNEMPLOYMENT



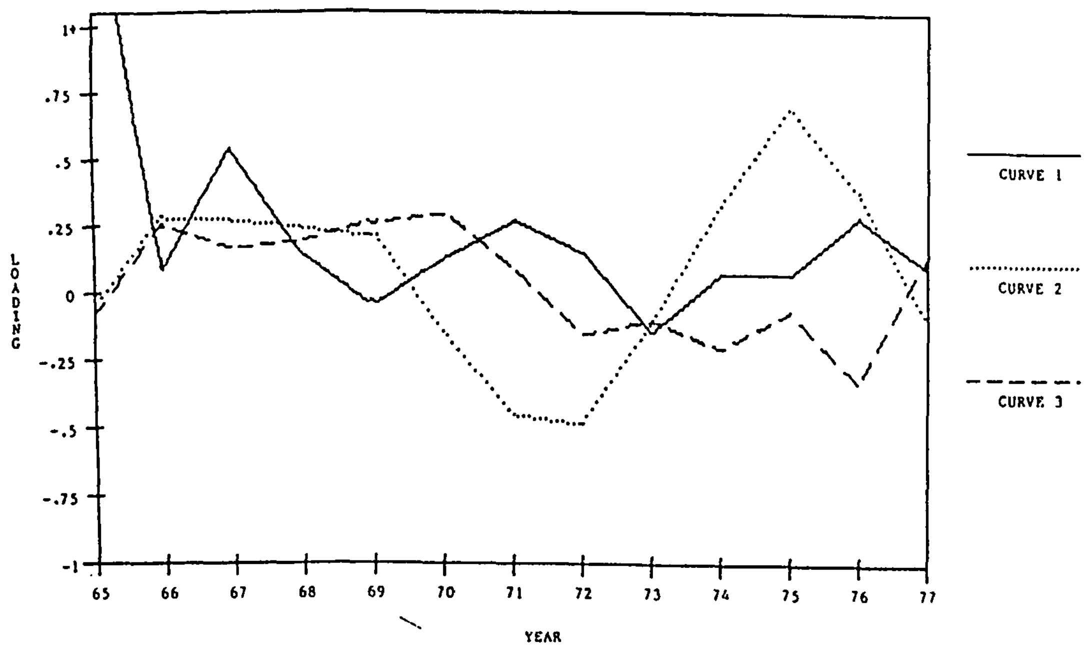
base. The major characteristic of the economies of these cities is a heavy dependence on one or two industries and these industries experienced major structural change in the 1950's. Their study also reveals that the incidence of structural unemployment in July, 1965 (the end of their time series), showed a reduction in structural unemployment in the cities of West Virginia and Pennsylvania and a major incresase in all West Coast cities and New England cities.

4.3.3. The Regional Component

The residuals obtained from equation (4.6) reflect aspects of each city's unemployment trend not accounted for by national and structural factors. Other researchers (e.g. Jeffrey, 1974) have shown that these are regional in nature. Using a similar method to that used in previous research, the residuals from equation (4.6) for each SMSA were factor analysed. Specifically, the matrix of covariances among the 56 quarters from 1964 to 1978 was subjected to a principal components analysis. The analysis produced 8 factors with eigenvalues greater than 1.0, which together explained 87 percent of the total variance. After examination, the first 3 factors were retained. They account for 70 percent of the variance in the residuals. Therefore, the interpretation will be limited to these three.

The factor loadings are plotted in Figure 4.6. Each time series plot of loadings is termed a reference curve. Each represents an independent dimension of the residual unemployment time series in the metropolitan system. The first reference curve accounts for 52 percent of the total variance. Its major trend is generally downward, with peaks at the begining of the series and in 1967, 1971 and in

Figure 4.6. THE REFERENCE CURVES



1976. Clearly, this reference curve highlights the recession of both 1970-71 and 1975-76. SMSAs that scored most on this reference curve are shown in Figure 4.7. In the case of San Diego and Seattle their residual series directly reflect the curve. San Antonio, El Paso and Canton, however, each have series dominated by the reverse of the trend shown in the reference curve: i.e. generally downward with troughs in those years where peaks occurred previously.

The second reference curve accounts for 12 percent of the total variance. As shown it exhibited a generally downward trend prio to 1972. This reference curve de-emphasizes the 1970-71 recession and reenforces the 1975-76 one. SMSAs that reflect the trend as shown are mainly found in the South Atlantic and Ohio Valley regions, and those that are the reverse are found throughout the center of the country and in the Middle Atlantic region.

The third reference curve accounts for only 6 percent of the total variance. Its major trend is generally downward. This residual series highlights the 1970-71 recession and de-emphasizes the 1975-76 one. Cities that reflect this residual trend are found mainly in the Mid-West and in Appalachian, and those are reverse are found largely in the North East.

The spatial patterns produced here have confirm the importance of the spatial dimension in local economic performance in general, and in business cycle behavior in particular. Cities located in geographical proximity tend to exhibit similar behavior in their response to economic impulses after controlling for structural and national factors. It is assumed that cities with similar residual trends are

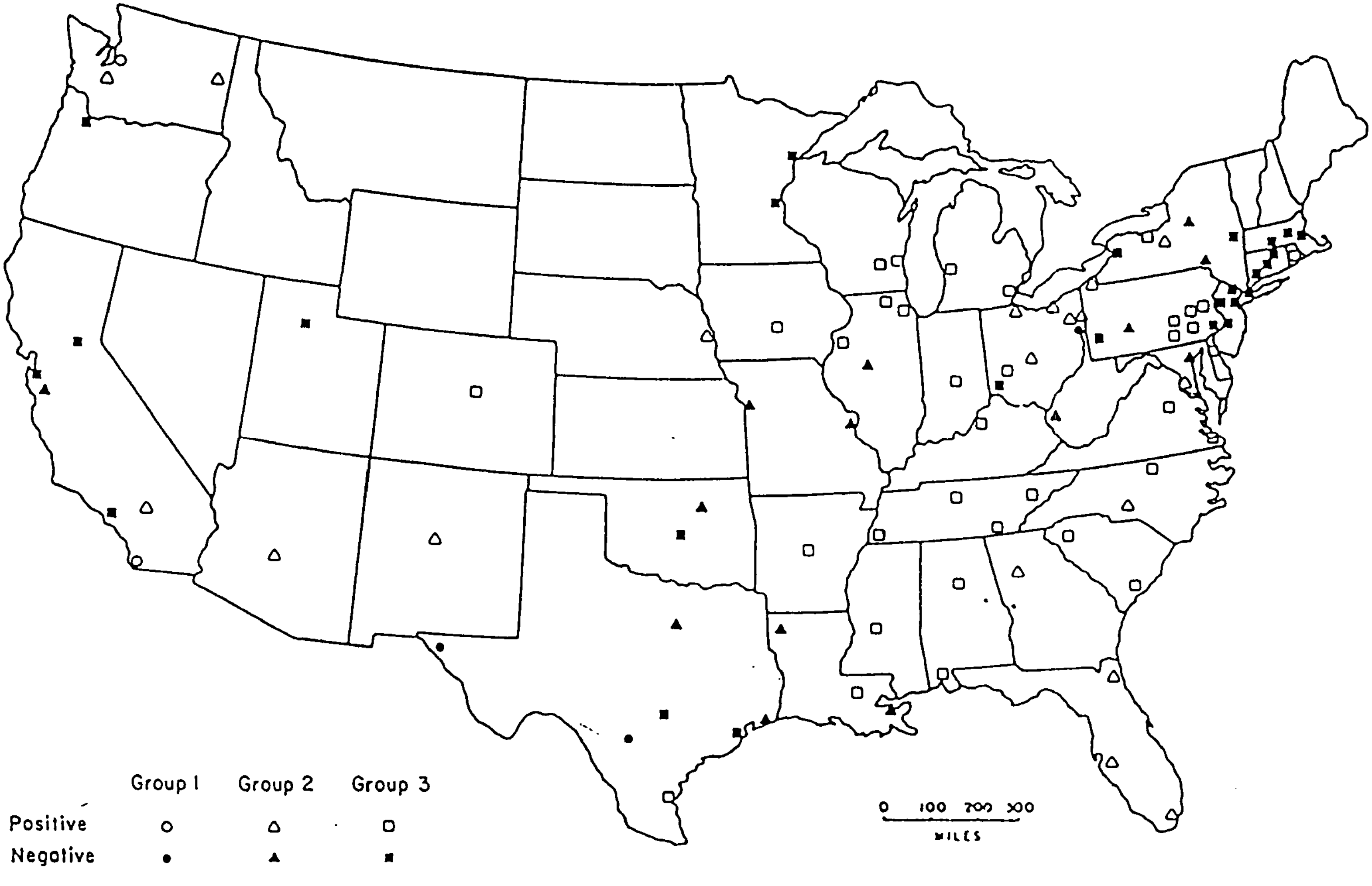


Figure 4.7. The regional component from equation (4.6)

exposed to similar impulses through interindustrial, financial and marketing linkages. The results produced in this study, however, differ from Jeffrey's (1974). This could be attributed to the different time period under study, use of a different estimation technique and alternate variable specification. It is not unreasonable to suggest, though, that the spatial structure of this system changed in connection with shifting patterns of regional development and growth.

4.4. Conclusions

This research aimed to identify spatial patterns of short term economic behavior in a metropolitan system. A model was developed and applied to 99 SMSAs using quarterly unemployment rates as an economic performance index. The results indicated that national economic forces are the most important factor in influencing local economic performance. Frost Belt cities exhibited strong sensitivity to national forces, and their economies were increasingly vulnerable to structural problems. In contrast, Sun Belt cities were less sensitive to national forces and tended to become less vulnerable to structural unemployment..

The residual component assumes that there are regionally specific forces that may induce local economic change. The results revealed that most urban economies appear to interact with others in a regional setting while others are not spatially bound to neighboring SMSAs. These results tend to confirm the hypothesis that local economies with similar economic fluctuations are exposed to similar impulses through a series of intricate spatially restricted industrial, financial and marketing linkages (Jeffrey, 1974). However, this research did not produce groupings as distinctly regional as in previous work of this type (e.g. Jeffrey, 1974). This may well be due to the different time period under study. The period of previous research, 1960-65, was one of comparative stability in the U.S. in a regional economic sense. The period 1965-78, on the other hand, was one of profound regional change. Traditional regional affiliations are expected to have broken down to some extent as new regional structures developed.

The policy implications of this research are significant. In recent years, macro-economic policy has relied heavily on the aggregate national unemployment rate as a proxy for the pressure of demand for labor. This research has found that in some labor markets, the local unemployment rate is more sensitive to fluctuations in the national rate than in other markets. This may seriously impair the usefulness of the national rate as an indicator used in economic stabilization policies. Furthermore, regional development policy in the U.S. has strongly emphasized the need to reduce regional unemployment disparities between prosperous and depressed areas. Such a policy, however, has not been outstandingly successful due to uneven regional impacts. Because of the relative importance of national forces in influencing local economic performance, the Federal government still has a vital role to play in instituting labor and employment policy. This type of policy could aim to have a differential spatial effect and thereby attempt to reduce the degree of inequality among individual labor submarkets. By doing so, it is essential to identify specific national-regional relationships.

Table 4.1. Estimates of equation (4.6)

SMSA	a_i	b_i	c_i	d_i	R^2
1	3.05 ** (.648)	-.060 (.038)	.0014 ** (.0006)	.63 ** (.124)	.90
2	.55 (1.943)	.063 (.133)	-.0006 (.0019)	.82 ** (.217)	.90
3	1.26 ** (.448)	-.083 ** (.023)	.0008 ** (.0004)	1.13 ** (.090)	.90
4	2.50 ** (.527)	-.137 ** (.033)	.0025** (.0005)	.51 ** (.094)	.92
5	-3.71 ** (1.837)	.386** (.125)	-.0059** (.0019)	1.04 ** (.261)	.91
6	-1.69 (1.071)	.151** (.070)	-.0021* (.0011)	.79 ** (.177)	.90
7	-2.54 ** (.776)	.121** (.042)	-.0017 ** (.0007)	1.22 ** (.155)	.88
8	-.22 (1.033)	-.079 (.067)	.0018 (.0010)	1.00 ** (.172)	.93
9	1.38 ** (.619)	-.065 * (.033)	.0016 ** (.0005)	.37 ** (.124)	.73
10	.10 (.375)	-.044 ** (.019)	.0010 ** (.0003)	.77 ** (.073)	.92
11	1.96 (1.286)	-.019 (.087)	.0003 (.001)	.45 (.191)	.70
12	2.62** (.594)	-.019 (.032)	.0008 (.0005)	.10 (.118)	.63
13	-2.86** (1.264)	.050 (.086)	-.0010 (.0013)	1.40 ** (.170)	.94
14	-.82 (.658)	.044 (.039)	-.0003 (.0006)	.69 ** (.126)	.89
15	.29 (.684)	-.027 (.043)	.0003 (.0006)	.59 ** (.122)	.82

DW[a]	RHO[b]
1.56	.45
2.11	.77
1.73	.16
2.20	.56
2.39	.71
2.20	.63
2.02	.26
1.88	.62
2.10	.18
2.10	.10
2.16	.69
2.06	.28
1.77	.72
1.83	.45
1.61	.57

SMSA	a_i	b_i	c_i	d_i	R^2
16	-.91 (.554)	-.010 (.032)	-.0001 (.0005)	1.09 ** (.107)	.92
17	-.28 (.684)	-.088 ** (.036)	.0013 ** (.0006)	1.12 ** (.137)	.83
18	-2.67 ** (1.186)	.098 (.080)	-.0013 (.0012)	1.28 ** (.174)	.94
19	-4.17 ** (.966)	.215 ** (.060)	-.0042 ** (.0009)	1.75 ** (.174)	.93
20	-3.63 ** (1.076)	.147** (.070)	-.0028 ** (.0011)	1.58 ** (.181)	.93
21	-5.71 ** (1.015)	.245** (.063)	-.0041 ** (.0010)	1.79 ** (.185)	.94
22	-4.49 ** (.657)	.311** (.039)	-.0053 ** (.0006)	1.25 ** (.126)	.95
23	.39 (1.047)	.090 (.066)	-.0010 (.0010)	.81 ** (.189)	.87
24	-1.38 * (.733)	.058 (.049)	-.0011 (.0007)	.85 ** (.111)	.94
25	-.33 (.648)	.055 (.041)	-.0015** (.0006)	1.03 ** (.115)	.89
26	-1.21 ** (.364)	.126** (.019)	-.0017** (.0003)	.82 ** (.073)	.94
27	-.65 (1.053)	-.009 (.071)	-.0001 (.0010)	.99 ** (.153)	.90
28	-.74 (.769)	.058 (.043)	.0007 (.0007)	1.08 ** (.152)	.95
29	-.34 (.639)	.017 (.037)	.0003 (.0006)	.98 ** (.124)	.94
30	-1.07 (.975)	.006 (.062)	.0011 (.0009)	1.16 (.172)	.95
31	.20 (.623)	.021 (.037)	.0001 (.0006)	.66 ** (.118)	.91

DW[a]	RHO[b]
2.00	.43
2.10	.17
2.10	.69
1.80	.55
1.76	.62
1.94	.54
1.78	.46
1.67	.56
1.90	.68
1.74	.57
1.86	.15
2.03	.69
1.94	.34
1.89	.41
1.88	.58
1.86	.47

SMSA	a_i	b_i	c_i	d_i	R^2
32	.91 (.618)	-.057 (.036)	.0015 ** (.0005)	.69 ** (.119)	.92
33	.55 (.615)	-.023 (.039)	.0007 (.0006)	.81 (.108)	.94
34	-2.91 ** (.794)	.078 * (.045)	-.0009 (.0007)	1.55 ** (.156)	.94
35	.68 (.632)	-.113** (.039)	.0028 ** (.0006)	1.02 (.115)	.97
36	-1.04 (.698)	-.054 (.044)	.0013* (.0007)	.96 ** (.122)	.95
37	-.56 (.675)	-.042 (.037)	.0009 (.0006)	1.11 ** (.134)	.90
38	-1.68 ** (.641)	-.075 ** (.034)	.0010 * (.0005)	1.37 ** (.128)	.90
39	-1.43 * (.809)	-.023 (.048)	-.0004 (.0007)	1.28 ** (.154)	.92
40	-.02 (.905)	-.013 (.058)	.0003 (.0009)	.90 ** (.156)	.90
41	-.55 (.711)	-.020 (.045)	.0003 (.0007)	.96 ** (.125)	.92
42	-.27 (.577)	-.070 ** (.030)	.0013 ** (.0005)	.86 ** (.116)	.85
43	-1.55 ** (.683)	.005 (.040)	-.0002 (.0006)	1.07 ** (.130)	.90
44	.81 (.643)	-.027 (.036)	.0006 (.0006)	1.12 ** (.127)	.91
45	-.94 (1.236)	-.051 (.072)	.0012 (.0011)	1.34 ** (.239)	.85
46	-1.57 ** (.598)	.071 ** (.034)	-.0014 ** (.0005)	1.23 ** (.117)	.92
47	-1.08 (.722)	-.127** (.047)	.0021 ** (.0007)	1.21 ** (.121)	.96

DW[a]	RHO[b]
1.94	.44
1.98	.58
1.87	.38
1.71	.54
2.26	.59
2.20	.29
2.16	.21
1.92	.47
1.98	.60
1.96	.58
2.06	.16
1.97	.46
2.17	.35
1.89	.43
1.99	.39
1.91	.62

SMSA	a_i	b_i	c_i	d_i	R^2
48	-.33 (.747)	-.097** (.047)	.0017 ** (.0003)	1.13 ** (.131)	.95
49	.22 (.507)	-.098 ** (.027)	.0017 ** (.0004)	.75 ** (.101)	.87
50	4.83 ** (1.303)	-.068 (.074)	.0024 ** (.0012)	.14 (.257)	.65
51	-1.31 * (.695)	-.018 (.044)	.0004 (.0007)	.85 ** (.123)	.92
52	-.27 (.465)	-.013 (.026)	.0010 ** (.0004)	.90 ** (.091)	.96
53	-.31 (.604)	.022 (.035)	.0001 (.0005)	.81 ** (.117)	.92
54	-.55 (.495)	-.120** (.027)	.0023 ** (.0004)	.85 ** (.098)	.93
55	-1.77 ** (.879)	-.103* (.058)	.0015 * (.0009)	1.26 ** (.139)	.95
56	-3.94 ** (1.276)	.068 (.084)	-.0013 (.0013)	1.81 ** (.204)	.94
57	1.72 ** (.837)	.087 (.053)	-.0015* (.0008)	.48 ** (.147)	.76
58	1.12 * (.657)	-.075 * (.040)	.0017** (.0006)	.55 ** (.122)	.88
59	.85 (.751)	-.118** (.043)	.0022 ** (.0007)	.47 (.147)	.76
60	-9.41 (5.713)	.733 (.340)	-.0102** (.0045)	.89 (.263)	.93
61	-.38 (.827)	.193** (.048)	-.0032** (.0007)	.90 ** (.161)	.84
62	-3.75 (3.094)	.551** (.203)	-.0071 ** (.0028)	.49 ** (.232)	.93
63	2.27 (1.426)	.164* (.091)	-.0027 * (.0014)	.42 * (.248)	.67

DW[a]	RHO[b]
2.23	.58
2.05	.23
2.17	.35
2.04	.57
1.97	.37
1.93	.42
1.76	.29
2.15	.66
1.59	.65
1.43	.58
2.22	.51
1.90	.39
1.65	.88
1.99	.41
1.64	.84
1.97	.59

SMSA	a_i	b_i	c_i	d_i	R^2
64	-.01 (.730)	.046 (.046)	-.0008 (.0007)	.49 ** (.129)	.77
65	-2.01** (.487)	.078 ** (.028)	-.0017 ** (.0004)	1.05 ** (.095)	.92
66	-.98 (1.119)	.042 (.073)	-.0005 (.0011)	1.31 ** (.184)	.93
67	1.75 ** (.726)	-.036 (.046)	.0006 (.0007)	.66 ** (.126)	.86
68	2.88 ** (1.232)	-.069 (.084)	.0010 (.0012)	.65 ** (.146)	.82
69	-.45 (2.889)	-.014 (.189)	.0004 (.0026)	.98 (.215)	.93
70	-.08 (.696)	-.060 (.046)	.0007 (.0007)	.85 ** (.108)	.91
71	1.39 ** (.694)	-.046 (.046)	.0009 (.0007)	.92 ** (.109)	.96
72	3.12 ** (1.017)	-.101 (.069)	.0012 (.0010)	1.02 ** (.145)	.92
73	-10.77 (8.808)	.740* (.446)	-.0080 (.0053)	.23 ** (.216)	.93
74	1.67 (1.063)	-.160** (.073)	.0034 ** (.0010)	.53 ** (.129)	.95
75	-.99 (1.234)	.007 (.084)	.0007 (.0012)	1.02 ** (.165)	.96
76	-1.13 (3.869)	-.131 (.234)	.0025 (.0031)	1.27 ** (.190)	.96
77	-1.37 (1.181)	-.761 (.081)	.0013 (.0012)	1.24 ** (.157)	.95
78	1.23 (1.575)	.043 (.108)	-.0005 (.0016)	.64 ** (.209)	.79
79	1.16 ** (.410)	.104** (.022)	-.0008 ** (.0003)	.42 ** (.082)	.93

DW[a]	RHO[b]
1.84	.57
1.98	.41
1.82	.63
1.96	.59
2.09	.76
1.95	.84
2.12	.67
1.74	.66
1.83	.70
1.50	.92
2.06	.75
1.75	.73
2.13	.88
2.04	.73
1.96	.73
2.05	.28

SMSA	a_i	b_i	c_i	d_i	R^2
80	-.22 (.532)	.039 (.032)	-.0003 (.0005)	.84 ** (.098)	.94
81	3.22 ** (.696)	-.103** (.047)	.0020 ** (.0007)	.24 ** (.095)	.90
82	1.57 (1.084)	-.008 (.072)	.0003 (.0011)	.70 ** (.174)	.86
83	-.0C (2.194)	-.189 (.146)	.0017 (.0020)	1.39 ** (.180)	.90
84	-2.33 * (1.393)	-.059 (.095)	.0003 (.0014)	1.31 ** (.152)	.93
85	.39 (.659)	.045 (.044)	-.0008 (.0006)	.61 ** (.104)	.91
86	.65 * (.352)	.034 * (.019)	-.0007 ** (.0003)	.63 ** (.070)	.87
87	.96 * (.518)	-.020 (.028)	.0005 (.0004)	.78 ** (.104)	.87
88	-.87 (1.319)	-.174* (.087)	.0019 (.0013)	1.53 ** (.212)	.85
89	.69 (.540)	-.036 (.034)	.0007 (.0005)	.62 ** (.096)	.91
90	.74 (.861)	-.048 (.059)	.0007 (.0008)	.63 ** (.090)	.94
91	-.76 (.524)	.016 (.033)	-.0004 (.0005)	.81 ** (.094)	.93
92	.83 * (.495)	-.039 (.032)	.0009 * (.0005)	.46 ** (.084)	.92
93	2.02 ** (.539)	-.145** (.033)	.0022 ** (.0005)	.91 ** (.099)	.93
94	.72 (.712)	-.104 ** (.048)	.0016 ** (.0007)	.87 ** (.092)	.96
95	1.55 ** (.337)	-.092 ** (.020)	.0016** (.0003)	.45 ** (.064)	.92

DW[a]	RHO[b]
2.09	.52
2.48	.71
1.72	.65
1.92	.83
1.85	.78
2.01	.66
1.95	.28
2.00	.23
2.15	.65
1.83	.56
2.05	.78
2.06	.56
1.89	.61
2.07	.52
2.16	.73
2.04	.46

SMSA	a_i	b_i	c_i	d_i	R^2
96	2.78 **	-.093 **	.0016 **	.61 **	.90
	(.482)	(.028)	(.0004)	(.093)	
97	2.39 **	-.063 **	.0012 **	.55 **	.83
	(.510)	(.028)	(.0004)	(.101)	
98	3.05 **	-.274**	.0050 **	1.10 **	.95
	(1.235)	(.084)	(.0012)	(.180)	
99	.10	-.047	.0005	.76 **	.93
	(.448)	(.028)	(.0004)	(.080)	

** Significantly different from zero at the 0.05% level.
* Significantly different from zero at the 0.10% level.
a DW is the Durbin-Watson statistic.
b RHO is the first-order serial correlation coefficient.
Standard errors are shown in parentheses.

DW[a]	RHO[b]
1.92	.44
1.80	.29
1.80	.70
2.16	.57

Chapter 5

THE METROPOLITAN WAGE MODEL

5.1. Specification

The following metropolitan wage model is proposed:

$$(\dot{W}/W)_{it} = a_{i0} + a_{i1}U_{it}^{-1} + a_{i2}(W/\bar{W})_{it-4} + a_{i3}(\dot{P}/P)_{t-1} + a_{i4}C_t + e_{it} \quad (5.1)$$

where $(\dot{W}/W)_{it}$ represents the percentage change in the wage rate in metropolitan area i;

U_{it}^{-1} represents the excess demand for labor in metropolitan area i;

$(W/\bar{W})_{it-4}$ represents the relative wage comparison variable;

$(\dot{P}/P)_{t-1}$ represents price expectations; and

C_t is a wage control variable.

The model is similar to that used by Martin (1978) and by Hanham and Chang (1981), with certain modifications described below. Additional variables which were discussed in Section 3.3.3 of this dissertation were considered and either rejected on a conceptual basis, on the basis of previous research by others in this field or simply because the data were not available at the disaggregate level - both spatially and temporally.

The exogenous variable $(\dot{W}/W)_{it}$, refers to the annual change in the average hourly earnings of manufacturing workers in a given metropolitan area, based on a four-quarter rate of change (U.S.

Department of Labor, Employment and Earnings). It has been argued that a four quarter difference is preferred to a first central difference and a one quarter difference in defining the rate of change because an annual adjustment of wages is the norm in the manufacturing sector. The hourly earnings is used as a proxy for the price of labor since it does not involve overtime earnings.

The reciprocal of the local unemployment rate, Uit, was used as a surrogate for excess demand for labor in the metropolitan area, the average of this measure over the four-quarter period corresponding to the wage-change variable being used in this case (U.S. Department of Labor, Area Trends in Employment and Unemployment). Should wages respond to changes in the excess demand for labor in the traditional Phillips curve manner, the coefficient for the unemployment variable will be positive. A negative coefficient would indicate that wages and unemployment rise or fall together and that, assuming they are rising, stagflation exists in the metropolitan areas's economy. As discussed in Chapter 4 the unemployment rate in any given submarket is determined by structural factors which are limited to that particular submarket, together with nationally originating forces, and regional forces. We can, therefore, examine the impact of each of these three components on wage rate changes. Since

$$U_{it} = f(N_{it}, S_{it}, R_{it}) \tag{5.2}$$

and since R_{it} is defined as:

$$R_{it} = f(\sum_{j=1}^{n} F_{ijt}), \tag{5.3}$$

we can re-specify equation (5.1) as:

$$(\dot{W}/W)_{it} = a_{i0} + a_{i1}N_{it}^{-1} + a_{i2}S_{it}^{-1} + a_{i3}F_{1it}^{-1} + a_{i4}F_{2it}^{-1} + a_{i5}F_{3it}^{-1} +$$

$$a_{i6}(W/\bar{W})_{it-4} + a_{i7}(\dot{P}/P)_{t-1} + a_{i8}C_t + e_{it} \quad (5.4)$$

The relative wage variable, $(w/\bar{w})_{it-4}$, expresses the earnings rate in a metropolitan area at any given time as a proportion of the average earnings rate of the metropolitan areas in the region which is assumed to have an influence upon the wages of its labor force. A suitable regionalization of the ninety-nine areas was derived in the following manner. It is assumed that the purpose of this variable is to capture the influence of a wage spread effect upon the determination of local wages. In previous studies this has been accomplished either by identifying a leading areal submarket or by establishing a region of influence. The former probably reflects too simplistic an assumption concerning the spatial interdependencies which exist in a complex, developed economy. The latter involves the definition of a suitable region of influence for each areal submarket. In the past this has been done either by assuming that all the submarkets in the sample under investigation constitute the region of influence (Marcis and Reed, 1974; Martin 1978), or by allocating the submarkets to administrative or census regions (Mathur, 1976). In neither case have the regions been chosen according to criteria stemming from the processes which are either known or assumed to exist. King and Forster (1973) have introduced a potential interaction term into a submarket model of inflation, but this too was conditioned by some rather arbitrary grouping of cities which they had to make, and by the functional form of the term.

Although it is likely that spatial proximity does play a part in wage spread effects, there is enough evidence of the role of national wage bargaining, widespread interregional trade relationships, extensive job control by corporations, and so on, to suggest that it may not necessarily predominate among the various influences. Ideally what is needed is a knowledge of the functional and spatial relations among the various components in the economy, something that is obviously lacking at present. One could perhaps rely on various economic-geographic theories, such as theories of industrial location, spatial interaction, central places, and diffusion, to suggest a priori what form the functional-spatial relations should take, but these theories have not been sufficiently integrated to use them in this manner.

This study has resorted to the research on models of the transmission of economic impulses through an urban system to determine regions of influence for each submarket. This study has assumed that local unemployment is determined by three components, namely national, structural, and regional. The regional component was derived by factor analysing the residual matrix obtained for each estimate of equation (4.6). The scores from these factors were used to create a single, mutually exclusive grouping of the metropolitan areas by means of Casetti's discriminant iterations procedure (Casetti, 1964). A seven group solution was chosen (Figure 5.1 and Table 5.1) and these results were used to compute the relative wage variable. Some distinct contiguous regions are noted; for example, in the North Central, New England, Middle Atlantic and South East areas. These groupings have been derived on the assumption that areas within any given region respond to similar regional economic forces or impulses.

Table 5.1.

Discriminant analysis of factor scores for wage spread effect grouping in 99 SMSAs

Group 1	Group 2	Group 3	
New Haven	Boston	Jersey City	Norfolk
Bridegport	Springfield	Newark	Miami
Hartford	Worcester	Paterson	
Minneapolis	Detroit	New York	
Pittsburgh	Grand Rapids	Rochester	
Cincinnati	Duluth	Syracuse	
Houston	St. Louis	Utica-Rome	
San Francisco	Omaha	Akron	
Oklahoma City	Trenton	Canton	
Riverside	Buffalo	Columbus	
	Philadelphia	Portland	
	providance	Erie	
	Salt Lake City	Phoenix	
	Spokane	Albuquerque	
	Los Angeles	Jacksonville	
	Shreveport	Tampa	
	New Orleans	Austin	
	Dallas	El Paso	
		Albany	
		Birmingham	
		Baltimore	
		Binghamton	

Table 5.1. (continued)

Discriminant analysis of factor scores for wage spread effect grouping in 99 SMSAs

Group 4	Group 5	Group 6	Group 7
Indianapolis	Johnstown	San Diego	Atlanta
Madison	Seattle		Charlotte
Washington D.C.	Tacoma		Charleston
Rockford	Huntington		Greenville
Peoria			Greensboro
Chicago			Nashville
Davenport			Knoxville
Cleveland			Chattanooga
Dayton			Tulsa
Toledo			Youngstown
Des Moines			Sacramento
Richmond			San Jose
Wilmington			Denver
Louisville			Kansas City
Reading			Mobile
Allenton			Little Rock
Harrisburg			Baton Rouge
Lancaster			Jackson
York			Memphis
Milwaukee			Beamont
			Corpus Christi
			San Antonio

Figure 5.1. Metropolitan groups for the relative wage variable

Institutional forces in the wage determination process, such as the effect of wage comparability bargaining, are therefore assumed to occur in the same spatial framework as that of the regional economic interdependencies between the various labor submarkets in the economy. If this variable captures the effect of wage adjustments made on the basis of comparison and regional spread effects, then its coefficient should be negative.

The price-expectations variable is based on the convergence scheme proposed by Brinner (1977), Kane and Malkiel (1976) and Martin (1978), and consists of the sum of two terms: the 'normal' rate of inflation, $(\dot{P}/P)^N$; and a positive fraction, λ, of the current deviation of inflation from the 'normal' rate or perceived target value. Specifically,

$$(\dot{P}/P)_t^E = (\dot{P}/P)^N_{t-1} + \lambda\left[(\dot{P}/P)_{t-1} - (\dot{P}/P)^N_{t-1}\right], \quad 0 \leq \lambda \leq 1 \qquad (5.5)$$

where $(\dot{p}/p)_t^E$: is the rate of increase in prices expected for period t in period t-1;

$(\dot{p}/p)^N_{t-1}$: is the the normal rate of inflation for period t-1;

λ: is a positive fraction of the deviation of actual inflation from the 'normal rate'; and

$(\dot{p}/p)_{t-1}$: is the actual rate of inflation for period t-1.

The policy target value, 'normal' inflation, is updated by contrasting the most recent prior conception of normal inflation with a lagged value of actual inflation:

$$(\dot{P}/P)^N_t = (\dot{P}/P)^N_{t-1} + \sum_{i=1}^{6} Z_i\left[(\dot{P}/P)_{t-i-1} - (\dot{P}/P)^N_{t-1}\right] \qquad (5.6)$$

where Z_i are lagged weights, which are assumed to sum to one. Substituting (5.5) into (5.6) gives the basic form to be included in the estimated wage inflation equation:

$$(\dot{P}/P)_t^E = \lambda \left[(\dot{P}/P)_{t-1} - \sum_{i=1}^{6} Z_i(\dot{P}/P)_{t-2-i}\right] + \sum_{i=1}^{6} Z_i(\dot{P}/P)_{t-2-i} \qquad (5.7)$$

It is hypothesized that λ is significantly greater than zero and less than one, and that the coefficient of the normal rate, $(\dot{p}/p)_t^N$, is not significantly different from one. This corresponds to the accelerationist hypothesis (Friedman, 1968). The distributed lag structure, $\sum Z_i(\dot{P}/P)_{t-2-i}$, is hypothesized to be a weighted sum of the increase in consumer prices for the six-quarter interval. The weights (Z_i) are constrained to the form of a first degree polynomial distributed lag for six quarters with a 'zero constraint' on coefficient values for seven quarters. It is based on quarterly data and is computed with linearly declining weights. The coefficient for this variable is expected to be positive. The U.S. Consumer price index (U.S. Department of Labor, Cosumer Price Index) is used to represent P.

Equation (5.1) can then be re-specified as:

$$(\dot{W}/W)_{it} = a_{i0} + a_{i1}N_{it}^{-1} + a_{i2}S_{it}^{-1} + a_{i3}F_{1it}^{-1} + a_{i4}F_{2it}^{-1} + a_{i5}F_{3it}^{-1} + a_{i6}(W/\bar{W})_{it-4} + a_{i7}(\dot{P}/P)_t^N + a_{i8}(\dot{P}/P)_t^E + a_{i9}C_t + e_{it} \qquad (5.8)$$

The wage control variable, C_t, represents the period from the fourth quarter of 1971 to the first quarter of 1974 during which the Economic Stabilization Program was in operation. It is a dichotomous dummy variable, in which those quarters were wage controls were in effect are given the value of one and the remaining quarters are given the value of zero. A negative coefficient for this variable would be indicative of the fact that a given metropolitan area's wage inflation was effectively controlled.

5.2. Model Estimation

The model in equation (5.8) was applied to each of the ninety-nine metropolitan areas listed in Table 1.1. Although these areas do not necessarily correspond to actual urban labor submarkets, the daily urban system probably being a better approximation, these Standard Metropolitan Statistical Areas certainly constitute their core and represent a substantial majority of each submarket's labor force. The period 1964-1978 was chosen because it included the change which began to occur in the character of inflation and in its relation to unemployment after the mid-1960's. It also incorporates two recessions, which took effect at the end of the 1960's and in the middle of the 1970's, and a period of national wage and price controls from 1971-1974.

The coefficients of equation (5.8) were estimated by the Cochrane-Orcutt regression technique and the results are given in Table 5.2. The Durbin-Watson statistic ranges from 1.35 to 2.36, and clearly exceeds the upper bound of the critical value at the 5 percent significance level, 1.80, in most cases. Since the lowest value for any of the metropolitan equations also exceeds the lower bound of 1.34, we can conclude that in no case does positive serial correlation definitely occur. Furthermore, there is no evidence of significant negative serial correlation. As shown in Table 5.2 and in Figure 5.2 the level of explained variance ranges from as high as .91 for Pittsburgh to as low as .32 for New York. Most equations have R^2

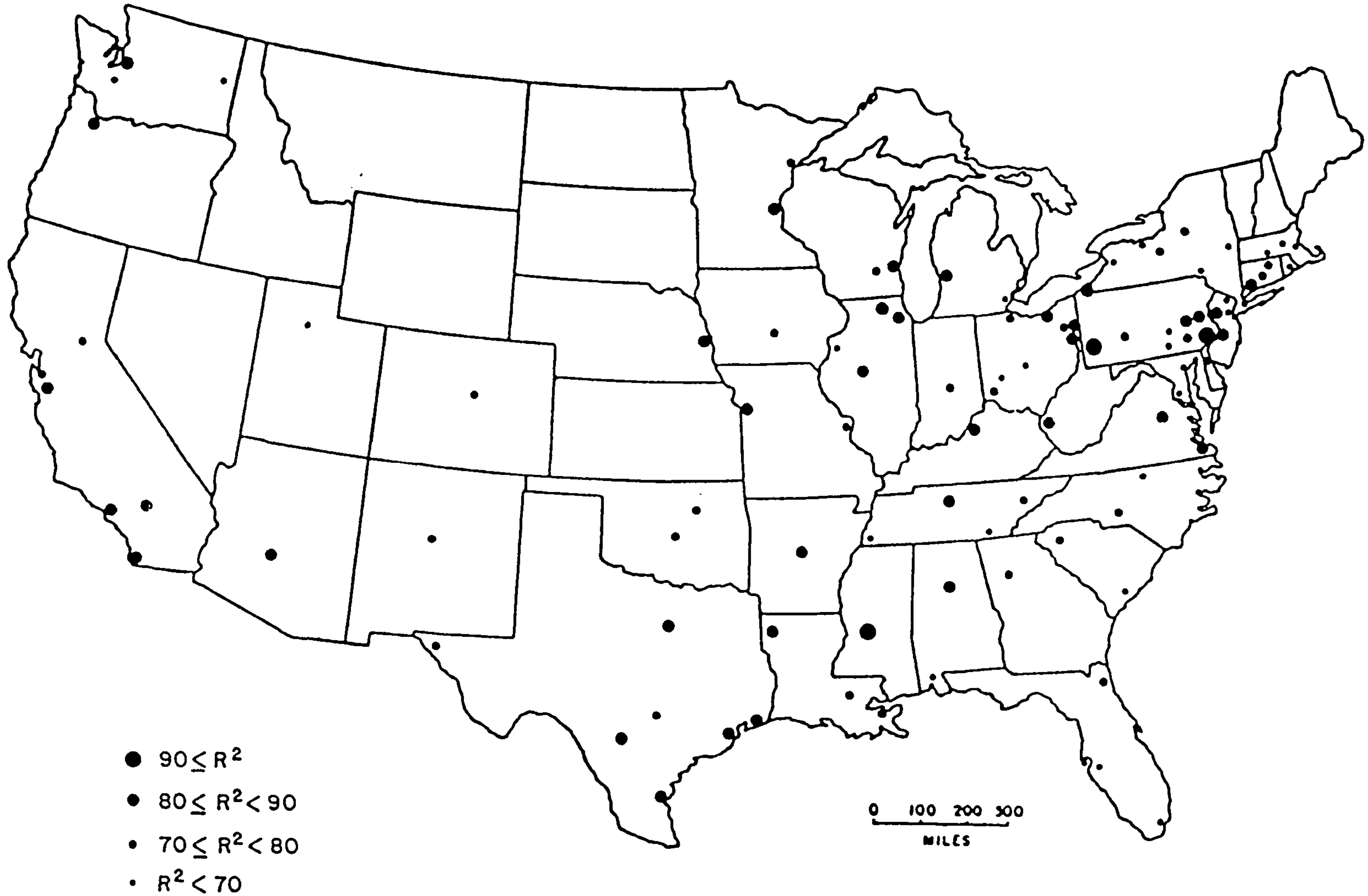


Figure 5.2. The R^2 values from equation (5.8)

values between .70 and .90 and only in the case of three metropolitan areas were the values below .50. They are Chattanooga, Binghamton and New York. In general, metropolitan areas located in the South and West tend to have lower R values, while those of the North and East tend to have high R^2 values.

The effect of the national unemployment component ($a_{i1}N_{it}$) is extremely varied. If the phillips curve relationship existed, its coefficient should be positive. As shown in Table 5.2 the national unemployment component coefficient is positive in thirty-seven cases, and significantly different from zero at the .05 percent level in only seven and at the .10 percent in three more. Of the sixty-two cases with negative coefficients, as many as thirty-eight are significant from zero. Clearly the Phillips curve relationship is not relevant in most cases. The spatial pattern of places with significant coefficients is reasonably distinct, with those having negative signs overwhelmingly concentrated in an area either side of the Mississippi river and in the North's manufacturing belt, and those with positive signs widely dispersed to the West, with some concentration in the North-east. (Figure 5.3).

The evidence for the structural unemployment component ($a_{i2}S_{it}$) is mixed. As shown in the third column of Table 5.2, of twenty-nine cases that have the correct positive sign, only eight are significantly different from zero at the 0.05 percent level and one more is significantly different from zero at the 0.10 percent level. Of thirty-three cases that have the negative sign, seven are significantly different from zero. These results do not give much

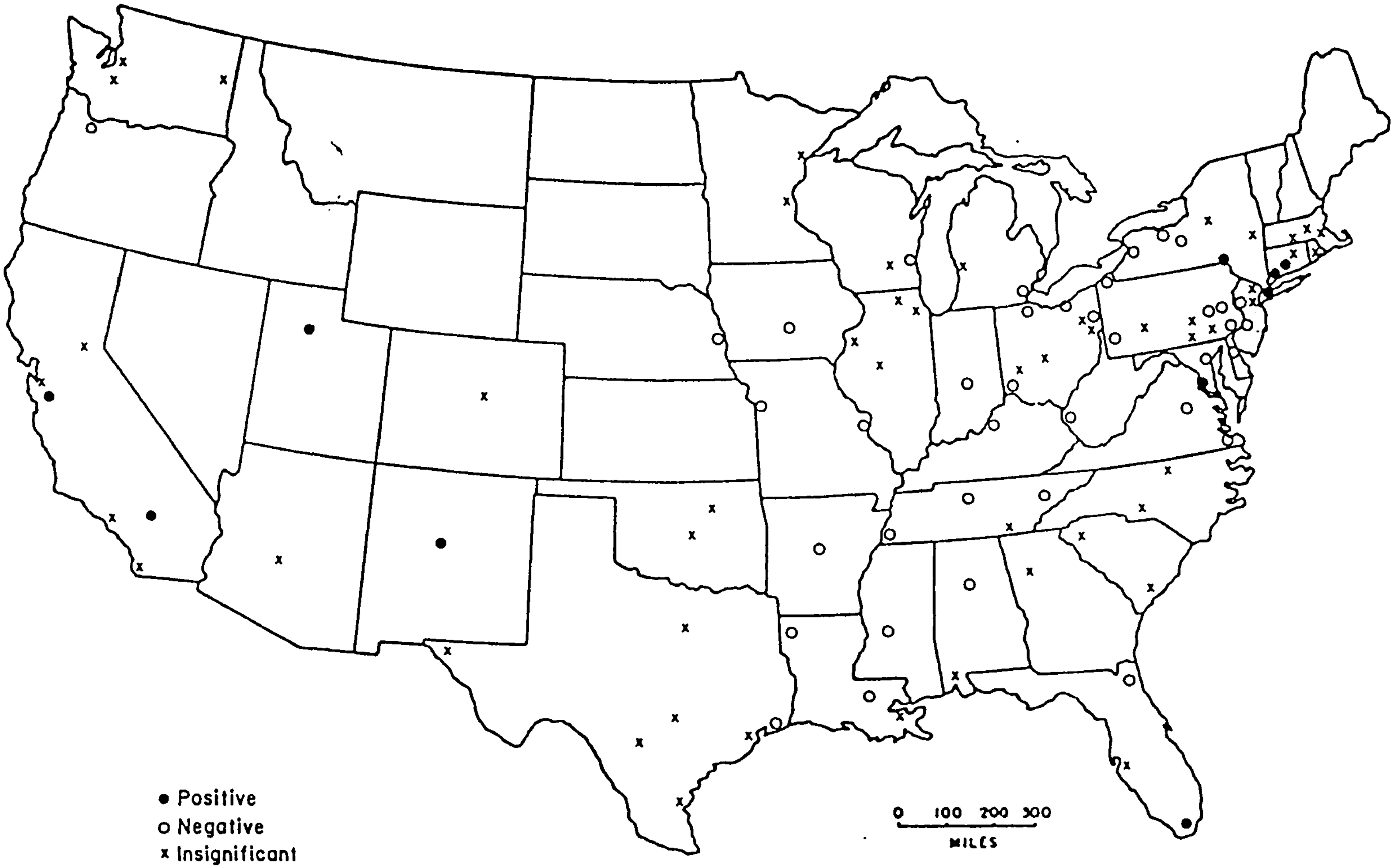


Figure 5.3. National unemployment coefficients, a_{i1}, from equation (5.8)

support for a Phillips type relationship between wage rate changes and structual unemployment. As shown in Figure 5.4, there is no very striking spatial pattern in the results. Those SMSAs that have significant positive coefficients are Chicago, Baltimore, Allentown, Erie, Reading, Norfolk, Richmond, Birmingham, and Greenville. A small concentration of negative coefficients is seen in the state of Washington.

There are three regional unemployment components. For the first, ($a_{i3}R_{it}$), forty-two cases have the correct positive sign, but only two are significantly differet from zero at the 0.05 percent level, while one is significantly different from zero at the .10 percent level. The coefficients are negative in fifty-seven cases, six of which are significantly different from zero. It appears that this component is not important in determing wages. And in most cases the sign is incorrect. Those SMSAs that possess correct positive signs and are significantly different from zero are: San Francisco, Boston and Harrisburg (Figure 5.5). The second component, ($a_{i4}R_{it}$), does not give a promising result either. Of the fifty-six cases with correct positive coefficients, only five are significantly different from zero at the .05 percent level, and one is significant at the .10 percent level. The coefficient is negative in forty-three cases, and significantly so in two of these (Figure 5.6). The effect of the third component, ($a_{i5}R_{it}$), is also minor. Its coefficients are positive in forty-six cases, and significantly different from zero at the .05 perent level in two, and at the .10 percent level in one of these. Of the fifty-three cases with negative coefficients, seven are

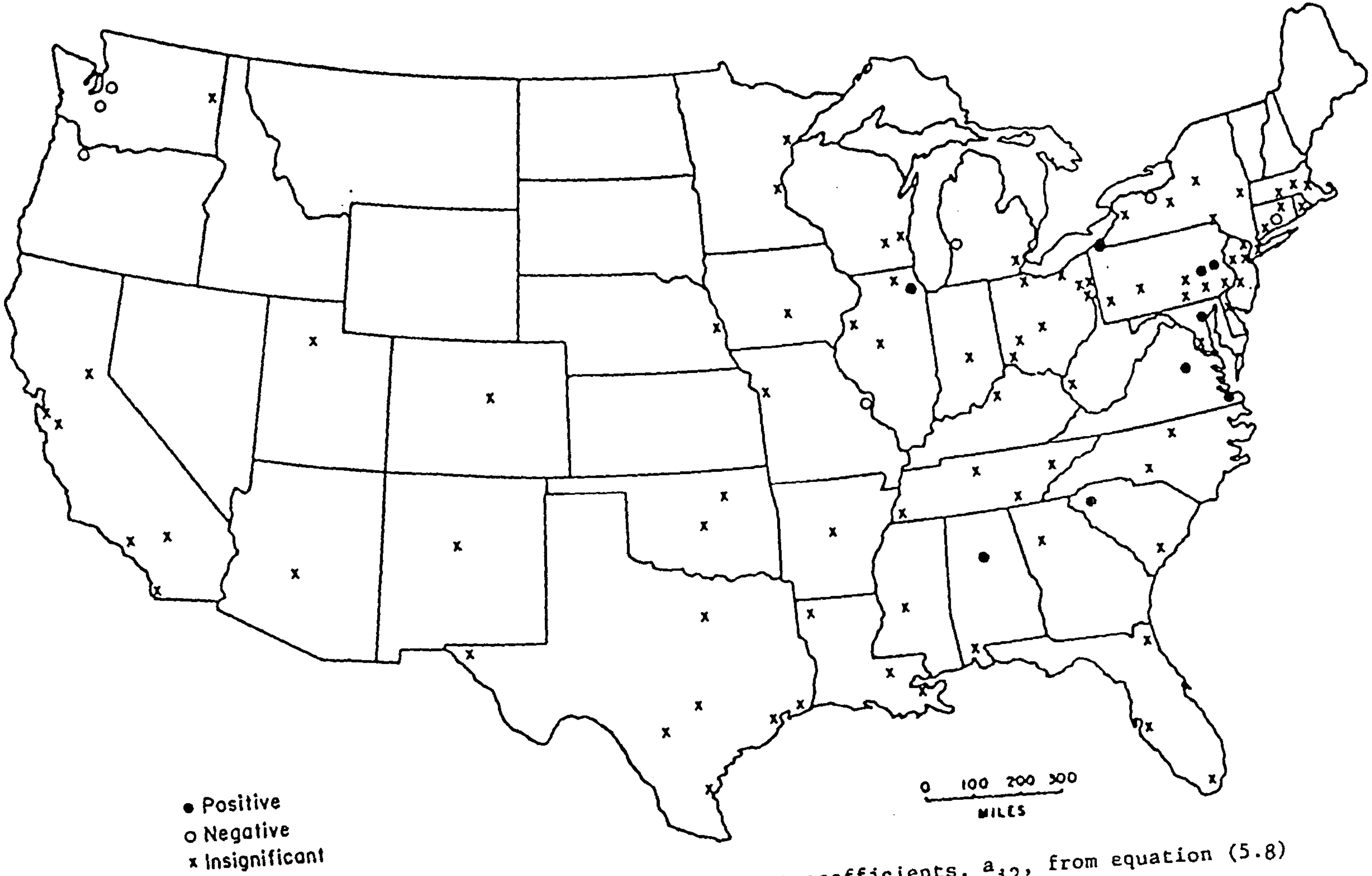


Figure 5.4. Structural unemployment coefficients, a_{i2}, from equation (5.8)

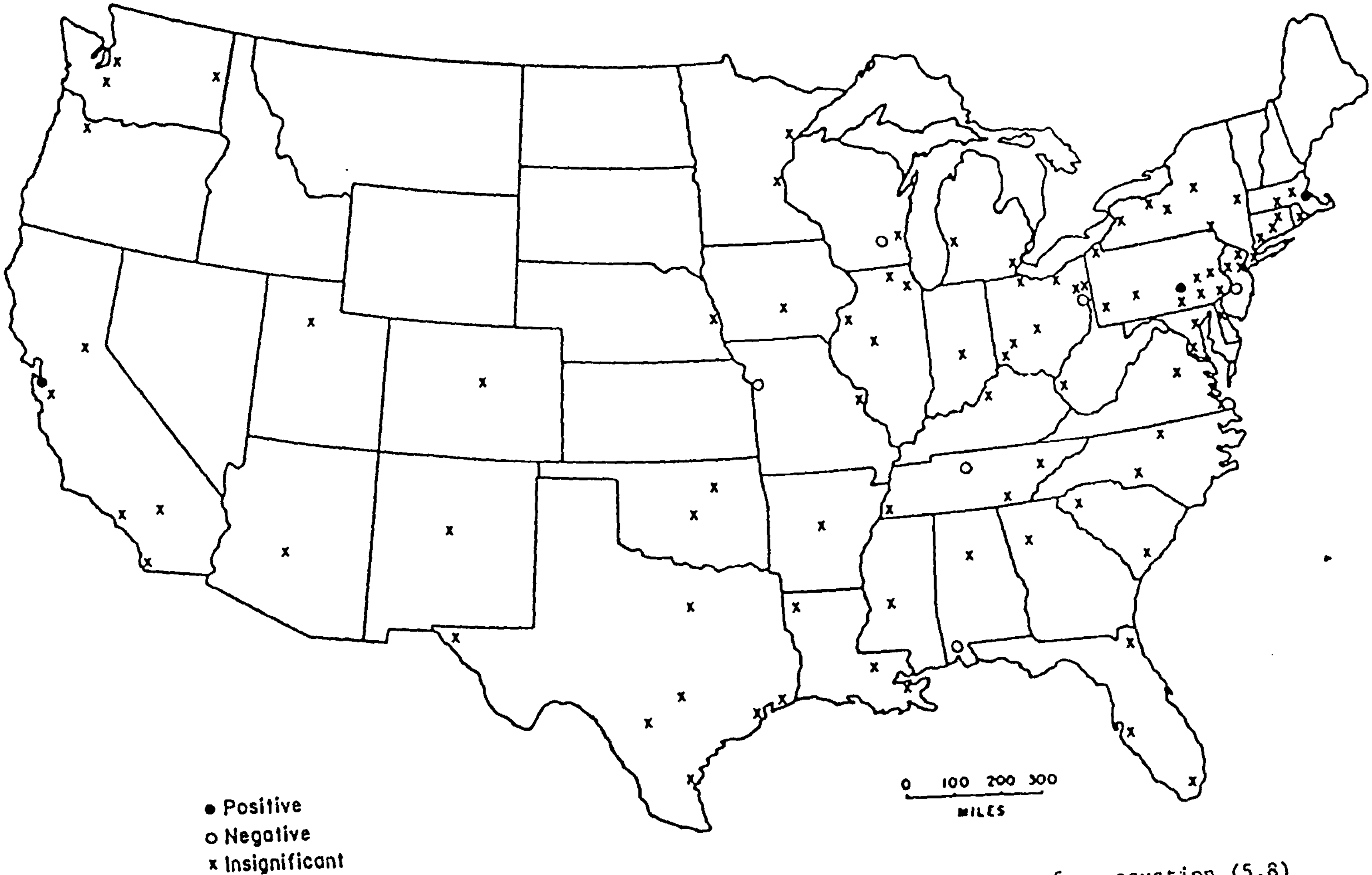


Figure 5.5. Regional unemployment coefficients, a_{i3}, from equation (5.8)

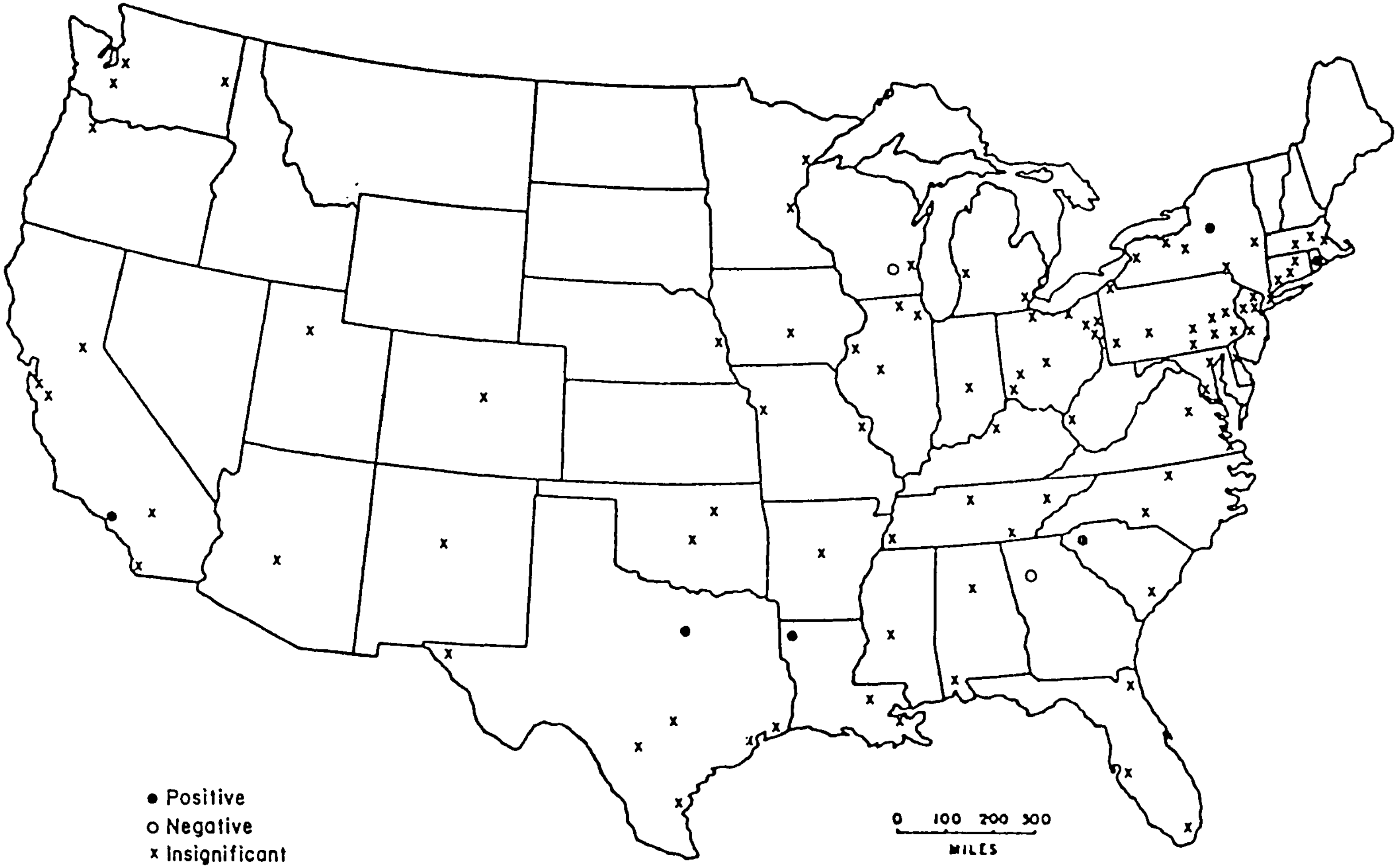


Figure 5.6. Regional unemployment coefficients, a_{i4}, from equation (5.8)

significantly different from zero. The spatial pattern of SMSAs with significant coefficients is distinct, with those having negative signs mostly concentrated in the South, and those with positive signs located in the Noth East (Figure 5.7).

The coefficients on the wage spread effect variable, $(a_{i6}W/\bar{W}_{it})$, are negative and statistically significant in all but five cases. The exceptions are San Jose, Denver, Los Angeles, San Diego and Houston, which are negative but insignificant. It appears that this variable is by far the dominant influence in the model. The extent of the influence varies a great deal throughout the study area, and distict spatial patterns are evident (Figure 5.8). The coefficient for this variable tends to be greater in the east of Mississippi river region in general, and in the North East and Midwest in particular.

Inflationary expectations are also spatially concentrated in their effect. Seventy-five of the metropolitan areas have the correct positive coefficient for the normal inflation term, twenty-six of them being significantly different from zero at the 0.05 percent level, while eight of them are also significantly different from zero at the 0.10 percent level. In only about one third of the cases, therefore, have wages adjusted to any degree of to price inflation in the urban system. In only seventeen have they adjusted fully in the sense that their normal inflation term has a coefficient which is both significantly different from zero and not significantly different from one. Most of these areas are located in the Sun Belt and in the North East (Figure 5.9). The convergence term is significant and positive

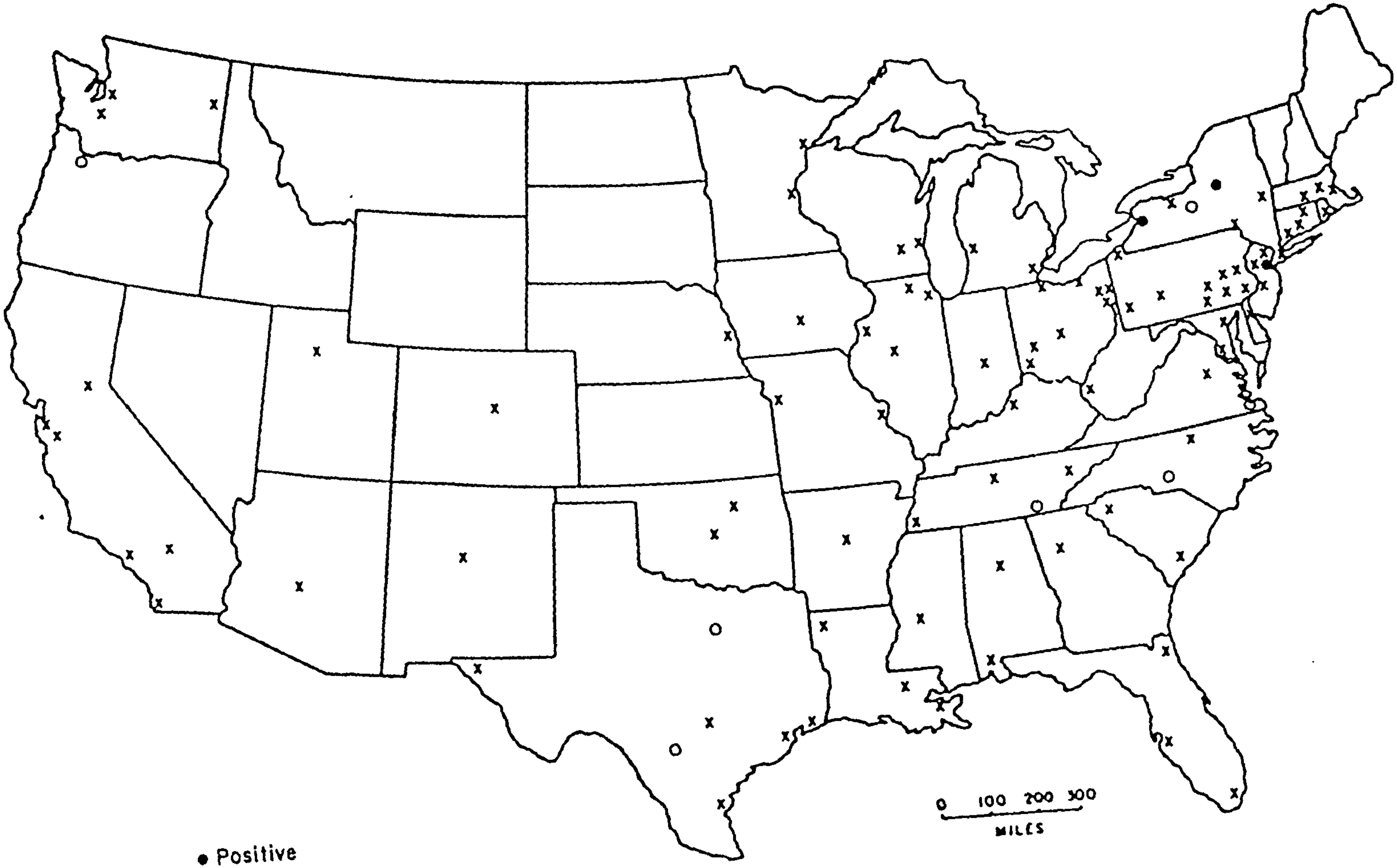


Figure 5.7. Regional unemployment coefficients, a_{i5}, from equation (5.8)

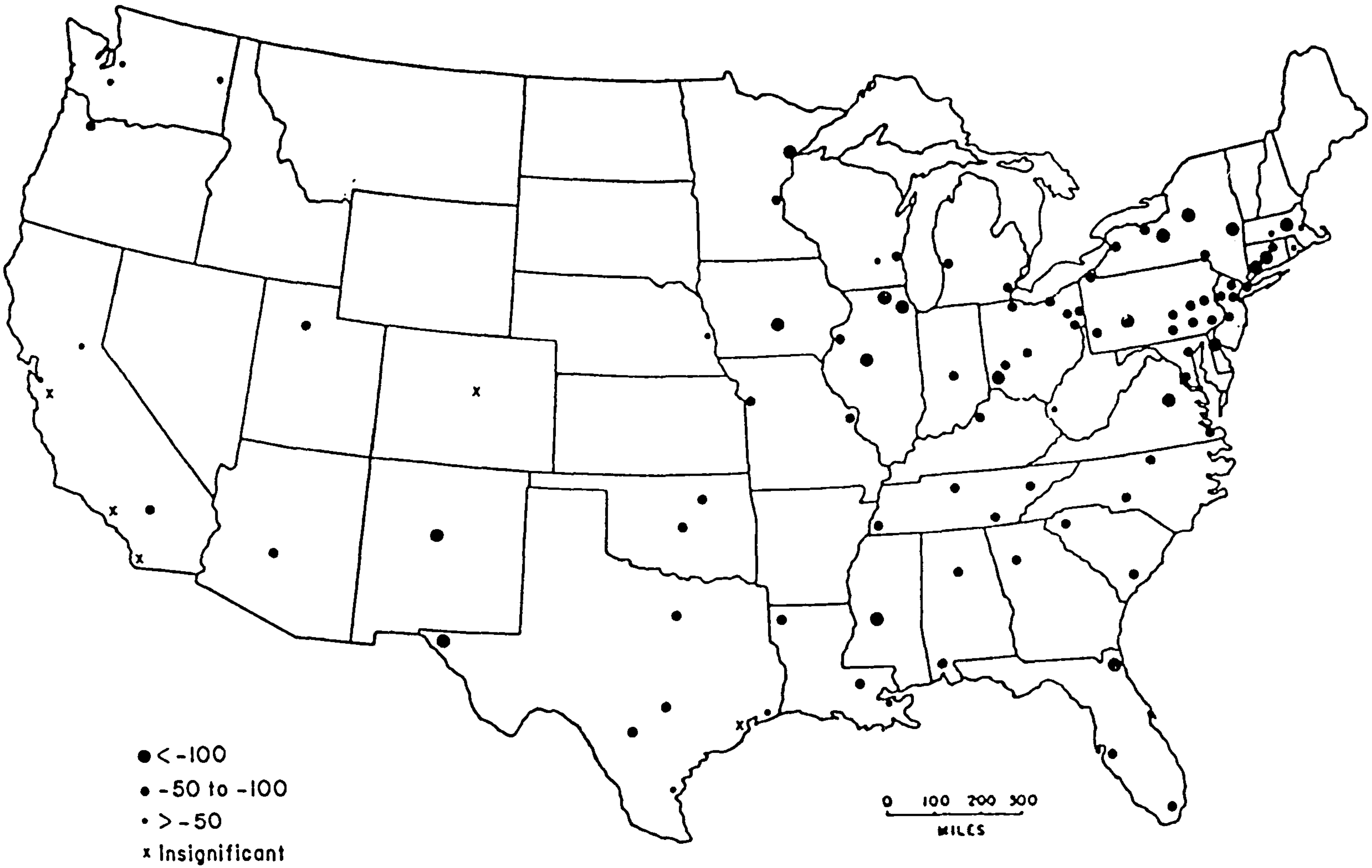


Figure 5.8. Wage-spread-effect coefficients, a_{i6}, from equation (5.8)

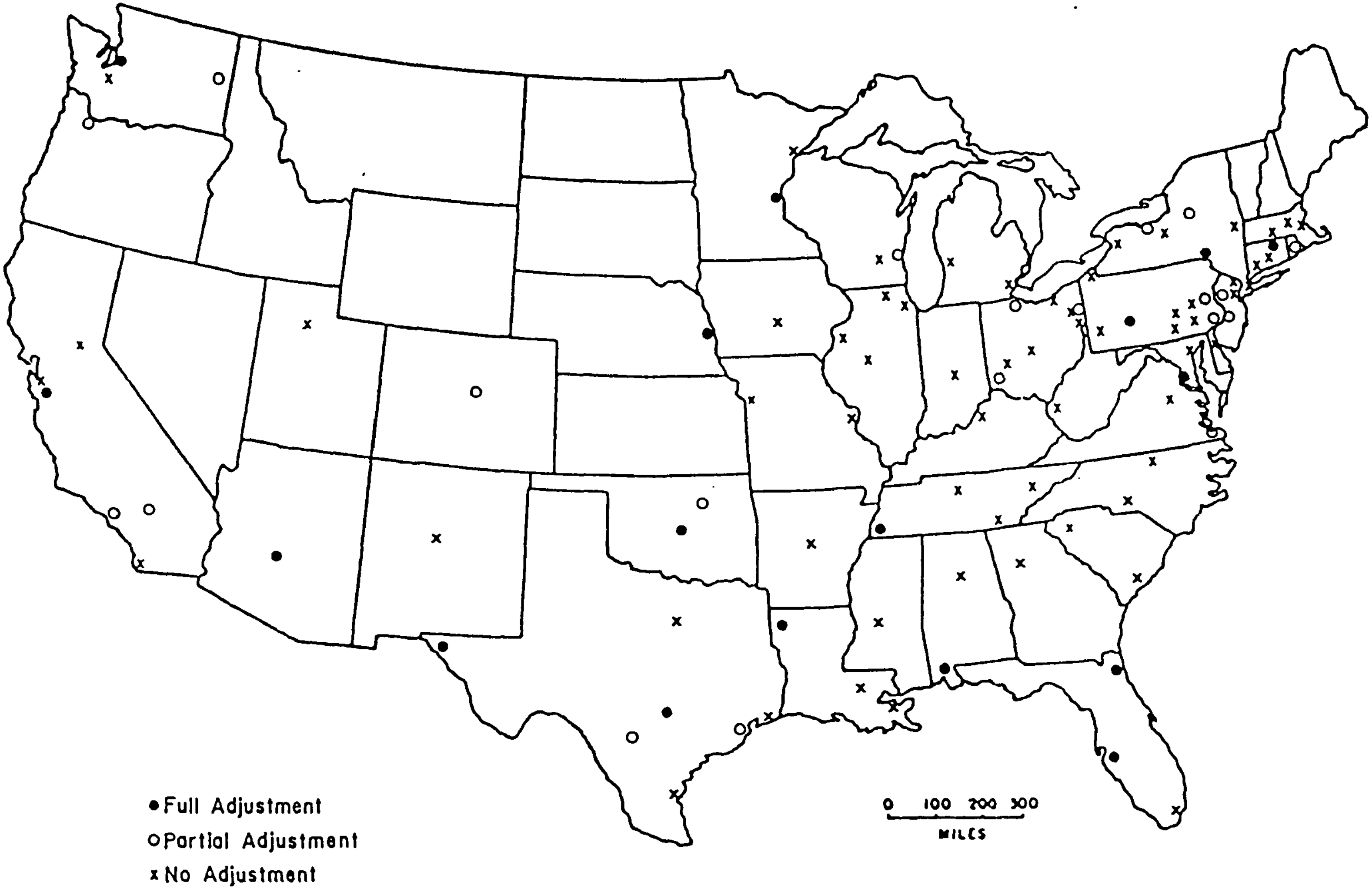


Figure 5.9. Normal rate term coefficients, a_{i7}, from equation (5.8)

in only one fifth of the cases. It is interesting to note that these metropolitan areas correspond very closely with those in which stagflation was significantly present (Figure 5.10).

Finally, the wage control policy variable, $(a_{i9}C_t)$, has very little significant effect on wage inflation in this metropolitan system (Figure 5.11). Only sixteen metropolitan areas (Wilmington, Des Moines, Grand Rapids, Syracuse, Cleveland, Portland, Norfolk, Utica-Rome, Birmingham, San Diego, Atlanta, New Orleans, Tulsa, Nashville, San Antonio, and Dallas-Fort Worth) have negative coefficients that are significant at the .10 percent level, while in nine areas (Washington D.C., Albany, Binghamton, New York, Richmond, Baton Rouge, Charlotte, Oklahoma City, and Memphis) they are positive. Assuming that the dummy variable approach used in this study is an acceptable method of representing the effect of wage controls, it appears that the Nixon Administration's wage and price stabilization program had little effect on wage inflation in the cities in question. If we ignore the issue of statistical significance, it appears that this policy was more effective than not, however. The results show that sixty percent of the SMSAs have negative coefficients. If anything, the policy was least effective on the east coast and most effective in the manufacturing belt of the Mid-West and in southern Appalachia.

5.3. Conclusions

The wage determination model presented in this Chapter generally performs well in explaining wage-rate changes. The explained variance (R^2) is above fifty percent in all but three cases, and above seventy

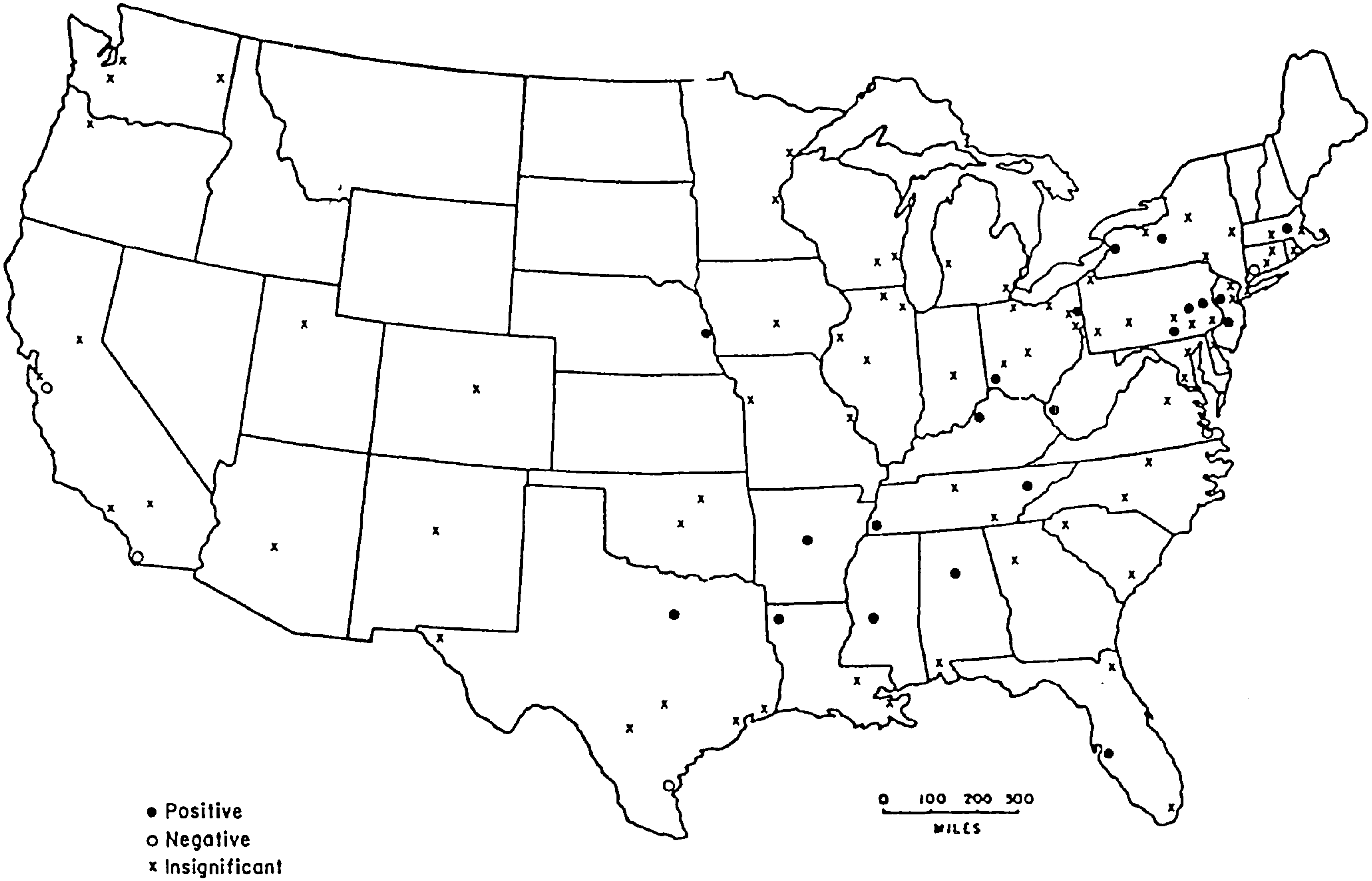


Figure 5.10. Convergence term coefficients, a_{i8}, from equation (5.8)

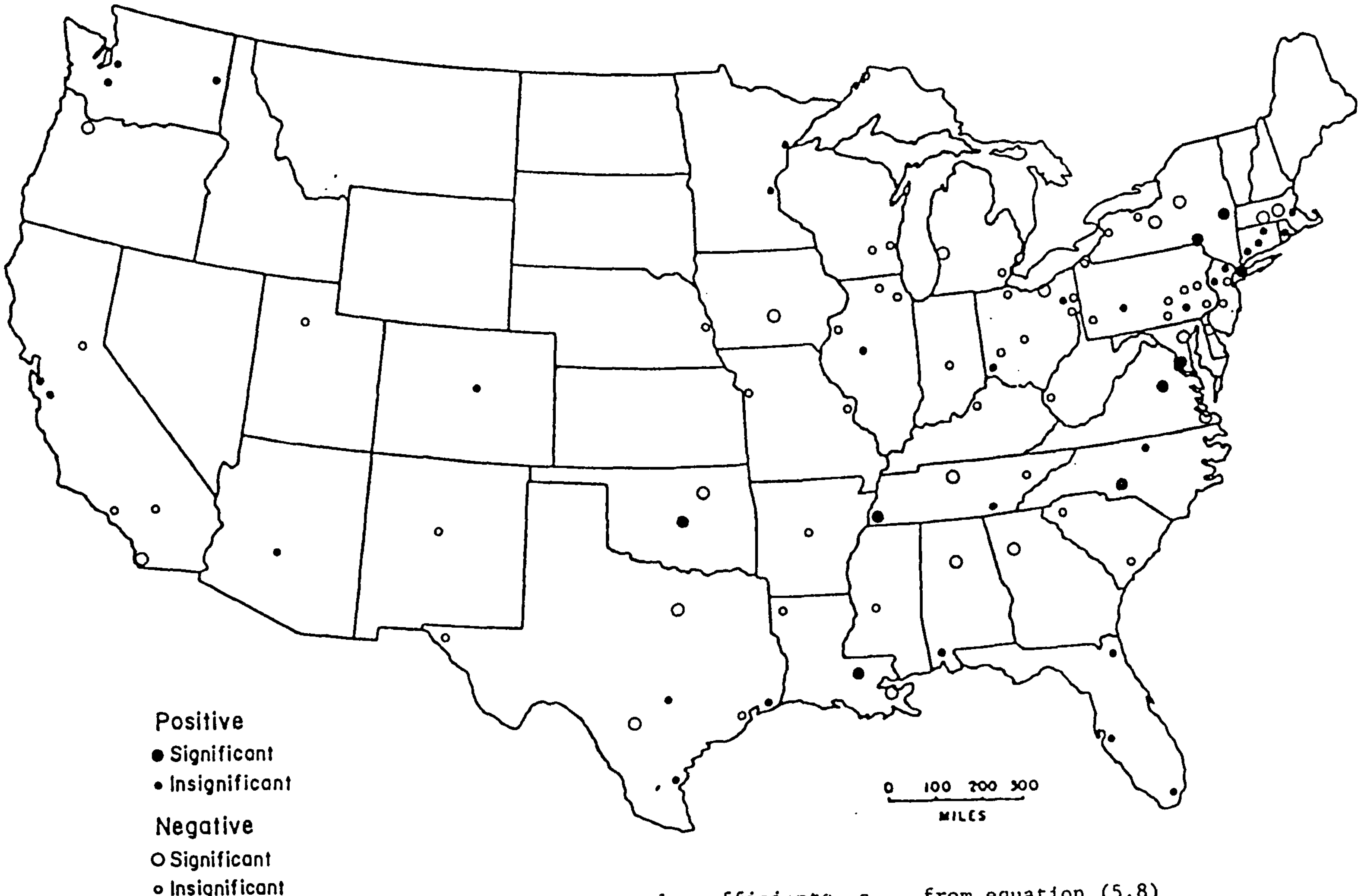


Figure 5.11. Wage-control coefficients, a_{i9}, from equation (5.8)

percent in seventy cases. In general, the model is less suited to explain wage-rate changes in the South and West regions. Concerning the role of the excess demand for labor, the three components derived from the unemployment transmission model had shown a little support of regional Phillips curve exists. On the contrary, they indicate that a significant reversal of this relationship has taken place.

It appears that the trade-off between wage inflation and excess demand for labor generated by national forces is not supported strongly in this study. In fact, there is a trend toward stagflation. The effects of structural unemployment and the three regional components of unemployment are minor. There are very few submarkets with significant correct positive signs for any of these variables.

Spread effects are the dominant influence in determining wage changes in this study, being statistically significant and having correct sign in all but five submarkets. The results indicate that these spread effects can take place within discrete clusters of metropolitan areas whose economies have been shown to be similar in terms of their susceptibility to regional economic forces. While this does not yet explicity involve a given process of spread, the spread effect factor that this study has incorporated in the model is suggestive of the spatial context within which the particular process or processes occur. The main difficulty presented in this approach is that workers may compare their wages with their counterparts in other urban sub-systems outside the region, or they may compare it through interregional industrial and occupational likages, notably by means of labor unions. Furthermore, the use of mutually exclusive groups rather than, more realistically, overlapping ones, and the question of temporal stability of the groups deserves further research.

Only slightly above one third of the labor submarket in the sample significantly adjust to inflationary expectations, and half of them did so fully. In general, then, this factor is far less important in North Central region. Its effects is concentrated in the submarkets located in the South and North East regions. Partial convergence is even less important affects wage changes in this study. A issue concerning the inflationary expectations term involves the use of a natinal consumer price index. Not only is it more plausible that workers try to adjust their wages to local price levels, but it presumably would be more pertinent to use the latter in any consideration of inflationary expectations as a tool of regional policy. Unfortunately, these types of data are restricted to less than thirty submarkets within the entire country, but even from these data it is clear that a great deal of spatial variation exists both in the level of prices and in their change over time.

The national policy of wage controls from 1971:3 to 1974:2 had little impact on these areas, and what impact there was varied both regionally and directionally. In general, it was less effective in the East, which might be attributed to the levels of unionization in the area. Since these wage and price controls consisted of four phases and only the first two phases were mandatory, unionized workers tended to be more militant in asking for wage increase to compensate for previous losses once the mandatory controls were lifted. However, in the less unionized areas such as in the South, employers tended to use wage controls as an excuse to hold down wage increases. Whether there resulted a form of spread effect between unionized and non-unionized sectors has been doubted in other research (Vroman and Vroman, 1979). Although this research did not specifically test for such a spread effect, the results do not appear to support one. It might be worth investigating the possibility of accomplishing the control of wages by means of a policy which separates through the wage-spread-effect process.

One further issue which this research has not dealt concerns the structure of the wage model. Martin (1978) has already shown that the effectiveness of a model such as this one, particular in terms of its forcasting ability, can be seriously undermined by temporal instability in the estimates of its parameters. Furthermore, there has been frequent criticism of the fact that most models of the type are expressed as single equations, and that this is too simplistic a represention of what is clearly a complex process. These are both valid grounds for being sceptical of the usefulness of this type of model presented in this Chapter, and certainly point out a further research need in this area.

Table 5.2. Parameter estimates for equation (5.8)

SMSA	a_{i0}	a_{i1}	a_{i2}	a_{i3}	a_{i4}	a_{i5}
1	36.06** (12.909)	-12.04 (9.133)	16.88 (15.549)	.003 (.0055)	-.0001 (.0007)	.002 (.0014)
2	45.70* (25.415)	5.71 (5.572)	0 (0)	.0174* (.0102)	.007 (.0122)	-.004 (.006)
3	15.58 (14.066)	29.40** (10.138)	-14.83 (9.617)	-.002 (.0057)	-.0003 (.0023)	.0001 (.0002)
4	22.07* (12.434)	5.81 (4.402)	16.00 (10.025)	.009 (.010)	-.002 (.0015)	-.0006 (.0011)
5	103.24** (14.08)	23.61** (10.53)	-.17 (47.28)	-.032 (.030)	.0009 (.011)	.0034 (.0062)
6	74.81** (18.00)	7.16 (10.536)	8.58 (32.999)	.008 (.0104)	.005 (.0072)	-.002 (.0033)
7	121.71** (15.35)	37.11** (11.77)	-12.49* (6.86)	-.006 (.005)	.006 (.005)	-.007 (.005)
8	136.05** (18.07)	-44.65** (12.21)	.02 (.151)	.019 (.036)	-.005 (.011)	-.004 (.006)
9	51.24** (21.44)	17.19* (9.90)	.14 (2.32)	.004 (.011)	-.003 (.009)	.0008 (.003)
10	141.15** (21.10)	2.56 (21.47)	55.40** (27.05)	.002 (.011)	.001 (.0009)	-.001 (.002)
11	100.64** (23.94)	-3.84 (15.34)	0 (0)	-.015 (.047)	-.025 (.027)	.0003 (.014)
12	-35.40 (692.67)	0 (0)	0 (0)	-.004 (.003)	-.007 (.017)	.002 (.004)
13	146.47** (38.84)	24.14 (41.44)	-76.73 (99.58)	-.006 (.026)	-.001 (.012)	-.008 (.009)
14	99.34** (22.30)	-24.60** (10.25)	0 (0)	.0003 (.001)	.0004 (.001)	-.0004 (.0009)
15	124.44** (17.14)	-21.1** (5.57)	0 (0)	.0006 (.012)	.00001 (.0002)	.001 (.002)

a_{i6}	a_{i7}	a_{i8}	a_{i9}	R^2	DW[a]	RHO[b]
-24.603** (11.170)	.169 (.169)	.345 (.256)	-.391 (.678)	.73	1.90	.39
-39.07* (21.24)	.92 (.131)	-.315 (.199)	1.95 (.600)	.77	2.00	.13
-16.177 (11.105)	1.294**+ (.234)	-.720** (.276)	.788 (.828)	.83	1.87	.32
-18.27 (12.34)	.489** (.160)	.221 (.208)	.915 (.694)	.76	1.89	.39
-106.01** (15.67)	-.179 (.197)	-.468** (.223)	.363 (.745)	.86	1.66	.51
-74.54** (18.612)	.609**+ (.250)	-.120 (.289)	.388 (.916)	.78	1.85	.59
-130.07** (17.509)	.231 (.162)	-.296 (.240)	.136 (.689)	.75	1.92	.10
-111.42** (16.21)	-.232 (.279)	.323 (.377)	-3.47** (1.178)	.77	1.85	.25
-60.84** (21.05)	1.24**+ (.587)	.563 (.612)	4.82** (2.02)	.66	1.56	.70
-117.02** (21.78)	-2.29 (.534)	-.71 (.559)	-2.73 (1.79)	.85	1.35	.64
-83.05** (18.00)	.55 (.72)	-.53 (.78)	-.065 (2.54)	.68	1.41	.65
-131.70** (16.40)	1.41 (.94)	1.07 (.71)	1.25 (2.33)	.82	1.73	1.0
-172.5** (21.80)	-.49 (.61)	.61 (.69)	-1.34 (2.20)	.83	1.58	.63
-80.74** (20.19)	-.26 (.32)	.008 (.35)	-.187 (1.13)	.73	1.77	.64
-101.8** (15.25)	-.221 (.21)	.256 (.28)	-1.56** (.87)	.78	1.90	.31

SMSA	a_{i0}	a_{i1}	a_{i2}	a_{i3}	a_{i4}	a_{i5}
16	81.53** (20.63)	-30.9** (11.29)	0 (0)	-.012 (.005)	.0002 (.0005)	.0007 (.0009)
17	88.03** (29.45)	-41.17** (17.27)	34.37** (15.92)	.015 (.009)	.004 (.010)	-.001 (.0001)
18	37.22** (18.44)	-2.96 (9.55)	0 (0)	.007** (.002)	.002 (.005)	.005 (.003)
19	52.91** (18.68)	-16.83 (14.60)	-9.81 (9.67)	.002 (.004)	.0007 (.0009)	.005 (.003)
20	116.53** (17.20)	-1.78 (24.26)	-.107 (.55)	-.001 (.005)	-.006 (.006)	.004 (.009)
21	106.35** (25.27)	-119.06** (32.33)	-1.0 (3.32)	-.012 (.018)	-.001 (.005)	-.003 (.003)
22	71.45** (18.61)	2.49 (12.27)	-178.00** (40.41)	.0001 (.002)	.0005 (.0003)	.001 (.002)
23	124.09** (18.16)	-15.6 (11.29)	0 (0)	.01 (.014)	.005 (.002)	.001 (.010)
24	65.64** (30.70)	-11.81 (7.47)	-14.53 (22.60)	.003 (.002)	.0004 (.001)	-.002 (.002)
25	126.49** (20.19)	-60.9** (31.50)	.063 (.072)	-.009* (.006)	.001 (.012)	-.006 (.001)
26	85.67** (28.10)	-21.94** (7.62)	-31.48** (13.81)	.001 (.002)	.003 (.005)	-.0001 (.0007)
27	52.09** (14.45)	-27.09** (9.45)	0 (0)	-.007 (.010)	.003 (.006)	.0003 (.0002)
28	104.96** (17.44)	4.08 (10.00)	0 (0)	.005 (.004)	-.003 (.006)	.007* (.004)
29	75.51** (19.25)	-12.88** (5.28)	0 (0)	.001 (.0007)	.0003 (.0006)	.003 (.002)
30	86.81** (18.16)	21.49 (15.52)	0 (0)	.005 (.005)	-.004 (.009)	-.003 (.007)
31	88.10** (15.46)	-36.57** (7.19)	0 (0)	-.004** (.001)	-.004 (.003)	.0004 (.003)

a_{i6}	a_{i7}	a_{i8}	a_{i9}	R^2	DW^a	RHO^b
-68.3** (19.58)	.060 (.224)	.572** (.231)	-.499 (.750)	.86	1.84	.73
-67.88** (24.88)	.333 (.25)	.451 (.335)	-1.53 (1.22)	.67	2.17	.28
-32.2** (19.20)	.282 (.18)	.089 (.21)	.322 (.78)	.58	1.96	.39
-48.4** (21.38)	.016 (.161)	.32 (.199)	-.20 (.638)	.68	1.99	.45
-116.76** (19.12)	.219 (.307)	1.05** (.474)	-.057 (1.28)	.54	2.02	-.124
-67.52** (18.56)	.285 (.385)	.55 (.49)	-.004 (1.51)	.54	1.99	.51
-59.86** (17.41)	.285 (.228)	.367 (.272)	-2.24** (.921)	.80	2.36	.45
-117.45** (17.71)	.08 (.29)	.35 (.42)	1.38 (1.24)	.72	1.89	.25
-69.63** (25.51)	.77**+ (.18)	.19 (.19)	.92 (.69)	.89	1.57	.69
-96.6** (18.29)	-.348 (.673)	.66 (.553)	-1.85 (1.63)	.87	1.36	.91
-66.9** (24.81)	.243 (.189)	.386 (.249)	-1.21 (.750)	.70	2.05	.28
-45.67** (13.08)	.796**+ (.131)	.320* (.191)	-.164 (.651)	.88	1.96	.19
-96.85** (17.69)	.161 (.187)	.360 (.276)	-.008 (.777)	.67	1.94	.18
-65.38** (18.16)	.365** (.115)	.380** (.155)	-.044 (.517)	.83	1.94	.37
-84.66** (18.96)	.310 (.237)	.081 (.362)	1.77 (1.07)	.58	1.94	.58
-72.12** (13.61)	.308* (.186)	.598** (.259)	-.024 (.780)	.86	1.90	.34

SMSA	a_{i0}	a_{i1}	a_{i2}	a_{i3}	a_{i4}	a_{i5}
32	113.37** (20.86)	2.92 (8.53)	-.016 (.098)	-.007 (.003)	.0009 (.004)	-.0009 (.004)
33	82.19** (21.19)	40.26** (14.29)	0 (0)	-.003 (.117)	.006 (.119)	.00007 (.293)
34	109.83** (24.28)	-124.55** (26.48)	.21 (.378)	-.005 (.005)	-.0009 (.002)	.006** (.002)
35	60.37** (23.15)	32.78** (18.29)	-1.92 (31.04)	-.003 (.004)	.0006 (.004)	-.001 (.006)
36	64.18** (16.35)	-17.06** (8.41)	-.22** (.90)	-.0008 (.103)	.0006 (.201)	.002 (.176)
37	130.10** (18.94)	-46.57** (10.32)	0 (0)	-.007 (.008)	.002 (.002)	-.0008** (.0003)
38	109.28** (18.59)	22.43 (22.53)	36.63 (23.83)	-.007 (.012)	-.004 (.006)	-.0007 (.0005)
39	1833.37 (1237.27)	4.15 (21.80)	0 (0)	-.015** (.007)	.0001 (.0015)	.0001 (.0004)
40	113.77** (18.85)	-41.73** (8.35)	0 (0)	.0001 (.0008)	.002 (.006)	.003 (.004)
41	112.10** (17.37)	-34.13** (11.93)	0 (0)	.006 (.006)	-.004 (.002)	-.001 (.0005)
42	108.47** (22.40)	-14.90 (8.60)	6.79 (11.02)	-.003 (.006)	-.001 (.006)	.00002 (.0004)
43	103.82** (55.24)	6.48 (15.60)	49.85 (81.62)	-.007 (.008)	-.003 (.003)	-.0003 (.001)
44	94.09** (21.32)	-39.99** (16.25)	0 (0)	-.014 (.014)	.004 (.008)	-.003 (.002)
45	112.83** (19.41)	-116.08** (21.28)	0 (0)	.015 (.022)	-.006 (.007)	-.0003 (.0006)
46	109.27** (19.99)	-17.68** (8.22)	-9.70** (4.13)	.0009 (.002)	-.004 (.002)	-.003** (.002)
47	79.74** (17.72)	-41.89** (11.52)	52.77** (19.0)	.017 (.013)	.0002 (.0003)	.003 (.003)

a_{16}	a_{17}	a_{18}	a_{19}	R^2	DW[a]	RHO[b]
-100.98**	.185	-.290	3.70**	.62	2.02	.11
(19.79)	(.258)	(.375)	(1.29)			
-95.03**	1.11**+	-.066	3.97**	.42	1.99	.08
(23.21)	(.352)	(.522)	(1.70)			
-75.84**	.33	.875**	-1.67	.64	1.87	.06
(18.43)	(.221)	(.370)	(1.09)			
-64.17**	.587	.056	2.79*	.32	1.84	.37
(24.75)	(.394)	(.45)	(1.60)			
-47.51**	.459**	.128	-.609	.69	2.07	.25
(13.03)	(.172)	(.228)	(.706)			
-106.41**	-.105	.66**	-1.56*	.77	2.03	.34
(17.06)	(.196)	(.277)	(.811)			
-83.55**	-.255	.27	.60	.78	1.59	.50
(17.29)	(.316)	(.33)	(1.18)			
-94.67**	.018	.259	-.490	.87	2.20	.99
(20.13)	(.350)	(.306)	(.897)			
-100.58**	.317*	.813**	.756	.76	1.98	.24
(18.46)	(.188)	(.283)	(.805)			
-89.59**	-.27	.34	-1.68*	.83	2.16	.70
(16.06)	(.270)	(.284)	(.908)			
-90.29**	.215	.37	-.15	.63	1.90	.28
(19.88)	(.220)	(.289)	(.901)			
-57.94**	-.218	-.290	-.402	.66	1.83	.66
(16.98)	(.301)	(.325)	(1.03)			
-69.48**	-.584*	.28	-1.22	.71	2.07	.62
(18.73)	(.323)	(.37)	(1.17)			
-68.94**	.502*	1.17**	-1.07	.81	1.99	.55
(13.38)	(.301)	(.360)	(1.18)			
-89.10**	.572**	.125	-1.95*	.86	1.92	.13
(16.42)	(.149)	(.197)	(.664)			
-67.23**	-.257**	.540**	-.162	.84	1.84	.44
(18.22)	(.197)	(.258)	(.772)			

SMSA	a_{i0}	a_{i1}	a_{i2}	a_{i3}	a_{i4}	a_{i5}
48	79.68** (16.09)	-25.41** (7.39)	15.73** (9.0)	-.012 (.008)	.0008 (.002)	-.0004 (.001)
49	89.16** (21.27)	-8.83 (9.51)	52.05 (19.49)	.007** (.013)	.002 (.003)	.005 (.005)
50	96.65** (23.26)	0 (0)	-9.94 (29.69)	-.014 (.014)	-.006 (.040)	.005 (.006)
51	75.65 (54.62)	-6.35 (8.43)	.61 (69.46)	-.0009 (.005)	.004 (.002)	-.0004 (.002)
52	88.48** (19.58)	-23.01** (8.98)	-.008 (.021)	-.002 (.003)	.0007 (.002)	.001 (.001)
53	91.93** (17.26)	-46.5** (10.37)	0 (0)	.005 (.004)	-.004 (.003)	-.003 (.002)
54	75.12** (18.58)	-23.89** (8.42)	39.82** (24.01)	-.005 (.006)	-.0003 (.0007)	-.0005 (.001)
55	58.76** (18.04)	-15.03 (11.14)	27.40 (25.70)	.0002 (.016)	-.005 (.005)	-.002 (.002)
56	53.07** (17.42)	16.66 (11.56)	52.25 (54.48)	-.0009 (.002)	.003** (.002)	-.002 (.001)
57	77.27** (14.62)	16.89** (8.15)	-.005 (.067)	-.004 (.006)	.003 (.001)	-.005 (.005)
58	83.06** (16.26)	-23.26** (8.159)	36.18** (14.29)	-.007 (.017)	.0003 (.0008)	-.008** (.003)
59	140.68** (15.60)	-31.14** (8.37)	83.46** (31.70)	.013 (.023)	.0002 (.006)	.019 (.016)
60	48.44** (13.68)	16.39 (10.27)	-132.72* (71.02)	-.029 (.132)	.028 (.027)	.005 (.004)
61	48.51** (13.49)	12.27 (9.36)	13.80 (31.70)	-.001 (.0087)	-.017 (.011)	-.001 (.001)
62	51.36** (21.93)	-1.31 (6.44)	-211.39** (103.85)	.103 (.109)	.002 (.029)	-.004 (.006)
63	52.30** (18.53)	-17.39** (4.95)	-27.56 (28.53)	-.013 (.017)	.025 (.023)	.002 (.009)

a_{i6}	a_{i7}	a_{i8}	a_{i9}	R^2	DW[a]	RHO[b]
-66.11** (15.64)	.176 (.146)	.563 (.202)	-1.23 (.598)	.80	1.93	.14
-90.0** (25.03)	-.256 (.279)	.496 (.365)	-1.74 (1.12)	.57	1.93	.27
-103.96** (23.72)	1.74**+ (.487)	.84 (.534)	1.14 (1.70)	.72	2.18	.55
-80.90** (16.83)	.079 (.211)	.146 (.220)	.261 (.731)	.79	2.25	.77
-76.84** (18.36)	.437** (.213)	.06 (.197)	-.617 (.607)	.90	1.73	.82
-69.51** (15.49)	.37 (.285)	1.04 (.265)	-1.09 (.843)	.91	1.65	.78
-69.8** (21.75)	-.33 (.23)	.73** (.241)	-1.31 (.804)	.82	2.01	.55
-58.84** (21.18)	.054 (.209)	.392* (.226)	-.55 (.797)	.66	1.93	.50
-46.17** (13.78)	.21* (.123)	-.004 (.158)	.036 (.505)	.67	1.74	.49
-82.8** (16.88)	-.58 (.302)	-1.54 (.429)	-2.57 (1.181)	.66	1.91	.11
-66.30** (16.81)	-1.10** (.334)	-.83** (.394)	-3.66** (1.234)	.82	1.77	.49
-135.48** (15.287)	.137 (.381)	.45 (.493)	8.22** (1.55)	.83	1.92	.23
-44.96** (12.48)	.62**+ (.23)	.057 (.257)	.093 (.825)	.83	1.86	.66
-44.32** (12.44)	.51* (.23)	-.31 (.26)	.90 (.80)	.69	1.77	.49
-41.32* (21.66)	.097 (.287)	.177 (.340)	.472 (1.15)	.67	1.78	.39
-37.67** (18.72)	.089 (.243)	.798** (.310)	-.54 (.982)	.81	1.97	.41

SMSA	a_{i0}	a_{i1}	a_{i2}	a_{i3}	a_{i4}	a_{i5}
64	53.73* (17.35)	-1.64 (10.17)	0 (0)	-.008* (.004)	-.010** (.003)	-.0003 (.001)
65	68.71** (12.85)	-17.94** (6.31)	-.54 (.093)	-.002 (.003)	.00002 (.0004)	.0008 (.002)
66	130.50** (16.26)	-.87 (7.86)	0 (0)	-.003 (.003)	.023** (.009)	.007** (.002)
67	-58.79 (84.37)	-21.63** (6.87)	251.80* (150.34)	.009 (.009)	.001 (.001)	.0009 (.001)
68	207.79 (189.43)	-12.51 (10.31)	-333.75 (546.24)	-.089** (.042)	-.022 (.016)	.0004 (.007)
69	88.26** (18.49)	2.01 (11.35)	0 (0)	.008 (.008)	-.003 (.017)	-.004 (.004)
70	68.87** (18.56)	-35.06* (19.94)	0 (0)	-.005 (.019)	-.001 (.003)	-.003 (.003)
71	18.01 (21.92)	-2.24 (7.54)	-3.0 (25.08)	.0004 (.0008)	.0003** (.0001)	-.0003 (.0006)
72	94.53** (20.38)	18.32* (10.81)	-.33 (48.54)	-.003 (.011)	-.005 (.0076)	-.0003 (.0031)
73	4.25** (1.38)	0 (0)	1.455 (1.33)	-.049 (.092)	-.024 (.071)	.00007 (.0002)
74	109.01** (19.80)	-26.56* (14.93)	9.48 (78.31)	-.025 (.027)	.019 (.014)	.00001 (.0001)
75	72.82** (16.16)	47.57* (24.89)	0 (0)	-.004 (.026)	.001 (.009)	-.0001 (.001)
76	53.78** (16.29)	11.09 (12.76)	0 (0)	.003 (.014)	.002 (.023)	.003 (.001)
77	114.53** (18.58)	-14.67 (29.11)	0 (0)	.044 (.027)	-.045** (.014)	-.0008 (.0014)
78	95.84** (18.21)	-45.29** (14.95)	0 (0)	-.007 (.056)	-.007 (.035)	-.002 (.016)
79	60.71** (14.45)	-9.56 (5.74)	-36.29 (41.88)	-.00006 (.003)	-.003 (.005)	.0001 (.0001)

a_{i6}	a_{i7}	a_{i8}	a_{i9}	R^2	DW[a]	RHO[b]
-47.11** (13.69)	.66 (.41)	.076 (.37)	-.707 (1.137)	.78	1.84	.85
-55.81** (11.26)	.277** (.133)	.147 (.149)	-.085 (.530)	.89	1.97	.54
-129.9** (16.52)	.220* (.133)	.063 (.208)	-.985* (.532)	.79	2.21	-.26
-70.35** (12.31)	.332 (.230)	.555** (.254)	-2.14** (.895)	.89	1.99	.58
-81.89** (22.91)	.676**+ (.262)	-.206 (.411)	.355 (1.18)	.61	1.91	.13
-84.78** (17.55)	.629**+ (.260)	.148 (.284)	.523 (.918)	.85	1.56	.63
-66.60** (20.04)	.521 (.472)	.821* (.438)	-1.00 (1.33)	.80	1.64	.83
-11.69 (11.14)	.427** (.120)	.219 (.150)	-.51 (.437)	.87	1.66	.72
-92.73** (16.43)	.489** (.217)	-.114 (.249)	-.985 (.808)	.85	1.73	.58
0 (0)	.272 (.321)	-.482** (.015)	-1.36** (.280)	.83	1.77	.72
-102.7** (17.96)	.932*+ (.488)	-.147 (.570)	2.10 (1.73)	.75	1.76	.64
-97.84** (21.17)	.323 (.544)	.229 (.488)	.872 (1.57)	.62	2.16	.83
-60.86** (18.50)	.91**+ (.242)	.478* (.293)	1.41 (.945)	.60	1.89	.36
-96.85** (16.61)	-.811 (.540)	-.730 (.467)	-2.60* (1.39)	.79	2.20	.90
-59.60** (12.05)	-.074 (.467)	.49 (.644)	3.69* (1.90)	.74	1.84	.42
-48.55** (14.58)	-.072 (.257)	.13 (.260)	-1.98** (.796)	.73	1.63	.73

SMSA	a_{i0}	a_{i1}	a_{i2}	a_{i3}	a_{i4}	a_{i5}
80	90.40** (18.71)	-30.95** (11.41)	0 (0)	-.0002 (.0004)	.008** (.004)	-.0001 (.00001)
81	102.0** (9.10)	-10.84** (5.32)	.153 (.471)	.007 (.020)	.002 (.003)	.001 (.003)
82	110.4** (18.52)	48.6** (20.11)	0 (0)	.007 (.017)	-.013 (.008)	-.0003 (.002)
83	57.65** (10.37)	-1.51 (11.92)	0 (0)	.045 (.035)	.002 (.010)	-.003* (.001)
84	52.58 (27.21)	-14.48 (22.67)	-54.22 (52.64)	.011 (.022)	.004 (.008)	.001 (.005)
85	66.40** (14.61)	-6.78 (4.58)	0 (0)	-.0005 (.0012)	-.0008 (.0017)	.004 (.0022)
86	86.06** (17.53)	1.72 (7.57)	-.35 (11.25)	-.0007 (.0008)	.0009 (.004)	.00009 (.0001)
87	103.51 (153.91)	4.69 (18.38)	-17.2 (146.08)	.011 (.012)	.008 (.006)	-.001 (.005)
88	76.31** (15.26)	-16.3 (12.88)	80.1** (23.73)	-.004 (.024)	.009* (.004)	.008 (.008)
89	65.39** (18.78)	1.26 (7.52)	0 (0)	-.0001 (.0024)	.0005 (.0021)	-.005* (.0025)
90	95.57** (20.55)	-29.73** (7.78)	0 (0)	-.005 (.0083)	-.002 (.0042)	-.003 (.0017)
91	56.1** (15.34)	-15.5* (8.55)	0 (0)	-.003* (.0015)	-.001 (.0009)	-.0008 (.0006)
92	33.3 (22.92)	-7.14 (6.62)	-2.82 (3.24)	.002 (.0032)	-.0001 (.0003)	-.002 (.002)
93	61.92** (13.83)	4.10 (11.55)	-26.45 (20.69)	-.005 (.012)	.00001 (.00007)	-.002** (.0009)
94	78.77** (17.76)	-24.5** (9.93)	2.40 (19.44)	-.002 (.025)	-.001 (.001)	-.002 (.003)
95	68.22** (16.27)	6.89 (8.72)	-22.19 (16.75)	-.0008 (.0034)	.0004 (.0014)	.002 (.0014)

a_{i6}	a_{i7}	a_{i8}	a_{i9}	R^2	DW[a]	RHO[b]
-91.34** (20.33)	.70**+ (.285)	1.07** (.320)	-.568 (1.04)	.81	2.01	.59
-115.2** (9.01)	.49 (.448)	.81** (.408)	-1.63 (1.24)	.90	2.06	.86
-136.48** (23.04)	-.36 (.53)	-.58 (.67)	-.88 (1.91)	.74	1.90	.60
-64.2** (14.29)	-.14 (.17)	-.13 (.21)	1.88** (.73)	.71	2.09	.55
-79.54** (23.16)	-.09 (.407)	.382 (.371)	.173 (1.120)	.63	2.06	.83
-73.99** (17.09)	.86**+ (.158)	.33 (.20)	1.82** (.627)	.81	2.14	.44
-79.2** (17.09)	.51** (.232)	.07 (.259)	-1.56* (.799)	.87	2.06	.63
-90.98** (20.16)	.27 (.489)	.481 (.545)	-1.57 (1.81)	.67	1.82	.62
-84.91** (20.97)	-.016 (.224)	.34 (.234)	-1.23 (.769)	.75	2.15	.37
-66.2** (23.08)	.15 (.200)	.027 (.269)	1.15 (.980)	.48	1.83	.27
-83.5** (21.13)	.20 (.267)	.88** (.350)	-1.34 (1.06)	.72	2.05	.36
-50.12** (17.33)	.02 (.222)	.40 (.268)	-2.04** (.857)	.82	2.08	.54
-23.5 (21.55)	.49** (.218)	.32 (.260)	-1.14 (.712)	.89	1.86	.57
-77.6** (19.24)	.45** (.225)	.23 (.307)	-1.52* (.866)	.80	2.15	.50
-73.9** (19.00)	.75**+ (.290)	1.03** (.322)	2.35** (1.055)	.68	1.93	.32
-91.34** (18.26)	1.20**+ (.398)	-.40 (.478)	1.82 (1.513)	.76	2.10	.53

SMSA	a_{i0}	a_{i1}	a_{i2}	a_{i3}	a_{i4}	a_{i5}
96	47.66**	-22.23**	-.02	.0007	-.003	-.0001
	(18.79)	(9.83)	(.645)	(.002)	(.006)	(.001)
97	56.10**	9.81	.16	-.002	-.0009	.0005
	(17.04)	(7.38)	(.241)	(.006)	(.002)	(.001)
98	80.60**	-15.04	-63.8	-.12	-.00005	.007
	(20.22)	(30.73)	(103.93)	(.076)	(.0006)	(.0005)
99	77.75**	9.95	0	.000005	.026**	-.001*
	(11.55)	(8.33)	(0)	(.0009)	(.008)	(.0006)

a_{i6}	a_{i7}	a_{i8}	a_{i9}	R^2	DW[a]	RHO[b]
-26.7**	.41	-.56	1.95	.85	2.00	.58
(12.18)	(.342)	(.344)	(1.24)			
-49.5**	.34	-1.19**	..25	.84	1.67	.53
(15.03)	(.317)	(.340)	(1.10)			
-119.07**	1.56*+	.03	-2.91	.76	1.79	.47
(23.92)	(.616)	(.70)	(2.56)			
-83.9**	.283	.656**	-1.51**	.86	1.82	.54
(14.31)	(.186)	(.254)	(.716)			

** Significantly different from zero at the 0.05% level.
* Significantly different from zero at the 0.10% level.
+ Not significantly different from one at the 0.10% level.
a DW is the Durbin-Watson statistic.
b RHO is the first-order serial correlation coefficient.
Standard errors are shown in parentheses.

Chapter 6

METROPOLITAN VARIATIONS IN THE WAGE ADJUSTMENT PROCESS

6.1. Introduction

The purpose of this Chapter is to explain variations in the wage adjustment process among urban labor markets. To accomplish this, the relation between a set of variables and the various parameters of equation (5.8) are examined by means of correlation.

6.2. Spatial Variation in Wages and the Adjustment Process

6.2.1. Wage differentials

The nature of wage differentials in space has been studied extensively by economists and geographers, where efforts have been made to identify the factors which have caused and have served to perpetuate them. However, there is no concensus as to what factors best explain such differentials. For example, Fuchs and Perlman (1960) and Goldfarb and Yezer (1976) suggested that a portion of the wage differential was explained by regional variations in industrial mix. Gallaway (1963) suggested that differing factor proportions, sustained in the long run by barriers to the free interregional flow of factors of production, was the most important variable in explaining wage differentials. Scully (1969) in his study of the North-South wage differentials examined five economic factors: (1) variations in the capital-labor ratio, (2) variations in the human educational capital manifest in production workers, (3) differences in union activity, (4) variations in the percent of non-white production workers and (5) variations in the percent of female production workers. All five of these variables were significant in a statistical sense. He concluded that the net effect of the capital-labor ratio and high proportion of females in the labor force were to create a wage differential unfavorable to the North while the net effect of human capital, proportion of non-white labor force and industry mix were unfavorable to the South. The effects of other factors such as policies and geographical location have also been tested. Segal (1967) suggested that regional wage differentials resulted from interregional variations in the policies of unions and management. Goldfarb and Yezer (1976) found that while white collar spatial wage patterns were positively related to cost-of-living, while race and federal government wage policies have an insignificnat effects on the spatial pattern of blue collar wage. They also found that city size, firm size and commuting distance are insignificant in explaining wage differentials. However, Muth (1971) and Fuchs (1967) have found a very significant positive relationship between city size and wages.

6.2.2. Adjustment Process Variations

Given that these type of factors have been used to explain wage differentials, it seems reasonable to suggest that they may have an influence on the wage adjustment process. Kaun and Spiros (1970), for example, in vitually the only study of its kind examined the relation between the coefficients obtained from a metropolitan wage determination equation and the degree of unionism and level of education. Using regression technique, Kaun and Spiros found that the responsiveness of wages to unemployment were significant and positively related to the level of education in metropolitan areas while negatively related to unionism. The explained variance for each of these variables was .57 and .40 respectively.

A alternative method is proposed here, that of employing simple correlation. There is no a priori reason for specifying a regression equation relating the parameters of equation (5.8) to various endogenous variables, and in fact the danger of multi-collinearity is very likely given a large number of them. By examining simple bivariate correlations, it should be possible to isolate some key variables for each parameter in equation (5.8).

6.3. An Empirical Examination of Variations in the Wage Adjustment Process

The following variables are used in the correlation analysis. The majority of these variables were measured so as to correspond in time with the middle of the wage rate and unemployment series, namely 1970.

1. Labor force characteristics. The following variables were examined for each metropolitan area: (V1) the proportion of women in the labor force (U.S. Census of Population, 1970); (V2) the proportion of women in the labor force who have children under six years of age (U.S. Census of Population, 1970); (V3) the proportion of males aged sixteen to seventeen in the labor force (U.S. Census of Population, 1970); (V4) the proportion of males aged sixty-five and older in the

labor force (U.S. Census of Population, 1970); (V5) the proportion of persons in the labor force with at least four years of high school education (U.S. Census of Population, 1970); (V6) median age of the population in the SMSA (U.S. Census of Population, 1970); (V7) the proportion of males in the labor force who are white (U.S. Census of Population, 1970); (V8) the proportion of females in the labor force who are white (U.S. Census of population, 1970); and (V9) the proportion of males in the labor force (U.S. Census of Population, 1970). During the past two decades, the composition of the labor force has dramatically changed. For example, there are more women, non-whites and elderly workers participating in the labor market today than ever before, and the average educational level is higher than before. These changes in the labor market have tended to shift labor supply and demand pressure and have consequently affected the wage adjustment mechanism. Kaun and Spiro (1970), for example, found that the level of education in the labor market was positively and significantly related to the sensitivity of wage inflation to unemployment. Sex and race discrimination in the labor market would also affect the wage adjustment process. Hyclak and Lynch (1980) and Perry (1972) have also pointed out that demographic changes in the labor force have contributed to rising structural unemployment, due mainly to higher frictional unemployment among women and teens. Variations in the labor force composition should be a major contributor to explaining wage adjustment differentials.

2. (V10) Industrial mix of the labor market. Labor markets differ in their industrial and employment composition. Since that

each of these sectors themselves constitute a labor submarket with varying wage adjustment processes, we should expect this factor to explain spatial variations in this same process. Metropolitan industrial mix was calculated as:

$$IM = \frac{\sum_{k=1}^{N} \left| \frac{e_{kj} - E_{ko}}{e_{tj} - E_{to}} \right|}{2} = \frac{\sum_{k=1}^{N} |d|}{2} \qquad (6.1)$$

where IM, 0< IM <1, is the industrial mix index;

e_{kj} = employment in the kth industry in the jth labor market;

e_{tj} = total employment in the jth labor market;

E_{ko} = employment in the kth industry in the nation;

E_{to} = total employment in the nation; and

d = deviation of the local percentage of employment in the kth industry from that of the nation.

The metropolitan employment data for the 16 industries that comprise the index were obtained from U.S. Census of Population, 1970.

3. (V11) Net migration in the labor market (U.S. Census of Population, 1970). Demographers and economists have viewed migration as an adjustment mechanism. Labors is expected to move from areas of higher unemployment and lower wages to areas of lower unemployment and higher wages. Various non-economic factors, however, generally intervene to constrain this mobility and constitute a major obstacle to labor market adjustment. This is an important contributing factor to structural unemployment.

4. (V12) The proportion of workers who work outside of the county of residence (U.S. Census of Population, 1970). It is assumed

that if workers are willing to travel outside of their residence county to a job location, a fiscal compensation has been taken into account in the wage adjustment process. In other words, workers will earn higher wages in the neighboring counties than the wage rate prevailing in their residence county. Fuchs (1967) suggested that the relation between city size and wage may in part reflect the higher commuting costs connected with working in larger cities. The proportion of the labor force which works outside of the residence county has been used as a proxy of commuting effects in the wage adjustment mechanism.

5. <u>(V13) Degree of unionization in the labor market</u> (Computed from data in <u>U.S. Census of Population, 1970</u> and <u>Statistical Abstract of the U.S., 1970</u>). Following Kaun and Spiro (1970), the degree of unionization is defined as

$$IU = \sum \left(\frac{e_i}{e} * \frac{U_i}{E_i} \right) * \frac{SU}{SE} \qquad (6.2)$$

where IU = degree of unionization;

e_i = employment in the ith major industrial sector;

e = total employment in the area;

SU = number of union members in the state;

SE = total state employment;

U_i = number of union member in the ith industry nationally; and

E_i = total national employment in the ith industry.

There are two schools of thought concerning the effects of unionization on the adjustment of wages. One argument is that unions tend to demand wages in excess of what would be established in competitive labor markets. The other is that unions simply try to "catch up" buying power which has been eaten up by inflation. In such a case, wage demands would tend to reduce the sensitivity of wages to changes in market conditions.

6. Strike acitivity. Three variables have been used to measure strike activity: (V14) work stoppages in the state in which the metropolitan area is located (Statistical Abstract of the U.S., 1970); (V15) total idle man-days during the year in the labor market (Statistical Abstract of the U.S., 1970); and (V16) the number of workers involved in work stoppages in the state in which the metropolitan area is located (Statistical Abstract of the U.S., 1970). These variables are used to measure the effect and strength of unionism.

7. (V17) Total manufacturing establishments in the labor market (U.S. Census of Manufactures, 1973). This variable should reflect the degree of labor market power in the demand, fewer establishments providing fewer opportunities for labor to bargain.

8. (V18) The proportion of the labor force in the electronics industry (computed from data in U.S. Census of Population, 1970). Wage rates should adjust more rapidly in areas with a concentration of rapidly growing industries. In the 1970's, electronics has been one of the fastest growing industries in the economy, and it is therefore used as an indicator of such growth.

9. (V19) Natural population growth in the labor market (U.S. Census of Population, 1970). The rate of population growth is one of the major indicators of labor supply. As such, it clearly should be

related to the process of wage adjustment in the local labor market.

10. (V20) The ratio of new capital expenditures in industry to the labor force in the labor market (computed from data in U.S. Census of Manufactures, 1973). Regional differences in new capital expenditures/labor ratios may be one of the contributors to wage differences in labor markets. Scully (1969), for example, has suggested that capital/labor ratios in the south may have been lower than those found in northern industries, contributing to the tradition of lower wages in the south.

11. (V21) The ratio of employees in the goods sector to employees in the service sector (U.S. Census of Population, 1970). The role of the service sector in the U.S. economy has increased in importance in the last two decades. It has been suggested that white collar wage patterns have kept pace with the cost of living, while blue collar wage patterns have been inconsistent. Wage differences between these sectors might be attributable to the effects of wage setting policies at the national level, the effects of racial discrimination, and firm mobility characteristics (Goldfarb and Yezer, 1976).

12. (V22) Income concentration in the labor market (U.S. Census of Population, 1970). The index of income concentration is a statistical measure of income inequality in the metropolitan area, which ranges from 0.0 to 1.0. As the index approaches 1.0, the inequality in income distribution increases. It is expected that workers in high income inequality labor markets would demand higher wages to cope with increases in the cost of living and to achieve

income parity.

13. (V23) A right-to-work law in the state in which the labor market is located (Statistical Abstract of the U.S., 1970). This is a dummy variable set equal to one when the state has a right-to-work law and equal to zero otherwise. States with right-to-work laws would tend to constrain the adjustment process.

6.3.1. Empirical results

Since bivariate correlations were calculated between each of the above twenty-three variables and the ten parameters from equation (5.8), the wage adjustment model. The ten parameters refer to: (1) the constant term; (2) national unemployment; (3) structural unemployment; (4) regional unemployment (component 1); (5) regional unemployment (component 2); (6) regional unemployment (component 3); (7) wage-spread-effect; (8) normal price inflation; (9) price inflation convergence;, and (10) wage control policy. The results are given in Table 6.1. The results for each parameter will be discussed in turn.

(1). Constant term (a_0). Everything else being equal, the constant term measures the latent inflationary bias in each labor submarkets. As shown in Table 6.1, five variables are significantly correlated with it at the .05 percent level. It is positively related to the proportion of women in the labor force who have childern under six years of age and with income concentration, while being negatively related to the proportion of males in the labor force who are white, the proportion of females in the labor force who are white and the proportion of males in the labor force. The results imply that labor markets with a high proportion of working women with small children or high income inequality tend to have an upward wage inflationary bias, whereas those labor markets with a high proportion of their labor force who are white or male tend to have downward inflationary bias. These results are certainly contrary to expectation.

(2). National unemployment (a_1). None of the variable are significantly correlated with the national unemployment parameter. If we ignore the issue of the statistical significance, the variable with the largest correlation with this parameter is the ratio of new capital expenditures in industry to the size of the labor force. The correlation is positive, suggesting that more capital intensive economies tend to have labor market adjustment processes that conform to a Phillips curve mechanism involving nationally influenced excess demand for labor.

(3). Structural unemployment (a_2). The responsive of wages to the increase of structural unemployment is significant and positively correlated with median age of the labor force at the .05 percent level. This indicates that the wage adjustments are less likely to reflect the degree of structural unemployment in labor markets with older populations. Youthful labor markets conform more to a Phillips adjustment mechanism with respect to structural unemployment.

(4). Regional unemployment component 1 (a_3). As shown in Table 6.1, only one variable is significantly correlated with the first regional component parameter at the .05 percent level. This component appears to be most effective in influencing wage adjustments in those labor markets with fewer women in the labor force. Two other variables with relative high correlation coefficients (though statistically insignificant) are net migration and total manufacturing establishments. These suggest that wages adjust more to regional demand for labor in areas of net immigration, but also in areas with small number of manufacturing establishments.

(5). Regional unemployment component 2 (a_4). There is a strong, significant negative relation between the responsiveness of wages to this form of regional demand and the proportion of males aged sixty-five and older in the labor force. A Phillips curve mechanism tends to operate in more youthful labor markets with respect to this form of regional demand.

(6). Regional unemployment component 3 (a_5). The effectiveness of the third regional form of demand is related significantly to the proportion of elderly, total number of establishments and industry mix. A Phillips curve mechanism operates in markets with a greater proportion of elderly, a greater number of establishments and less diversified industrial mix with respect to this form of regional demand.

(7). Wage-spread-effect (a_6). There is a significnat negative relationship between this parameter and the proportion of the labor force with at least four years of high school education. This suggests that wages adjust more effectively to spread-effects in labor markets with a more educated labor force. It is not unreasonable to assume that educated workers tend to be more aware of the wage earnings of their counterparts outside of their own labor market, and would use such wage comparisons as an argument to demand higher wages.

(8). Normal price inflation ($\hat{a}_7$). The responsiveness of wages to normal price inflation is positively correlated with the proportion of the male labor force aged sixty-five and older and negatively correlated with the median age of the population in the labor market. This suggests that the wages of labor keeps pace with inflation more effectively in those labor markets with a younger work force on average, and in those with a greater proportion of elderly. At first sight these appear to be contradictory, but they do not necessarily conflict if referring to two distinct segments of the labor force with similar wage adjustment mechanisms.

(9). Price convergence ($\hat{a}_8$). Wage adjustment more effectively to the convergence of inflationary expectatons in labor markets that are losing workers (net out-migration). This is intuitively reasonable as those remaining could bargain for higher wages in a situation of declining labor supply. The other variables with relative high correlation coefficients (but statistically insignificant) are work stoppages and the proportion of the labor force in the electronics industry. It suggests that more effective wage adjustment to convergence of inflation expectaton in labor markets where have fewer work stops, workers in stops and fewer employed in electronics industry.

(9). Wage policy. There is no significant relationship between the wage control parameter and any of the variable examined here. If we disregard statistical significance, the responsive of wages to the implementation of wage controls is most correlated with the proportion of males in the labor force. It appears that the wage control policy

Table 6.1.

Correlations for equation (5.8) parameters

	a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9
V1	09	-04	05	-20*	13	13	-16	02	05	06
V2	24*	11	04	-04	-04	05	-01	07	03	01
V3	-13	-09	-07	-02	-05	03	-10	04	-05	08
V4	-03	07	-03	-13	-55*	28*	10	20*	-10	10
V5	06	02	-08	-08	-01	16	-22*	-16	-08	-04
V6	03	02	20*	01	02	05	07	-23*	-07	-01
V7	-23*	-05	-04	01	02	-02	-04	01	01	-12
V8	-23*	-05	-04	01	02	-02	-04	01	-01	-10
V9	-26*	-02	-08	03	04	-04	-02	-01	-02	-15
V10	-05	06	09	12	09	-20*	12	-03	02	03
V11	-02	10	04	16	05	-04	-13	-12	-22*	-08
V12	-01	-11	11	04	06	-13	-10	-03	08	02
V13	-13	-07	-06	-01	09	-02	-02	-04	-08	-01
V14	-10	02	-09	-01	08	-02	07	02	-16	01
V15	-09	03	-08	02	09	-02	06	-02	-12	06
V16	-10	04	-08	03	15	-01	01	-01	-16	01
V17	-01	-07	03	-17	-01	29*	-04	02	-10	06
V18	-10	-01	-12	-12	-05	07	10	05	-15	05
V19	09	12	-08	-01	-02	-01	01	-06	-06	-13
V20	-04	15	-02	03	-03	-03	-01	-04	01	-04
V21	-14	-07	-02	-10	-03	01	07	10	-01	04
V22*	20	06	08	10	03	02	11	-01	04	08

Table 6.1. (continued)

Correlations for equation (5.8) parameters

	a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9
V23	11	09	01	01	-13	02	10	07	07	-01

* Significantly different from zero at the .05 percent level.

Correlation coefficients are multiplied by 100.

was more effective in labor markets that had a higher proportion of male in the labor force. This may be due to the fact that males are more unionized and earn higher wages on average.

6.4. Conclusions

This part of the study employed a correlation analysis to explore the relation between a number of factors and the spatial variation in the wage adjustment process. The results are far from promising in a statistical sense. Of twenty-three variables, only half of them are significantly correlated with any one of the wage determination coefficients. Both the national unemployment and wage control policy parameters are not significantly correlated with any of the the twenty-three. Variations in the wage adjustment process among metropolitan labor markets seem to be attributable, in order of frequency of significant occurrence in the correlation analysis, to: the proportion of elderly in the labor force (3); the median age of the metropolitan population (2); and the proportion of women in the labor force, the proportion of women in the labor force with small children, the proportion of persons with four years of high school in the labor force, the propotion of males and of females in the labor force, industrial mix, net migration, number of manufacturing establishments, and income concentration (1 each).

The correlations are surprisingly low and all but three factors relate to no more than on parameter in equation (5.8). The results are too weak to warrant making generalizations about the wage adjustment process as a spatially varying phenomenon. They could be due to model mis-specification or simply to the fact that such spatial variations are random occurrences. The latter seems very doubtful given the fact that in many cases there clearly were distinct spatial patterns in the maps of the parameters from equation (5.8); see Figure 5.3 through 5.11, for example. It may be that there are not system-wide factors involved, but factors that influence the wage adjustment process in certain regions only, or perhaps at varying levels of intensity between areas. If such were the case, the relationships examined in this Chapter would not uncovered them, This clearly is an important topic for further research.

Chapter 7

CONCLUSIONS

7.1. Summary

The period 1964-78 was characterized by persistently high and, frequently, accelerating rates of inflation in the U.S. economy. During this time a number of events, both national and international in origin, occurred which appear to have altered the decision-making process that underlies the determination of wages. The traditional role of supply-demand imbalances, in particular, appears to have diminished in importance, and may even have become irrelevant in certain sectors of the economy. This period was also noteworthy for the distinct shift in regional economic growth and development that took place in the United States from the northeast and north central parts of the country to the southern and western regions. The impact of this locational shift had caused, in part, a shift in the distribution of unemployment among metropolitan areas. It has also contributed to the narrowing of metropolitan wage differentials. Much of the stimulus for this change came from the spatial distributional effects of federal spending. It seems quite likely, therefore, that both of these major changes in the U.S. economy, the shift in income growth patterns and wage adjustment process, and the shifting pattern of the economic costs of regional development, in the form of unemployment, substantially resulted from federal actions. The traditional regional policy which was mainly based on the Phillips curve relationship appears to be irrelevant in solving today's complex regional economic problems.

This research has developed a modified Phillips curve mechanism to analyze the wage-rate changes for labor markets within the urban system of the United States. The significance of this model is that, although it depends upon the concept of labor market linkages, it does not require these links to be predefined. Instead, the structural interdependence of the system is inferred from the output of the modelling procedure. An economic impulses model has been utilized to accomplish this objective.

When applied to ninety-nine metropolitan areas, using the unemployment rate as a proxy for economic performance, the economic impulses model performs well in explaining fluctuations in local economic activities during the time period 1964-1978. The explained variance was above eighty percent in all but nine cases. It indicated the major importance of national economic forces as opposed to structural and regional forces in predicting local unemployement rates. The results reveal that the intensity and degree of local response to national cyclical impulses varies substantially. They confirm that more diversified metropolitan economies tend to be less vulnerable to national cycles. The results also indicate that for the urban system as a whole, structural unemployment trends vary regionally. A declining structural unemployment trend was found in Sun Belt SMSAs, whereas the reverse was found in the Frost Belt.

Regional forces were the least important factor in influencing local economic performance. However, a relatively distinct spatial pattern tends to suggest the importance of geographical proximity in response to economic impulses after national and structural factors have been taken into account.

The estimation of the wage determination model produced several interesting results. The coefficients for the unemployment variables, national, structural and regional, were in most cases not significantly different from zero even at the .10 percent level, and in many cases had the wrong sign. On the other hand, the wage-spread-effect variable was consistently the most important factor in explaining local wage-rate changes. Price inflation had an effect on wage adjustments in less than half the labor markets. Finally, the wage and price controls of the Nixon Administration proved to be irrelevant in most cases. Wage inflation was as likely to increase as decrease during this period.

The results obtained from the analysis of differentials in the wage adjustment process were not encouraging in a statistical sense. In general, however, demographic characteristics of the labor force tended to stand out as factors capable of explaining some of these variations.

7.2. Policy Implications

The Federal government has increasingly been involved in local labor market planning through its urban and regional policy. The creation of the Economic Development Administration (EDA) in 1965, for example, was to stimulate the development of depressed areas, primarily through the funding of projects which would provide permanent jobs in areas of persistently high unemployment. More recently, the Employment and Training Administration (ETA) has administrated the Comprehensive Employment and Training Act of 1973. CETA provides for a number of closely related manpower and training programs. The intention of these policis is to reduce regional and local unemployment rates. However, the success of these policies is debatable.

It is important for policy makers to be aware that there is a strong national-regional-local interdependency within the space-economy. Without such recognition, any policy that is designed to reduce spatial disparities will likely fail. In this context, there is a need to develop a regionally differentiated business cycle policy. For cyclically sensitive labor markets, that are very responsive to national trends, a policy should address the promotion of long term growth and the creation of the more diversified economic base. For those labor markets whose cyclical behavior conforms to national trends, a regional policy should only be implemented to reduce temporary unemployment problems during an economic downturn. If the cyclical behavior of labor market is insensitive to the national cycle, a regional policy to stimulate long term growth should be undertaken. For those labor markets that have experienced long term structural unemployment problems, a job training program is needed. For those labor markets influenced by regional economic forces, a regional policy should be introduced to provide facilities necessary to attract industry and to improve the investment environment.

The policy implications of the wage-spread-effect are significant. Recognizing the interdependency of regional wages, one could argue that inflationary pressure is generated in those labor markets with low unemployment and high wages, and that this will spill over to labor markets with higher unemployment and lower wages. If this hypothesis is true, then the wage transfer mechanism will generate an inflationary bias in the economic system as a whole and intensify the unemployment problems of the depressed regions. A wage subsidy or income assistance program in depressed areas may relieve some of this pressure from the depressed regions. However, if one could argue that wage inflation spills over from high wage and high unemployment labor markets to low wage and low unemployment ones. This would provide policy-makers with a basis to formulate a policy that would reduce regional unemployment disparities without the expense of inflation.

The national policy of wage controls from 1971 to 1974 had little impact on regional wage adjustments. The ineffectiveness of this income policy mainly resulted from the assumption that wage inflation spreads from high wage highly unionized sectors of the economy to low wage and less unionized ones. By controlling those key unionized sectors of the economy, one would expect the policy to be effective. In practice, however, a relatively low wage but growing sector will also generate inflationary pressure in the national economy. A wage-control policy would be more effective if this aspect of wage-spread-effects has been considered.

7.3. Research Suggestions

It is clear that the subnational wage determination mechanism is a complex process. The model presented in this study does not resolve all the issues associated with it. There is room for further research in this area. Specifically, four research suggestions are presented:

(1). There is a need to identify actual linkages between local economies and labor markets, including those of labor, goods and services and finance, and to assess their role in the wage determination process.

(2). There is a need to develop a dynamic model that can incorporate the changing relationships in this process.

(3). There is a need to investigate how these changing relationships are connected to regional growth and decline.

(4). There is a need to identify which federal and state government policies affect the local wage adjustment process, -- for example, federal monetary policy, foreign trade policy and state fiscal policy.

This is a substantial area for research and clearly one that has significant long term implications for both national and subnational economic development.

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