A spatial examination of Ohio's economic growth

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Abstract

It is widely acknowledged that Ohio's economy involves distinct spatial patterns across different regions of the state. Despite this, data sources have not been available at a small enough spatial scale to allow analysis of patterns of labor market change over time in urban, suburban and outlying areas. This study draws on a new database derived from establishment level (ES202) information on employment and earnings developed by the Ohio Urban Universities Program (UUP). The database allows us to examine growth of employment and earnings over the period from the first quarter of 1989 to the first quarter of 1998 for each zip-code area in the state. A major feature of the changing economic landscape during the last decade has been the movement of firms from urban to suburban and outlying locations. Our examination analyzes these changing patterns of employment, earnings and establishments by classifying the 1,009 Ohio zip-code areas into urban, suburban and outlying areas.

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1 Introduction

Traditional sources of labor market information available from the Bureau of Labor Statistics (BLS) or the Ohio Bureau of Employment Services (OBES) are organized on the basis of counties or metropolitan areas. One of the most important influences on the spatial dimension of economic activity throughout the U.S. during the decade of the 1990's has been the movement of firms from urban to suburban and outlying locations. Analysis of the impact of this movement and its transformation of the economic landscape has been hindered by a lack of labor market information for small geographic areas.

This study draws on a preliminary set of estimates for quarterly employment, nominal payroll and establishments at the zip-code area level. This new source of labor market information was constructed by a network of university researchers coordinated by the Ohio UUP. In cooperation with the Ohio Bureau of Employment Services, establishment level information (ES202 data) on quarterly employment and payroll reported by firms for unemployment insurance purposes has been developed to form a database that contains employment, payroll and the number of establishments in each of Ohio's 1,009 zip code areas. The raw ES202 data information represents an administrative database that is not immediately useful for the type of analysis we provide in this study. The initial ES202 information was statistically transformed to facilitate the analysis we undertake in the sequel. For a detailed report on the statistical methods and transformations employed, see LeSage (1999).

Economic growth of a region can take one of two forms, resulting in very different benefits to the region's tax and economic base. The first type of economic growth involves firms moving into the region from outside, bringing employment to the area in which these firms locate and payroll income to the entire region. This type of development enhances the tax base of the area where the firm locates and the economic base of the entire region is improved by additional income which works its way through the larger region as a result of multiplier effects. A second type of growth involves movement of an existing firm from one area within the region to another area in the region. This creates a decrease in the tax base of the area the firm left and a corresponding increase in the tax base of the area to which the firm moved. There is no net change in the payroll income of the region, or the regional tax base.

A previous study (LeSage and Connin, 1994) using ES202 data compiled a complete inventory of all firms in an office/light industrial park located in

an area neighboring the Toledo urban area from its beginnings in 1978 to 1993. That study reported:

1. Of the 270 firms located in the park, 81 firms represented firms that were previously located in Toledo urban areas.

2. 7,600 of the 14,600 jobs in the park represented employment associated with the firms previously located in the Toledo urban areas.

3. Total payroll in the park was $369 million, of which $232 million represented payroll from firms that relocated from the Toledo urban areas.

4. Less than a dozen firms from the total 270 firms in the industrial park represented firms that moved into the metropolitan region from outside the region.

The public policy implications from area growth associated with movement of existing firms already located in the region to another area in the same region are manifold. One municipal jurisdiction loses tax base while another area in the same region gains tax base. From a regional perspective there is no increase in the income base associated with this shifting of economic activity from one location to another.

In this study we focus on the disparity in employment, payroll and establishment growth that has taken place in urban, suburban and outlying areas in each of the eight metropolitan regions in the state. The patterns we find reflect a trend where the urban areas are growing less rapidly than suburban and outlying areas. In addition, this more rapid growth in the outlying areas has translated to a smaller share of the total regional employment, payroll and establishments in urban areas.

Economists have recently placed great emphasis on the role of technology transfers and knowledge or technological spillovers in formulating recent theories of economic growth (see Romer, 1994, and Grossman and Helpman, 1994 for a review of this literature). These are closely related to the role ascribed to cities by Jacobs (1969) as environments that crowd individuals, occupations, and industries into close proximity thereby facilitating the flow and exchange of ideas from person to person and firm to firm. This rapid and low cost flow stimulates ideas and innovation that lead to economic growth.

The disparity in employment, payroll and establishment growth that we find raises a serious policy question for the urban areas: Will declining employment shares leave employment densities sufficient to produce these

benefits that induce other firms to locate in urban areas? Using a projection of employment for urban, suburban and outlying areas in all eight metropolitan regions to the year 2010, we find that this issue may be of particular concern for the five smaller Ohio metropolitan regions.

Another policy issue that arises from the shifting location of metropolitan employment relates to the difference between the location of workers and jobs, known as spatial mismatch in the literature. Wilson (1996, p. 37) speculates that the loss of blue-collar manufacturing jobs in Chicago to its suburbs is producing the "growing mismatch between the suburban location of employment and minorities' residence in the inner city." Kasarda (1990, p. 251) relates the simultaneous loss of manufacturing and other blue-collar jobs and the smaller increase in information-processing jobs in major cities of the Northeast and upper Midwest during the 1970s and 80s to the structural mismatch between city jobs and the black labor force: "As blue-collar and other less knowledge-intensive jobs dispersed to the suburbs, working-class whites were able to relocate much more easily than blacks."

In looking for a possible spatial mismatch in the Cleveland metropolitan area, Kaplan (1999) uses employment data from the Census Transportation Planning Package and population data (both for 1990) to construct a job-opportunity index for each "labor market" that he centers around each of the 1727 block groups in the metropolitan area. Based on a ratio of jobs to population in the civilian labor force, Kaplan argues that the Cleveland "suburbs do not enjoy an advantage over the city of Cleveland in the availability of overall employment..." although he does find that job opportunities appear more scarce in areas where the black population is high. (Kaplan, 1999, p. 208) Of course, if Clevelanders have been leaving Cleveland at a faster rate than jobs up to the 1990 census, then his job-opportunity index will make Cleveland's job situation look artificially robust. Measures of the relative growth rates in employment and changes in the relative share of employment among urban, suburban, and outlying areas may provide a more accurate picture of the major employment changes occurring within metropolitan regions.

Section 2 of the paper sets forth the methodology used to define urban, suburban and outlying areas within each of the eight metropolitan regions. In Section 3 we present growth rates of employment, payroll and establishments over the period from the first quarter of 1989 to the first quarter of 1998. Calculations were also carried out to determine the shares of the urban, suburban and outlying areas total regional employment, payroll and establishments during the first quarter of 1989 and the first quarter of 1998. Section 4 examines the rate of change in these patterns of growth over time

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to determine if the trends observed over the longer period vary with the business cycle. An examination of growth and decline in individual zip-code areas within each of the urban, suburban and outlying areas defined in this study is undertaken in Section 5. Section 6 carries out a simulation of future employment growth to the year 2010 based on the observed historical trends. Using these results we examine projected shares of urban, suburban and outlying employment for each of the eight Ohio regions. Conclusions can be found in Section 7.

2 Definitions of areas used in the study

Because our interest centers on the growth of employment, earnings and establishments in urban versus suburban and outlying areas we need to define these areas. The definition we used for urban areas relies on the U.S. Postal Service designations of zip codes associated with the eight major cities in Ohio: Akron, Canton, Cincinnati, Cleveland, Columbus, Dayton, Toledo, and Youngstown-Warren. Note that these zip-code areas do not correspond to the municipal borders of the central cities. In many cases they include areas located in unincorporated areas surrounding the city corporation limits. Consider also that many of these unincorporated areas represent locations of new office and industrial park developments that have attracted new firms, employment and payroll. This exerts an upward bias on the rates of growth we report for urban areas. We overcome this problem to some extent by enumerating the number of zip-code areas within each urban area that exhibited growth versus those that were in decline. Note also that we will use the term metropolitan region in our discussion of the eight regions in our analysis, but we do not intend this to mean a formal metropolitan area defined by the Census Bureau. We will use the term metropolitan region to refer to the regions defined by all zip-code areas classified as urban, suburban and outlying centered on the eight major cities in Ohio.

The definition of suburban areas involved using a mapping/GIS program (ARCVIEW) to determine zip-code areas that shared borders with the urban zip-code areas. Geographers refer to these neighboring areas as "first-order contiguous." Outlying areas were defined as zip-code areas that were neighbors to the suburban areas, i.e., have shared borders with the suburban areas. These would represent "second-order contiguous" areas with respect to the urban areas.

There are numerous reasons for relying on these definitions. First, many spatial statistical methods are available to analyze first- and second-order

contiguity relationships. Second, the definitions represent a rule-based approach that can be easily replicated by other researchers using GIS software. Third, an examination of the classification results from using these definitions for various urban areas produced intuitively pleasing results. As an example, in the Toledo metropolitan area the suburban neighbors included all of the major municipalities surrounding Toledo, (Maumee, Oregon, Perrysburg, Rossford, Sylvania). Finally, a map of the urban, suburban and outlying areas based on these definitions seemed intuitively pleasing. By this we mean that it defines regions centered on the eight major Ohio cities that radiate outward to surrounding areas.

Alternative definitions for classifying areas as urban, suburban and outlying might be employed based on population or employment density, market relationships and interactions, transportation connectivity, etc. The classification approach set forth here is based on geographic proximity relationships that may or may not reflect economic connectivity. This is an issue that needs further study, but our purpose here is to examine economic growth from a primarily geographic perspective, making our classification approach appropriate to this task.

Figure 1 shows a map of Ohio with the urban, suburban and outlying areas associated with each of the eight Ohio metropolitan areas. The classification scheme resulted in the following number of zip-code areas associated with each of the eight Ohio metropolitan areas: Akron 46, Canton 38, Cincinnati 76, Cleveland 81, Columbus 57, Dayton 62, Toledo 36, and Youngstown 54. This reflects a total of 450 out of 1,009 zip-code areas in Ohio.

A few points to note regarding construction of our classification scheme for zip-code areas:

1. Akron, Canton and Cleveland contained a small number of zip-code areas that were second-order contiguous to other cities. These were counted as outlying areas in both cities when we carried out our calculations.

2. Akron, Canton and Cleveland exhibited some truncation with respect to second-order neighbors because their close proximity to each other meant that second-order neighbors were inside the Akron, Canton or Cleveland urban area. These second-order contiguous areas were not classified as outlying areas as shown in Figure 1, which might have the effect of producing less outlying areas for the Akron, Canton and Cleveland regions.
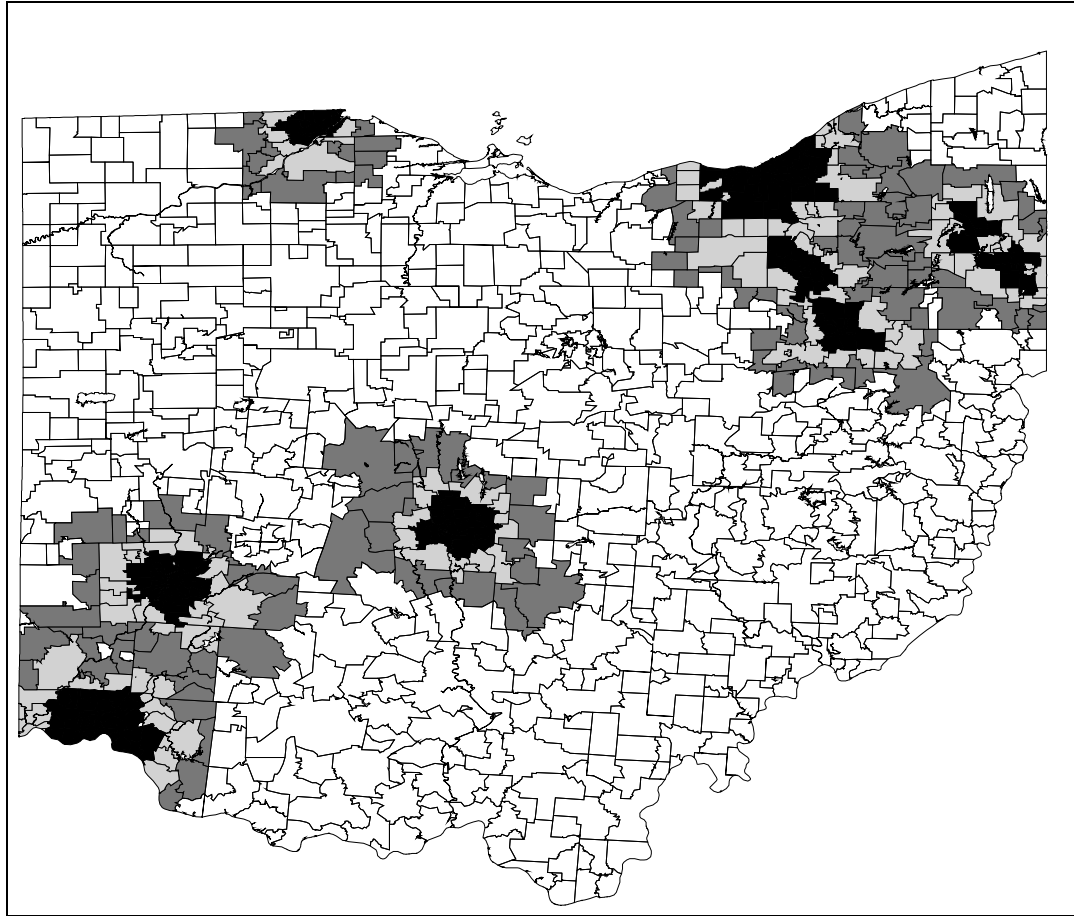
Figure 1: Classification of urban, suburban and outlying areas. Black areas represent urban, light grey are suburban and dark grey are outlying areas. White areas were not included in the study.

3. The Warren and Youngstown urban areas were counted as a single urban area with first- and second-order neighbors determined on the basis of the union of Warren and Youngstown zip-code areas.

4. Some metropolitan areas such as Cincinnati, Toledo and Youngstown-Warren included first- and second-order neighbors that were in Kentucky, Michigan and Pennsylvania respectively. Since our database includes only Ohio information, the calculations regarding economic growth in surrounding areas versus the urban area may not reflect the

entire extent of these differences for these three regions.

3 A comparison of employment, payroll and establishment growth rates

Given these definitions we calculated the growth rates of employment, payroll and establishments for urban, suburban and outlying areas in each of the eight metropolitan regions over the period from 1989Q1 to 1998Q1. An employment growth rate reflects the percentage change in employment over the period and is computed using: log(emp 1998Q1/ emp 1989Q1). A similar formula was used to determine payroll and establishment growth rates. An average growth rate for urban, suburban and outlying employment, payroll and establishments is also presented in the table. These averages reflect the growth rates of total urban, suburban and outlying employment, payroll, and establishments for all eight metropolitan areas, not a simple average of the eight numbers preceding the average in the table. These averages then measure the extent to which total urban, suburban and outlying employment, payroll and establishments were growing in the aggregate of the eight Ohio regions. They represent employment-, payroll- and establishment-weighted averages, so that the growth rates associated with large regions take on relatively more importance in determining the average. Intuitively, this makes sense in that we wish to measure the average growth rate of aggregate urban employment versus average aggregate suburban employment, etc. Comparisons across regions for a given classification (say urban) then indicate whether the individual regions are growing at a faster or slower rate than aggregate urban employment in the state.

The results are shown in Table 1. Interpretation of the figures reported in the table are as follows. For Akron employment growth in the urban area we report 0.077, or a 7.7 percentage growth in employment over the 9 years, 1 quarter (37 quarters) from 1989Q1 to 1998Q1. The table is organized by urban, suburban and outlying areas to facilitate comparison of growth rates in these three different types of geographic areas.

A number of conclusions can be drawn from Table 1. First, in seven of the eight metropolitan areas we see higher growth rates for employment, payroll and establishments in the suburban areas than in the urban areas. (The exception is Canton, and Youngstown-Warren exhibited a slightly lower payroll growth rate in the suburban areas than in the urban areas.) This is not particularly surprising given the widely observed trend of firms moving from urban to suburban areas during the decade of the 1990's. The

average growth rates for employment in the suburban areas was 27.5 percent versus 7.0 percent for the urban areas, a rate of growth four times higher. Payroll growth averaged 61.2 percent for suburban areas compared to 42.4 percent for urban areas and establishments growth averaged 34.6 percent for suburban compared to 21.0 percent for urban areas.

What is perhaps surprising is that the outlying areas exhibited average growth rates for employment, payroll and establishments roughly equal to that of the suburban areas. A public-policy implication of this flows from the fact that most of the growth in outlying areas occurs in unincorporated areas that do not have payroll-tax authority in the state of Ohio. The region as a whole suffers a decrease in payroll-tax base when this type of growth occurs.

A second point from the table is the tremendous variation in growth rates between the different urban areas. For the case of urban employment, the growth rates range from a high of 13.8 percent in Columbus to a low of 1.4 percent in the Toledo urban area. Extreme variation in the observed economic growth is one result that arises throughout this study.

Use of county-wide data glosses over this important point For example, note that recent information from OBES concerning growth in employment reported in Kozlowski (1999) states that Columbus metropolitan area employment grew by 20 percent over the period from 1990 to 1999. From Table 1 we see that the 20 percent overall growth at the metropolitan area level arises from 13.8 percent growth in the urban areas, 47.9 percent growth in suburban and 26.8 percent growth in outlying areas.

Anyone who has worked with growth rates has probably learned that areas with a large base of employment, payroll or establishments will tend to exhibit slower growth rates than areas starting with a smaller base of employment, payroll or establishments. To control for this dimension of economic growth we present the shares of total regional employment, payroll and establishments in each of the three categories in Table 2. These shares were calculated for 1989Q1 and for 1998Q1 to show how the higher growth rates in suburban and outlying areas relative to urban areas have impacted the share of total regional employment, payroll and establishments over time. Again, we calculate average shares by aggregating over all eight regions during 1989Q1 and 1998Q1.

Here we see a relatively consistent pattern reflected in the average shares reported for the two time periods. Urban areas (on average) lost 4.4 percent share of total metropolitan employment in the state with suburban areas gaining 2.4 percent share and outlying areas gaining 2 percent share. A similar pattern emerges for payroll and establishments. For payroll, urban

Table 1: Ohio Urban, Suburban and outlying Growth 1989Q1-1998Q1

Urban areas	Employment Growth Rate 89Q1-98Q1	Payroll Growth Rate 89Q1-98Q1	Establishments Growth Rate 89Q1-98Q1
Akron	0.077	0.337	0.252
Canton	0.097	0.481	0.251
Cincinnati	0.068	0.523	0.220
Cleveland	0.050	0.365	0.191
Columbus	0.138	0.499	0.290
Dayton	0.026	0.335	0.160
Toledo	0.014	0.287	0.134
Youngstown-Warren	0.066	0.506	0.152
average	0.070	0.424	0.210
Suburban neighbors	Employment Growth Rate 89Q1-98Q1	Payroll Growth Rate 89Q1-98Q1	Establishments Growth Rate 89Q1-98Q1
Akron	0.228	0.582	0.306
Canton	0.071	0.253	0.162
Cincinnati	0.399	0.727	0.413
Cleveland	0.201	0.528	0.337
Columbus	0.479	0.952	0.523
Dayton	0.280	0.547	0.284
Toledo	0.246	0.524	0.341
Youngstown-Warren	0.079	0.486	0.253
average	0.275	0.612	0.346
outlying neighbors	Employment Growth Rate 89Q1-98Q1	Payroll Growth Rate 89Q1-98Q1	Establishments Growth Rate 89Q1-98Q1
Akron	0.245	0.628	0.394
Canton	0.239	0.462	0.270
Cincinnati	0.255	0.578	0.258
Cleveland	0.405	0.768	0.483
Columbus	0.268	0.555	0.307
Dayton	0.235	0.542	0.172
Toledo	0.138	0.335	0.164
Youngstown-Warren	0.182	0.509	0.172
average	0.273	0.596	0.313

areas lost 3.8 percent share, suburban areas gained 2.2 percent and outlying areas gained 1.6 percent share; for establishments, urban areas lost 2.9 percent share, suburban areas gained 1.8 percent share and outlying areas

gained 1.0 percent share. (The loss by urban areas and the offsetting gains in suburban and outlying areas do not balance due to rounding.)

Turning attention to the individual regions, Dayton lost the largest share of urban employment at 5.6 percent (the average share loss was 4.4 percent). Columbus was next with a loss of 4.8 percent share and Cincinnati, Cleveland and Toledo all exhibited a 4.6 percent loss. Canton and Youngstown-Warren showed the smallest declines in urban employment shares of 1.0 and 1.5 percent respectively.

Payroll losses in share averaged 3.8 percent, but for individual regions we see Akron with an urban share loss of 6.7 percent share, Columbus with a loss of 5.3 percent, Dayton with a loss of 4.8 percent, Cleveland with a loss of 4.7 percent and Toledo with a loss of 4.2 percent. Again, Youngstown-Warren exhibited the smallest loss in payroll share with only 0.2 percent loss.

A similar examination of establishment shares reveals that Cleveland lost the largest share at 4.5 percent with Toledo second losing 3.7 percent share. In this case, Canton lost the smallest share at 1.1 percent, Dayton the next smallest at 1.5 percent and Youngstown-Warren lost 1.7 percent share.

Summarizing, we see a consistent pattern of more rapid growth rates for employment, payroll and establishments in the suburban and outlying (outlying) areas than in the urban areas for seven of the eight Ohio metropolitan regions. These differences in growth rates translated into a declining share of total regional employment, payroll and establishments located in the urban areas over the period 1989Q1 to 1998Q1.

4   Growth rates over time

In this section we examine growth rates over alternative time periods in an effort to determine if the more rapid growth of suburban and outlying areas relative to urban areas documented in the previous section is changing or accelerating over time.

The rate of decline in urban areas' shares of total employment documented in the previous section suggests an average loss of 4.4 percent share over the time period involving 9 years and 1 quarter used in the calculations. Given that the average share of employment in urban areas was still at 67.6 percent in 1998Q1 representing around two-thirds of total metropolitan employment, a 4.4 percent loss in share over slightly more than 9 years time may suggest that we will see no rapid changes in the economic landscape.

Table 2: Ohio Urban, Suburban and outlying Shares 1989Q1-1998Q1

Urban Areas	Employment share 89Q1	Employment share 98Q1	Payroll share 89Q1	Payroll share 98Q1	Firms share 89Q1	Firms share 89Q1
Akron	0.507	0.468	0.543	0.476	0.441	0.418
Canton	0.630	0.620	0.630	0.663	0.560	0.571
Cincinnati	0.804	0.758	0.811	0.788	0.744	0.717
Cleveland	0.772	0.726	0.795	0.748	0.719	0.674
Columbus	0.778	0.730	0.803	0.750	0.686	0.655
Dayton	0.620	0.564	0.654	0.606	0.545	0.530
Toledo	0.658	0.612	0.665	0.623	0.656	0.619
Youngstown	0.640	0.625	0.666	0.668	0.537	0.520
Average	0.720	0.676	0.743	0.705	0.651	0.622

Suburban neighbors	Employment share 89Q1	Employment share 98Q1	Payroll share 89Q1	Payroll share 98Q1	Firms share 89Q1	Firms share 89Q1
Akron	0.251	0.269	0.227	0.254	0.293	0.293
Canton	0.220	0.211	0.233	0.195	0.256	0.238
Cincinnati	0.114	0.149	0.109	0.130	0.152	0.178
Cleveland	0.127	0.139	0.124	0.137	0.153	0.166
Columbus	0.130	0.172	0.116	0.170	0.171	0.206
Dayton	0.173	0.203	0.165	0.189	0.197	0.217
Toledo	0.240	0.281	0.239	0.283	0.242	0.281
Youngstown	0.193	0.191	0.163	0.160	0.259	0.277
Average	0.157	0.181	0.148	0.170	0.193	0.211

outlying neighbors	Employment share 89Q1	Employment share 98Q1	Payroll share 89Q1	Payroll share 98Q1	Firms share 89Q1	Firms share 89Q1
Akron	0.241	0.263	0.230	0.270	0.266	0.290
Canton	0.150	0.170	0.137	0.142	0.184	0.191
Cincinnati	0.082	0.093	0.080	0.082	0.105	0.105
Cleveland	0.101	0.136	0.081	0.114	0.128	0.160
Columbus	0.092	0.098	0.081	0.080	0.144	0.140
Dayton	0.207	0.232	0.181	0.206	0.258	0.253
Toledo	0.102	0.107	0.096	0.094	0.102	0.099
Youngstown	0.167	0.183	0.171	0.172	0.205	0.202
Average	0.122	0.142	0.108	0.124	0.155	0.165

This type of inference depends to a great extent on whether the higher growth rates for suburban and outlying areas have been accelerating over time. If we find evidence of acceleration in the growth rates, major changes in the economic landscape may take place in a relatively short time frame.

Another motivation for examining the annualized growth rates over alternative time periods is that business cycle conditions such as the 1990-92 recession may account for some of the differences in growth rates documented in the previous section. Calculation of growth rates over different time periods will provide some insight regarding how the urban, suburban and outlying areas are influenced by business cycle activity.

To determine whether economic growth rates are changing over time, annualized growth rates were calculated for the period 1989Q1 to 1993Q1; the period 1993Q1 to 1996Q1; and 1996Q1 to 1998Q1. An annualized rate is determined by dividing the growth rate for the entire period by the number of years in each period. As an example, for the period covering 1989Q1 to 1993Q1 we would divide the growth rate by 4.25 years. A similar conversion was applied to the other two periods. The use of first-quarter to first-quarter time periods avoids possible seasonal variation in employment, payroll, and establishments. A comparison of annualized growth rates over these three time frames should answer the question of whether economic growth in the suburban and outlying areas is changing over time.

The results are presented in Tables 3 and 4. Table 3 presents employment growth rates for the three areas over the three alternative time frames, for each of the eight metropolitan areas.

Average growth rates are presented where the average represents a straight average over the eight numbers associated with each metropolitan region. This provides a measure of central tendency for the three time periods. We see the impact of the 1990-92 recession which produced negative growth rates over the period from 1989Q1 to 1993Q1 in the urban areas for six of the eight metropolitan regions. None of the eight urban areas exhibited growth rates above 1 percent during this recessionary period. In contrast, six of the eight suburban areas had employment growth greater than 1 percent during this period and the average growth rate was 1.52 percent. Similarly, seven of the eight outlying areas exhibited growth rates exceeding 1 percent during this time period and the average growth rate was 1.99 percent.

During the 1993Q1-1996Q1 period of economic recovery we see positive growth rates for employment, but the growth rates in suburban and outlying areas are consistently higher than those for the urban areas. The average growth rate for suburban areas was 4.0 percent, and for outlying areas we find 3.68 percent average growth compared to 1.58 percent for the urban

Table 3: Employment growth rates (annualized) over time

Urban Areas	89Q1-93Q1	93Q1-96Q1	96Q1-98Q1
Akron	0.0027	0.0178	0.0034
Canton	0.0034	0.0155	0.0142
Cincinnati	-0.0001	0.0120	0.0130
Cleveland	-0.0078	0.0154	0.0150
Columbus	0.0055	0.0247	0.0150
Dayton	-0.0095	0.0075	0.0183
Toledo	-0.0115	0.0200	-0.0008
Youngstown-Warren	-0.0033	0.0134	0.0162
Average	-0.0026	0.0158	0.0118
Suburban Areas	89Q1-93Q1	93Q1-96Q1	96Q1-98Q1
Akron	0.0144	0.0312	0.0291
Canton	-0.0127	0.0225	0.0231
Cincinnati	0.0231	0.0670	0.0371
Cleveland	0.0186	0.0326	0.0071
Columbus	0.0471	0.0540	0.0460
Dayton	0.0189	0.0502	0.0164
Toledo	0.0114	0.0396	0.0306
Youngstown-Warren	0.0010	0.0226	0.0005
Average	0.0152	0.0400	0.0237
outlying Areas	89Q1-93Q1	93Q1-96Q1	96Q1-98Q1
Akron	0.0282	0.0295	0.0131
Canton	0.0185	0.0372	0.0175
Cincinnati	0.0226	0.0304	0.0268
Cleveland	0.0408	0.0498	0.0311
Columbus	0.0222	0.0338	0.0284
Dayton	0.0190	0.0384	0.0318
Toledo	-0.0054	0.0335	0.0229
Youngstown-Warren	0.0135	0.0417	-0.0046
Average	0.0199	0.0368	0.0209

areas on average.

During the final period we see some cooling off after the rapid expansion in the 1993Q1-1996Q1 time frame. Here again the urban areas averaged 1.18 percent employment growth while the suburban and outlying areas averaged 2.37 and 2.09 percent, nearly double the growth of the urban areas.

Using the average growth rates we would conclude that the urban areas are adversely impacted by recessions (1989Q1-1993Q1) whereas the suburban and outlying areas employment growth slowed but remained positive.

During the economic recovery (1993Q1-1996Q1) the suburban areas exhibited an employment growth rate more than 2.5 times that of the urban areas and the outlying areas showed an average growth rate that was 2.3 times that of the urban areas. During the final period when growth was steady but slower than the expansion phase of the business cycle (1996Q1-1998Q1) the suburban and outlying areas produced employment growth around twice that of the urban areas. This suggests that recessions produce employment declines in the urban areas, but suburban and outlying areas still managed to grow employment by more than 1 percent per year.

During post-recession recovery, the urban areas added jobs, but the suburban and outlying areas added jobs at more than twice the rate of the urban areas. Finally, during a period of stable economic growth the suburban and outlying areas managed to grow employment around twice that of the urban areas.

Table 4 shows payroll growth rate calculations based on the same three time periods presented in Table 3 for all metropolitan regions and each of the three areas.

Examining the average growth rates we find that the suburban and outlying areas managed to produce higher payroll growth than the urban areas in all three time periods. The disparity between urban, suburban and outlying areas payroll growth is not as large as that for employment growth. We see similar evidence of the recessionary period showing lower payroll growth, the recovery period exhibiting the highest payroll growth and the final period of steady growth somewhere in between.

5   Spatial variation in growth versus decline

As indicated above, a tremendous amount of heterogeneity exists in the rate of economic growth across regions as well as urban versus suburban and outlying areas and within the individual zip-code areas classified as urban, suburban and outlying. To provide an indication of this, we calculated the proportion of zip-code areas in each area classification that exhibited positive growth over the period 1989Q1 to 1998Q1.

These proportions are reported in Table 5, where a higher proportion of areas showing positive growth is indicative of homogeneity within the area classifications. It is also a sign of economic growth versus decline. The table presents the proportions in three columns showing urban, suburban and outlying proportions side-by-side for easy comparison of these three area classifications in each region. The averages reported in the table represent

Table 4: Payroll growth rates (annualized) over time

Urban Areas	89Q1-93Q1	93Q1-96Q1	96Q1-98Q1
Akron	0.0187	0.0556	0.0340
Canton	0.0293	0.0726	0.0538
Cincinnati	0.0445	0.0565	0.0669
Cleveland	0.0129	0.0584	0.0537
Columbus	0.0334	0.0635	0.0669
Dayton	0.0169	0.0497	0.0449
Toledo	0.0016	0.0656	0.0296
Youngstown-Warren	0.0739	0.0420	0.0246
Average	0.0289	0.0580	0.0468
Suburban Areas	89Q1-93Q1	93Q1-96Q1	96Q1-98Q1
Akron	0.0422	0.0706	0.0768
Canton	-0.0001	0.0556	0.0325
Cincinnati	0.0445	0.1197	0.0662
Cleveland	0.0380	0.0820	0.0446
Columbus	0.0923	0.1046	0.0979
Dayton	0.0330	0.0995	0.0368
Toledo	0.0182	0.0956	0.0603
Youngstown-Warren	0.0467	0.0716	0.0243
Average	0.0394	0.0874	0.0549
outlying Areas	89Q1-93Q1	93Q1-96Q1	96Q1-98Q1
Akron	0.0520	0.0828	0.0614
Canton	0.0294	0.0662	0.0541
Cincinnati	0.0436	0.0757	0.0651
Cleveland	0.0732	0.0971	0.0627
Columbus	0.0413	0.0733	0.0628
Dayton	0.0427	0.0927	0.0597
Toledo	0.0280	0.0411	0.0368
Youngstown-Warren	0.0395	0.0896	0.0222
Average	0.0437	0.0773	0.0531

straight averages of the consistent numbers for the eight regions.

From the table we see a pattern where the suburban and outlying areas exhibited positive growth rates in a larger proportion of the zip-codes that make up these areas. For example, Akron employment in the urban area zip-codes contained 71 percent of the zip codes in which positive growth was observed. In contrast, we find 82 percent of the suburban area zip codes exhibiting positive growth and 89 percent of the outlying area zip-codes.

Examining individual regions, we see that in Toledo fewer than half of

the urban zip codes exhibit positive growth whereas all of the suburban area zip codes had positive growth. The Columbus urban area zip-codes showed the largest proportion of positive growth, but even in that region we see all of the suburban areas showing positive growth whereas only 79 percent of the Columbus urban area zip codes managed positive growth.

Table 5: Portion of zip-code areas shown positive growth 1989Q1-1998Q1

	Employment growth		
Region	Urban areas	Suburban areas	outlying areas
Akron	0.71	0.82	0.89
Canton	0.71	0.45	1.00
Cincinnati	0.68	0.79	0.80
Cleveland	0.59	0.84	0.94
Columbus	0.79	1.00	0.88
Dayton	0.69	0.69	0.82
Toledo	0.47	1.00	0.75
Youngstown-Warren	0.69	0.67	0.59
Average	0.66	0.78	0.83
	Payroll growth		
Region	Urban areas	Suburban areas	outlying areas
Akron	0.94	1.00	0.89
Canton	1.00	0.82	1.00
Cincinnati	0.98	0.86	0.93
Cleveland	0.91	1.00	1.00
Columbus	1.00	1.00	0.94
Dayton	0.93	0.81	0.94
Toledo	0.88	1.00	0.92
Youngstown-Warren	0.88	0.95	0.94
Average	0.94	0.93	0.95
	Establishments growth		
Region	Urban areas	Suburban areas	outlying areas
Akron	0.76	1.00	0.94
Canton	0.86	0.73	1.00
Cincinnati	0.81	1.00	1.00
Cleveland	0.83	0.89	1.00
Columbus	0.89	1.00	0.94
Dayton	0.72	0.94	0.88
Toledo	0.76	1.00	0.83
Youngstown-Warren	0.81	0.95	0.88
Average	0.81	0.94	0.94

The situation for nominal payroll growth is one where the broad majority of zip-code areas showed positive growth over the 1989Q1-1998Q1 period used in the calculations. Nonetheless, we still see some evidence that a larger proportion of the suburban and outlying zip-code areas showed positive growth.

Finally, establishment growth follows this pattern as well. Zip codes located in urban areas tended to exhibit a smaller proportion of cases with positive growth than the suburban and outlying zip-code areas.

6   A simulation of future trends

To examine the future impact of the observed historical trends we simulated employment growth for the period 1998Q1 to 2011Q1. Beginning with the employment levels in 1998Q1, we applied annualized growth rates computed for the periods 1993Q1-1996Q1 and 1996Q1-1998Q1 (reported in Table 3). We assumed that the first 6 years from 1998 to 2002 would be periods of rapid growth similar to those experienced during the 1993Q1 to 1996Q1 period reported in Table 3. This seems reasonable since the economy is currently experiencing record low levels of unemployment. For the remaining years from 2003 through 2010 we assumed a more moderate growth rate similar to that experienced from 1996Q1-1998Q1.

The simulation involved applying the annualized growth rates reported in Table 3 for the relatively rapid period of growth from 1993Q1-1996Q1 to the initial levels of employment from 1998Q1 in all three types of areas in all eight metropolitan regions for the years 1998-2002. The slower growth rates from Table 3 presented for the period 1996Q1-1998Q1 were applied for the remaining years of the simulation period.

At the end of the simulation period the employment levels were used to compute the shares of total metropolitan region employment in urban, suburban and outlying areas. Table 6 reports the resulting simulated shares for these three types of areas for all eight Ohio metropolitan areas. In addition, the table reports the initial 1998Q1 level of employment as well as the projected levels of employment for 2011Q1 in all areas and metropolitan regions.

We see a continuation of the trends experienced during the historical period, which is not surprising given the simulation methodology. The point of the simulation is to facilitate policy makers vision regarding the character of the economic landscape in Ohio if present trends influencing the location of firms continue.

Table 6: Simulation of future employment and shares

	Akron employment levels		
Dates	Urban areas	Suburban areas	outlying areas
1998Q1	147339	84868	82867
2011Q1	167730	124740	108070
1989Q1 Shares	0.507	0.251	0.241
1998Q1 Shares	0.468	0.269	0.263
2011Q1 Shares	0.419	0.311	0.270
	Canton employment levels		
Dates	Urban areas	Suburban areas	outlying areas
1998Q1	110033	37421	30157
2011Q1	125261	55002	39329
1989Q1 Shares	0.630	0.220	0.150
1998Q1 Shares	0.620	0.211	0.170
2011Q1 Shares	0.570	0.250	0.179
	Cincinnati employment levels		
Dates	Urban areas	Suburban areas	outlying areas
1998Q1	543188	107106	66735
2011Q1	618363	157425	87032
1989Q1 Shares	0.804	0.114	0.082
1998Q1 Shares	0.758	0.149	0.093
2011Q1 Shares	0.717	0.182	0.101
	Cleveland employment levels		
Dates	Urban areas	Suburban areas	outlying areas
1998Q1	752009	143837	140665
2011Q1	856084	211413	183447
1989Q1 Shares	0.772	0.127	0.101
1998Q1 Shares	0.726	0.139	0.136
2011Q1 Shares	0.684	0.169	0.147

To summarize the simulation results, at the beginning of 2011 three of the eight Ohio metropolitan areas will hold a share of total metropolitan region employment greater than 60%, Cleveland, Columbus and Cincinnati. These are the largest three Ohio metropolitan regions. Also keep in mind that the urban shares of employment for Cincinnati are biased upward by the exclusion of employment growth in suburban and outlying areas in Kentucky due to limitations of our database. Cincinnati's urban share will more likely be around 68% similar to Cleveland and Columbus in 2011.

For the other five metropolitan regions we see the Akron urban area

falling below 50% share and Dayton coming close to a 50% share. Toledo is next in terms of rapid loss of urban share of regional employment, followed closely by Canton and Youngstown. Note also that the urban shares in Toledo and Youngstown suffer from an upward bias due to growth in surrounding areas that lie outside the scope of our Ohio database. It seems likely that the urban shares for these two cities will be less than 50%.

Table 6: (continued) Simulation of future employment and shares

	Columbus employment levels		
Dates	Urban areas	Suburban areas	outlying areas
1998Q1	518677	122264	69866
2011Q1	590460	179705	91115
1989Q1 Shares	0.778	0.130	0.092
1998Q1 Shares	0.730	0.172	0.098
2011Q1 Shares	0.686	0.209	0.106
	Dayton employment levels		
Dates	Urban areas	Suburban areas	outlying areas
1998Q1	256592	92493	105745
2011Q1	292103	135947	137906
1989Q1 Shares	0.628	0.173	0.207
1998Q1 Shares	0.564	0.203	0.232
2011Q1 Shares	0.516	0.240	0.244
	Toledo employment levels		
Dates	Urban areas	Suburban areas	outlying areas
1998Q1	165509	76089	28899
2011Q1	188415	111836	37688
1989Q1 Shares	0.658	0.240	0.102
1998Q1 Shares	0.612	0.281	0.107
2011Q1 Shares	0.558	0.331	0.112
	Youngstown employment levels		
Dates	Urban areas	Suburban areas	outlying areas
1998Q1	149273	45717	43756
2011Q1	169932	67195	57064
1989Q1 Shares	0.640	0.193	0.167
1998Q1 Shares	0.625	0.191	0.142
2011Q1 Shares	0.578	0.228	0.194

That the largest three Ohio cities manage to maintain substantially larger shares of their regional employment than the smaller cities may relate to the role of technology transfers and knowledge spillovers (Romer, 1994;

Grossman and Helpman, 1994). The largest three Ohio cities may still have employment density levels in the urban areas sufficient to provide technology transfer and knowledge spillovers. This makes location in the urban areas attractive to firms. On the other hand, the smaller Ohio metropolitan regions may have urban areas that have lost the required employment density needed to produce these spillovers and induce firms to locate in their urban core areas. We speculate that there may be a "tipping point" where employment density falls below critical levels necessary to provide the economic benefits to firms that have traditionally been attributed to location in urban areas. Future work might examine how changes in employment density impact economic growth over time.

7   Conclusion

This examination of Ohio's economic growth demonstrates that the spatial scale at which we analyze these patterns may affect the inferences drawn. Public policies regarding land-use, zoning and economic development issues would be better informed by the type of analysis carried out here. Focusing on a smaller spatial unit of analysis provides a much richer picture of forces at work to transform the economic landscape of Ohio.

Policy makers may have been hindered in the past by a lack of data availability for small spatial units, but the database used in the analysis presented here developed by the Ohio UUP ES202 network should overcome some of these difficulties for Ohio policy makers. Spletzer (2000) indicates that the Bureau of Labor Statistics will soon begin releasing ES202 information nationwide. In addition to this data source, the U.S. Census Bureau will begin releasing annual updates for small areas in 2004.

Our analysis shows a clear trend toward lower growth rates in urban areas than suburban and outlying areas for seven of the eight Ohio metropolitan regions. We acknowledge some limitations in our methodology stemming from the fact that the database is limited to Ohio. This precludes analysis of suburban and outlying areas neighboring on Cincinnati, Toledo and the Youngstown-Warren regions. Nonetheless, during the economic recession of 1990-92 urban areas exhibited lower growth in employment, payroll and establishments than neighboring suburban and outlying areas. Average growth of employment for the urban areas during this period was negative, whereas both suburban and outlying areas managed employment growth rates above 1 percent.

During the economic recovery period from 1993-96 growth in the subur-

ban and outlying areas exceeded that in urban areas. This recovery period produced the largest gap between employment and payroll growth in urban versus suburban and outlying areas. Suburban areas expanded employment at a rate more than 2.5 times that of the urban areas and outlying areas grew employment by more than 2 times that of urban areas. Finally, during a steady growth period from 1996-98Q1, we find the same pattern, with suburban and outlying areas averaging growth rates around twice that of the urban areas.

Over the entire period of our study covering 1989Q1-1998Q1, urban areas in Ohio lost 4.4 percent of their share of total metropolitan region employment. This declining share of the regional economic base in Ohio's eight major urban areas should have important policy implications. Our analysis shows no reason to believe that the trends pointed out here will be reversed anytime soon. One of the conclusions from our analysis is that periods of rapid economic growth are likely to accerbate the trend of decline in urban areas share of the regional economic base.

A simulation of these observed trends into the future suggests that all but the largest three Ohio metropolitan regions (Cincinnati, Cleveland and Columbus) will approach a 50 percent share of the total regional employment in their urban areas by 2010. The largest three Ohio cities appear to be approaching a 68 percent share of total regional employment located in their urban areas by 2010. Economists have pointed to technology transfer and knowledge spillovers that take place in urban areas where a sufficient employment density exists as a major factor behind the growth of cities (see Glaeser et al., 1992). We speculate that falling urban shares of total regional employment observed for the period from 1989Q1 to 1998Q1 in the five smaller Ohio metropolitan regions may rule out these benefits to firms from locating in those urban areas.

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