FEDERAL RESERVE BANK OF PHILADELPHIA

Ten Independence Mall
Philadelphia, Pennsylvania 19106-1574
(215) 574-6428, www.phil.frb.org

Working Papers

Research Department

WORKING PAPER NO. 99-10

POSTWAR TRENDS IN METROPOLITAN EMPLOYMENT GROWTH: DECENTRALIZATION AND DECONCENTRATION

Gerald Carlino
Federal Reserve Bank of Philadelphia
and
The Wharton School, University of Pennsylvania

Satyajit Chatterjee
Federal Reserve Bank of Philadelphia

August 1999

WORKING PAPER NO. 99-10
POSTWAR TRENDS IN METROPOLITAN EMPLOYMENT GROWTH: DECENTRALIZATION AND DECONCENTRATION

by

Gerald Carlino
Federal Reserve Bank of Philadelphia
and
The Wharton School, University of Pennsylvania

and

Satyajit Chatterjee

Federal Reserve Bank of Philadelphia

August 1999

We thank Ted Crone and Rick Lang for comments and Mike McLaughlin for excellent research assistance. The opinions expressed in this paper are solely those of the authors and do

not necessarily represent those of the Federal Reserve Bank of Philadelphia, the Federal Reserve System, or the University of Pennsylvania.

ABSTRACT

A key finding to emerge from this study is that the widely studied suburbanization or decentralization of employment and population is only part of the story of postwar urban evolution. Another important part of the story is a postwar trend of relatively faster growth of jobs and people in the smaller and less-dense MSAs (deconcentration). We find that postwar growth in employment (and to a lesser extent population) has favored metropolitan areas with smaller levels of employment (population) as well as metropolitan areas with lower levels of employment (population) density. These trends are shared by major regions of the country and by manufacturing and non-manufacturing employment. The fact that employment growth has favored MSAs with smaller levels of employment (or lower levels of employment density) indicates that economic processes favoring convergent (as opposed to parallel) metropolitan growth played an important role in the postwar era.

INTRODUCTION

Mills and Hamilton (1994) suggest that the "two most important measures of an urban area are its total population and its total land area." Density, therefore, seems to be a useful summary of these features. The state of Nebraska and the San Francisco metropolitan area have approximately the same number of people residing in them. What distinguishes them is that Nebraska has 20 people per square mile while the San Francisco metro area has almost 1600. To date, size has been better studied than density. And, the vast bulk of research devoted to urban evolution has focused on the evolution of the size distribution of population across cities. The almost exclusive focus on population size is puzzling because theory suggests that the benefits of growth rise with a metropolitan area's *employment* while the cost of accommodating growth should rise with a metropolitan area's population and employment density.

The purpose of this paper is to document postwar facts on the evolution of spatial distribution of employment and population using both density and size measures. We find that postwar growth in employment has favored metropolitan statistical areas (MSAs) with smaller levels of employment as well as metropolitan areas with lower levels of employment density. These trends for total employment are shared by manufacturing and non-manufacturing employment as well as by major regions of the country. The tendency for employment to grow relatively faster in MSAs with lower levels of employment and/or lower levels of employment density is collectively referred to as *deconcentration of employment*.

We also find evidence of population deconcentration (defined analogously to employment deconcentration) but it is not as strong as that for employment. While population

growth has favored the less densely populated MSAs, the trend is not as marked as that for employment. And, population growth does not appear to be systematically related to population size, indicating that MSAs with different population sizes (as opposed to different population densities) have growth at roughly the same rates (often referred to as "parallel growth").

The fact that employment deconcentration is more marked than population deconcentration is an important finding because it directs attention to economic processes that tend to get ignored in studies of urban evolution. As noted earlier, most studies on US urban evolution focus on metropolitan population and so tend to find evidence for parallel growth (see Ehrlich and Gyourko (forthcoming) and Black and Henderson (1997 and 1999)).[1] One consequence of these repeated findings of parallel metropolitan population growth is that the modeling of urban evolution has tended to gravitate toward steady-state models.[2] However, the fact that employment growth has favored MSAs with smaller levels of employment (or lower levels of employment density) suggests that economic processes favoring *convergent* (as opposed to parallel) metropolitan growth played an important role in the postwar era. Thus, the view that U.S. urban evolution has settled down to some sort of a steady state may be unwarranted.

This deconcentration has reinforced the decline in the spatial concentration first owing to the movement of people and jobs from metropolitan central cities to suburbs (decentralization).

---

[1] Also, Eaton and Eckstein (1997) find evidence of parallel growth of population for urban areas in France and Japan.

[2] For instance, Black and Henderson (1997 and 1999) explore models of urban evolution with deterministic and stochastic steady-state growth, respectively. Eaton and Eckstein (1997) also study a model of steady-state growth. These models predict parallel growth in population and employment.

An interesting question arises: how much of the overall decline in spatial concentration is due to deconcentration and how much of it is due to decentralization? We use county level data to investigate this issue. Interestingly, the overall decline in spatial inequality is accounted for by both of these forces. This is true for employment regardless of whether counties are ranked by employment size or employment density, and it is true for population when counties are ranked by population density. The only exception occurs if counties are ranked by population size; in this case, the decline in overall spatial inequality is almost entirely due to the decentralization of population. Our density findings suggest, however, that the postwar deconcentration of people and jobs was at least as important in contributing to the overall decline in spatial inequality as was the more widely recognized decentralization trend.

Thus, a key finding to emerge from our examination of county-level trends is that the widely studied decentralization of employment and population is only part of the story of postwar urban evolution. Our density findings suggest that an important, and not so well studied, part of the story is a postwar trend of relatively faster growth of jobs and people in the smaller and less-dense MSAs, i.e., deconcentration.

DATA

We use County Business Patterns (CBP) data for the years 1951, 1959, 1969, 1979, 1989, and 1996. The data consist of full- and part-time employees covered by the Federal Insurance Contributions Act (FICA).[3] Our data set consists of 653 metropolitan counties in the

[3] County Business Patterns data reflect employees on the payrolls of covered firms during the first quarter of the year. With the exception of 1951 and 1996, the first quarter for all other years in our sample occurred about one year before business-cycle peaks. The first quarter of 1951 occurred two years before a business-cycle peak. At this writing, the expansionary phase

United States.[4] For each of the six years, we constructed a common set of MSAs by combining counties according to the 1983 classification of metropolitan counties. We chose the 1983 classification of counties as metro or non-metro for the following reason. Our intent is to use employment and population density as an indicator of metropolitan congestion levels, which requires that we measure metropolitan land area as the area of the region around a central city in which people may live and find it practical to commute into the city. Congestion levels would rise as this region gains employment and population. Unfortunately, there is no direct measure of the area of such a region for each MSA.[5] Given this, one possibility is to adopt the classification of metro counties from the end of the sample period and assume that it was practical to live in those counties and commute to the central city in 1951 as well. However, this may overstate the true metropolitan land area for the early postwar years. As a compromise, we chose the metro classification from 1983 in the belief that this would give a reasonably accurate measure of metro land area pertinent for assessing congestion levels without serious distortion of the true

---

of the business cycle that began in the second quarter of 1991 has not yet reached its peak. Nonetheless, five of the six periods between 1951 and 1994 occurred at about roughly the same phase of business-cycle expansions, and all six periods occurred during an expansionary phase of the cycle. Generally, employees of establishments exempt from FICA, such as most government employees, self-employed persons, and railroad employees, are excluded from County Business Patterns.

[4]Data on variables other than employment (population and land area of counties) were taken from the City and County Data Book. Although counties represent a finer level of geographical detail, we chose metropolitan statistical areas (MSAs) as the geographical unit for our analysis since MSA boundaries are based on local labor markets definitions. An MSA typically consists of a central city of at least 50,000 people, as well as any contiguous counties that are metropolitan in character, as determined by the percentage of its nonagricultural labor force and by the amount of commuting between the counties and the central city.

[5] Reported measures of MSA land area are "activity-based." A county close to a central city will not be classified as metropolitan until it becomes sufficiently urban in character. In contrast,

metro land area for the early years.[6] This procedure gave us a sample consisting of employment and other data for 297 MSAs.

METROPOLITAN DENSITY AND URBAN EVOLUTION

We use our sample to document the disparity in employment densities across U.S. metropolitan areas and how these disparities have evolved during the postwar period. Figures 1a – 1c report employment density by deciles for selected periods *ranked by 1951 MSA employment density.*[7] The first nine groups have 30 MSAs each and the final group has 27. Figure 1a depicts the decile distribution for total MSA employment. The 30 densest MSAs in 1951 accounted for 54 percent of total metropolitan employment but only 34 percent in 1996, while the collective employment share of the third through the tenth deciles rose from 36 percent to 56 percent. Figure 1b shows the density distribution for manufacturing employment, while Figure 1c gives the distribution for non-manufacturing employment. The 30 densest MSAs in 1951 accounted for 54 percent of total metropolitan manufacturing employment in 1951 but only 31 percent in 1996, while the collective employment share of the second through the tenth deciles rose from 46 percent to 69 percent. A similar redistribution of non-manufacturing employment from the initially most dense MSA to the initially less dense has occurred during the postwar period (Figure 1c). Finally, Figure 1d shows the density distribution for total metropolitan population. The 30 densest MSAs in 1950 accounted for 47

---

a measure of MSA land area based on distance from central city would always include such a county. This latter concept of MSA land area is the relevant one for assessing congestion levels.

[6] The choice of 1983 classification of metro counties has the additional advantage that our results can be compared to those in Ehrlich and Gyourko (forthcoming) who also adopt the same classification.

percent of total metropolitan population in that year, but by 1990 their share fell to 35 percent. Thus, both employment and population have deconcentrated during the postwar period.

Figure 2 shows average annual growth rates of deciles ranked by 1951 density for total employment, manufacturing employment, non-manufacturing employment, and population. As Figure 2 makes clear, there is a strong inverse relationship between employment growth and initial employment density. An inverse relationship exits between average annual population growth and initial population density, but it is much less pronounced than the inverse relationship found for employment. The initially most dense MSAs have grown less rapidly than the less dense ones, leading to a more equal spatial distribution of population and employment in the postwar period. Put differently, these findings are suggestive of a convergent growth process for population and employment during the postwar period.

One concern is that some MSAs that are in the 1st decile in 1951 grew slowly enough during the postwar period to drop out of the top decile and were replaced by other fast-going MSAs. Thus, employment and population shares for the 30 densest MSAs in *1996* may be much closer to the shares accounted for by the 30 densest MSAs in *1951*. Figures 3a – 3c show the employment shares allowing the MSAs in each grouping to change groupings from year-to-year.[8] Figure 3a shows that the 30 densest MSAs in 1951 accounted for 54 percent of total metropolitan employment in that year. The share accounted for by the 30 densest MSAs in 1996 fell to 40 percent in 1996, but the share drops to 34 percent if the 1996 decile

[7] For ease of exposition, the graphs present data for only three of our six periods: 1951 (the initial period), 1969, and 1996 (the last period).

[8] The 1951 ranking remains the same as before, but the rankings for 1959, 1969, 1979, 1989, and 1996 are ordered according to MSA densities in each of these years.

consists of the 30 densest MSAs in 1951. Thus, the general tendency of deconcentration of total employment found for initial 1951 density rankings reappears, although somewhat truncated, when the MSAs in each of the deciles are reordered according to the year being graphed. Figure 3b shows how the density shares of manufacturing employment changed over time, and Figure 3c shows the density share for non-manufacturing employment, when the MSAs in each of the deciles are reordered according to the year being graphed. The general pattern of deconcentration is found whether deciles are defined in terms of initial 1951 MSA density distribution, or the deciles at each point in time consist of MSA density distributions for the year being examined. Finally, Figure 3d shows that the finding of population deconcentration does not depend on the way the deciles are defined.

Figure 4 shows average annual growth rates for total employment, manufacturing employment, non-manufacturing employment, and population when MSAs are allowed to change deciles from year-to-year. As before, Figure 4 shows an inverse relationship between total employment growth and employment density. Figure 4 shows a less clear relationship between MSA population density and population growth than was found when the MSAs were placed in deciles according to their 1951 densities. While average growth of MSAs in the first decile tended to be below average growth of the MSAs in the 7^{th}, 9^{th} , and 10^{th} deciles, MSAs in the 5^{th} and 6^{th} deciles had the slowest average annual growth rates of population during the postwar period. Nonetheless, the bulk of the data suggest that the densest MSAs have grown less rapidly than the less dense ones during the postwar period, leading to a more equal spatial distribution of people and jobs.

Figures 5a – 5d show the Lorenz curves and the associated Gini coefficients of inequality for each of the six years for total employment, manufacturing employment, non-manufacturing employment, and population. In each of these figures, we ranked MSAs by their density (employment density, manufacturing employment density, etc.) in each of the years and then plotted the cumulative share of the relevant variable (employment share, manufacturing employment share etc.) against cumulative share of MSA land area.[9] In each case we find that over time the Lorenz curves have moved closer to the diagonal line and the Gini coefficients have fallen. Thus MSA employment and population have become more uniformly dense over the postwar era.

METROPOLITAN SIZE AND URBAN EVOLUTION

While the foregoing analysis was in terms of the density distribution of people and jobs, most previous studies have looked at the size distributions. Figures 6a – 6c report the size distribution of employment by deciles for selected periods *ranked by 1951 MSA employment size*. Figure 6a depicts the size distribution for total MSA employment. The 30 largest MSAs in 1951 accounted for 58 percent of total metropolitan employment in 1951 but only 44 percent in 1996, while the collective employment share of the third through the tenth deciles rose from 26 percent to 39 percent. Figure 6b shows the size distribution for manufacturing employment, while Figure 6c gives the size distribution for non-manufacturing employment. The 30 largest MSAs in 1951 accounted for 60 percent of total metropolitan manufacturing employment in

[9] Thus, for instance, if each MSA were equally dense in terms of employment, the Lorenz curve in 5a would coincide with the diagonal. Of course, in reality employment density is not the same across MSAs and thus leads to Lorenz curves that are bowed out above the diagonal line. The

1951 but only 40 percent in 1996, while the collective employment share of the second through the tenth deciles rose from 40 percent to 60 percent. As Figure 6c shows, a similar redistribution of non-manufacturing employment from the initially largest MSA to the initially smallest MSA has occurred during the postwar period. Finally, Figure 6d shows the size distribution for total metropolitan population. The 30 largest MSAs in 1950 accounted for 52 percent of total metropolitan population in 1950, but by 1990 their share fell to 43 percent. Thus, whether we look at initial density or initial size, the spatial distribution of population and employment has become more evenly dispersed during the postwar period.

Figure 7 shows average annual growth rates of deciles ranked by 1951 size for total employment, manufacturing employment, non-manufacturing employment, and population. As Figure 7 makes clear, there is an inverse relationship between growth during the period 1951-96 and initial MSA size. The inverse relationship is strongest for the employment categories and muted for population.

Figures 8a-8c show the size distribution for total, manufacturing, and non-manufacturing employment, and Figure 8d gives the size distribution for population, allowing the MSAs to change deciles from year-to-year. These figures also show the general tendency of employment displayed in all of the previous figures. However, there is much less evidence for dispersal of population. The 30 densest MSAs in 1950 accounted for a little more than 50 percent of total metropolitan population in 1950, while the share of the 30 densest MSAs in 1990 accounted for just under 50 percent of total metropolitan population in 1990.

Gini coefficient is an index of degree to which the Lorenz curve is bowed out, the index being zero if the Lorenz curve coincides with the diagonal.

Figure 9 shows average annual growth rates for total employment, manufacturing employment, non-manufacturing employment, and population when MSAs are allowed to change deciles from year-to-year. For total and non-manufacturing employment, growth is slowest for the 30 largest MSAs and fastest for MSAs in eight through 10 deciles. For manufacturing employment, postwar growth was strongest for MSAs in the fifth through seventh deciles and slowest for MSAs in the first decile. For population, growth was fairly uniform across deciles, except for the smallest decile, which displayed slightly faster growth.

We conclude this section by presenting the Lorenz curves and associated Gini coefficients of inequality for each of the six years. Figures 10a through 10d are similar to the Lorenz curves reported in Figures 5a through 5d except that they rank MSAs in each year by size rather than density. Lorenz curves for employment (total, manufacturing and non-manufacturing) have moved closer to the 45 degree line over time (and the associated Gini coefficients have fallen), but the curve for population has remained essentially unchanged.

This finding of mostly uniform population growth during the postwar period is broadly consistent with "parallel growth" for U.S. metropolitan areas reported by Ehrlich and Gyourko (forthcoming) and Black and Henderson (1999). However, our finding of parallel growth of population across MSA size distributions during the postwar period is contingent both upon using population *size* and allowing MSAs to change deciles from period-to-period. Thus, the bulk of the population findings support the convergent growth view as well, although the evidence is not as clear as that for employment.

DECONCENTRATION IN RELATION TO DECENTRALIZATION

It is well known that during the postwar period people and jobs have moved away from central cities to surrounding areas.[10] Thus, the deconcentration of employment and population documented in the previous two sections has occurred in conjunction with *decentralization* of employment and population *within* metropolitan areas. In this section, we approach employment and population trends at the level of counties that comprise metropolitan areas. This permits us to study deconcentration and decentralization in an integrated fashion and to judge the relative importance of these two trends for postwar U.S. urban evolution.

To measure the contribution of decentralization and deconcentration to changes in overall spatial inequality, we use an inequality index suggested by Theil (1967). Unlike the Gini coefficient, Theil's index has the property that the contribution of sub-groups to total inequality (or the contribution of sub-groups to the change in total inequality) can be unambiguously determined (Shorrocks (1980)). As before, we first present our findings with respect to density and then with respect to size.

Decentralization, Deconcentration, and Density

In this section the geographical unit of observation is each square-mile of metropolitan land area. Let N be the total number of square miles of metropolitan land area, let n be the mean metropolitan employment density, and let e_i be the level of employment on the ith square mile of metropolitan land. Then, Theil's index of inequality in employment density is:

$$I_E^d = \frac{1}{N}\sum_{i=1}^{N} \log\left(\frac{n}{e_i}\right) \qquad (1.1)$$

Since we have observations only at the county level, we assume that county employment is uniformly distributed over county land area. Thus, (1.1) reduces to:

$$I_E^d = \frac{1}{N}\left\{\sum_{c=1}^{C} N_c \log\left(\frac{n}{e_c}\right)\right\} \tag{1.2}$$

where C is the number of metropolitan counties, N_c is the number of square miles in county c, and e_c is the employment density of county c. Further, if we group counties according to the MSA they belong to, then it can be shown that:

$$I_E^d = \sum_{m=1}^{m} \frac{N_m}{N}\left\{\sum^{C_m} \frac{N_{c,m}}{N_m} \log \frac{n_m}{p_{c,m}}\right\} + \sum_{i=1}^{m} \frac{N_m}{N} \log\left(\frac{n}{n_m}\right) \tag{1.3}$$

where C_m is the number of counties in metropolitan area m, $N_{c,m}$ is the number of square-miles in county c of metropolitan area m, n_m is the mean employment density of metropolitan area m, and $p_{c,m}$ is the employment density of county c in metropolitan area m. Thus, if we define W_E^d (m) as the Theil index measuring inequality within metropolitan area m and B_E^d as the Theil index measuring inequality between metropolitan areas, then overall inequality can be written as:

$$I_E^d = \sum_m \frac{N_m}{N} W_E^d(m) + B_E^d \tag{1.4}$$

Analogous expressions hold for manufacturing and non-manufacturing employment and for population.

As Table 1 shows, the total inequality among MSAs for total employment density fell from about 1.6 in 1951 to about 1 in 1996, a 39 percent decline in overall inequality. The total inequality index for manufacturing employment density fell 49 percent between 1951 and 1996,

[10] See Mieszkowski and Mills (1993) and references therein.

while the total inequality index for non-manufacturing employment density declined by one-third. Table 1 shows that the total inequality index for population density fell 30 percent between 1950 and 1990.

The change in the inequality index *within* MSAs is a measure of decentralization of employment. We define decentralization of employment as the movement of people and jobs from the MSA's central city county to its adjacent metropolitan counties.[11] For total employment density, the index for inequality within MSAs fell from 0.52 in 1951 to 0.35 in 1996, a 33 percent decline. The index for inequality within MSAs fell 47 percent for manufacturing employment density, while the index fell 34 percent for non-manufacturing employment density. The index for inequality within MSAs fell 25 percent for population density between 1950 and 1990.

Decentralization of both people and jobs is a long-run and widely documented pattern in the United States. But the Lorenz curves show that a more general pattern of deconcentration of employment and population among MSAs is also taking place. For total employment density, the index for inequality *between* MSAs, reflecting deconcentration, fell from 1.05 in 1951 to 0.61 in 1996, a decline of almost 42 percent. The index for inequality between MSAs fell 49 percent for manufacturing employment density, while the between index

[11]Decentralization in our analysis is different from suburbanization. Suburbanization occurs when people and jobs move from the MSA's *central city* to its adjacent suburbs. Our measure of decentralization understates suburbanization since county-level data are used in the analysis. Most counties that contain the central city of an MSA also contain close-in suburbs. This understatement is of little concern, since deconcentration, and not suburbanization, is the main focus of this article.

fell by one-third for non-manufacturing employment density. The index for inequality between MSAs fell 29 percent for population density between 1950 and 1990.[12]

Decentralization, Deconcentration, and Size

The Theil index of inequality of county employment is:

$$I_E^s = \frac{1}{C}\sum_{c=1}^{C} \log\left(\frac{r}{e_c}\right), \tag{1.5}$$

where e_c is employment in county c and r is the mean county employment. If we group counties by metropolitan areas, overall inequality of county employment can be expressed as:

$$I_E^s = \sum_m \frac{C_m}{C} W_E^s(m) + B_E^s \tag{1.6}$$

In this expression, W_E^s denotes inequality in county employment within MSA m and is given by :

$$W_E^s(m) = \tfrac{1}{C_m}\sum_{c=1}^{C_m} \log\frac{r_m}{e_{c,m}} \tag{1.7}$$

where $e_{c,m}$ is employment in county c of metropolitan area m and r_m is the mean county employment in metropolitan area m. The second term in the rhs of (1.6), namely B_E^s denotes between MSA inequality:

$$B_E^s = \frac{1}{C}\sum_{i=1}^{m} C_m \log\left(\frac{r}{r_m}\right) \tag{1.8}$$

[12]The Theil index gauges inequality in density and size among MSAs shown in the Lorenz diagrams and summarizes it in a single number. Lower values of the index are associated with less inequality. Unlike the Gini coefficient, the Theil index does not have a simple interpretation in terms of the Lorenz diagram.

Table 2 reports Theil indices based on MSA size. The Theil indices based on MSA size are in broad agreement with those based on MSA density. The indices based on density and those based on size indicate that a substantial reduction in inequality has occurred in the postwar period. One difference is the somewhat larger decline in the *within* indices when they are based on MSA size as opposed to MSA density. Similarly, there is a smaller decline in the *between* indices when they are based on MSA size as opposed to MSA density. Nonetheless, the indices for density and the indices for size are in agreement that both population and employment have become less spatially concentrated during the postwar period.

REGIONAL TRENDS

Another well documented postwar trend is the frostbelt-to-sunbelt "movement" of people and jobs. Since the sunbelt region also contains a disproportionately large share of the initially least dense MSAs, this could result in a spurious negative correlation between subsequent growth and initial density. We will show that even within the sunbelt region, the initially least dense MSAs grew relatively faster than the initially more dense ones. To see this, we partitioned our data set into two broad regions. The sunbelt region consists of MSAs located in the Southeast, Southwest, Rocky Mountain, and Far West regions. The frostbelt region consists of MSAs located in the New England, Mideast, Great Lakes, and Plains regions. Within each region, we regressed MSA growth rates over the period 1951-96 for employment, and 1950-90 for population, on the log of initial MSA density, *IDEN* :

$$\dot{g} = \text{constant} + b\text{IDEN}$$

where $\dot{g}$ is the growth rate of employment or population, and IDEN is 1951 MSA employment density in the employment regressions, and 1950 MSA population density in the population regressions. We expect a negative coefficient on the initial MSA density variables. Table 3 reports the findings for the regressions for the frostbelt and sunbelt regions for both employment and population.

The coefficients on the initial density variables are negative and significant in both the frostbelt and sunbelt regressions for both the employment and population versions of the model. Thus, even though overall growth has favored the sunbelt region, within that region, the initially least dense MSAs grew relatively faster than the initially more dense ones. Even within the relatively slow-growing frostbelt region, the initially least dense MSAs tended to grow relatively faster than the initially more dense ones. The important point is that even though there has been a "shift" to the sunbelt region, growth has favored the initially least dense MSAs in both regions of the country.

The results also indicate that growth of the initially least dense MSAs in the sunbelt was much stronger than growth of the initially least dense MSAs in the frostbelt region. The estimated coefficient on the initial density variable in the employment equation for the sunbelt region is more than 2.5 times greater than the estimated coefficient on the initial density variable in the frostbelt region. (In the population equation, the difference is more than five-fold.)

Similarly, metropolitan areas in the West region of the country tend to contain more land area than counties elsewhere, which implies that densities of western MSAs tend to be lower than densities of MSAs elsewhere. Because population and employment in the postwar period have grown rapidly in the West, the regional bias in the measurement of density may partly

account for the rapid growth of (apparently) low-density MSAs.[13] We also partitioned our data set into MSAs located east of the Mississippi River and those found west of the Mississippi River. The results of these regressions are presented in Table 4. Once again the coefficients on the initial density variables are negative and significant in both the employment and population regressions. Thus, even though growth has favored the West region, within that region, the initially least dense MSAs grew relatively faster than the initially more dense ones.

Finally, Table 5 (Table 6) is similar to Table 3 (Table 4) except initial MSA size is substituted for initial MSA density. Table 5 partitions the data into frostbelt-sunbelt regions, whereas Table 6 partitions the data into MSAs east and west of the Mississippi River. The coefficients on initial size variables are negative as expected. With the exception of the population equation in the west of Mississippi River regression, the coefficients are significantly different from zero as well. The findings suggest that employment has grown faster in smaller MSAs regardless of major regions of the country. Population has grown relatively faster in smaller MSAs in either the frostbelt or sunbelt regions. While population has grown relatively faster in the initially smaller MSAs east of the Mississippi River, population growth of the initially smaller MSAs west of the Mississippi River has not been more rapid than growth in initially larger MSAs. Nonetheless, the bulk of the evidence suggests a negative correlation of postwar growth with either initial density or initial size, and this correlation holds for major regions of the country.

[13] We thank Joe Gyourko for bringing this to our attention.

CONCLUSIONS

Three kinds of domestic movements of jobs and people have been important in the postwar period. First has been the movement from metropolitan central cities to suburbs (decentralization). Second has been the movement from frostbelt (eastern, northeastern, and north central) to sunbelt (southern and western) regions. A key finding to emerge from this study is that the widely studied decentralization of employment and population is only part of the story of postwar urban evolution. An important, and not so well-studied, part of the story is a postwar trend of relatively faster growth of jobs and people in the smaller and less-dense MSAs (deconcentration). We find that postwar growth in employment (and to a lesser extent population) has favored metropolitan areas with smaller levels of employment (population) as well as metropolitan areas with lower levels of employment (population) density. These trends are shared by both manufacturing and non-manufacturing employment as well as by major regions of the country.

The fact that employment growth has favored MSAs with smaller levels of employment (or lower levels of employment density) suggests that economic processes favoring convergent (as opposed to parallel) metropolitan growth played an important role in the postwar era. Thus, our findings caution against the view that the evolution of US urban areas has settled down to some sort of a steady state.

Although the purpose of this paper is to document the postwar facts on spatial deconcentration of people and jobs, the causes underlying deconcentration are an interesting issue for future research. Some researchers argue that agglomeration economies have declined

because of continuing innovations in production, transportation, and communications technologies and this decline has favored less dense locations. For example, Garnick and Renshaw (1980) argue that the miniaturization and the development of lightweight materials may have reduced firms' incentives to locate in the densest metropolitan areas in order to lower transportation costs. Some researchers have argued that government policies in the postwar period have favored less dense locations. Leven (1978) and Coleman (1978), for example, argue that the advent of the interstate highway network may have accelerated employment growth in previously remote and poorly connected low-density MSAs. In addition, Beale (1977, 1982) suggests that a change in people's preferences in favor of less urbanized living may have made low-density MSAs more attractive. Alternatively, work by Chatterjee and Carlino (1999) suggests that growth has favored the less dense metro areas not because agglomeration economies, policies, or preferences have changed, but because congestion costs associated with growth have increased faster in more dense locations. It is our hope that documenting the postwar trend of more rapid growth in the smaller and less dense metropolitan places will serve as the impetus for future research into its underlying causes.

REFERENCES

Beale, Calvin. "The Recent Shift of United States Population to Nonmetropolitan Areas, 1970-1975," *International Regional Science Review*, 2 (1977), pp.113-22.

Beale, Calvin. "The Population Turnaround in Rural Small-Town America," in W.P. Browne and D.F. Hadwigner, Eds., *Rural Policy Problems: Changing Dimensions,"* Lexington, Mass.: Lexington Books (1982).

Black, Duncan, and Henderson, J. Vernon. "A Theory of Urban Growth," *Journal of Political Economy*, 107 (1999), pp. 252-84

Black, Duncan, and Henderson, J. Vernon. "Urban Growth," National Bureau of Economic Research Working Paper 6008 (April 1997).

Chatterjee, Satyajit and Carlino, Gerald. "Aggregate Employment Growth and the Deconcentration of Metropolitan Employment," Working Paper 98-6/R, Federal Reserve Bank of Philadelphia (1999).

Coleman, James S. "Social Processes and Social Policy in the Stable Metropolis," in C.L. Leven, ed., *The Mature Metropolis*. Lexington, Mass.: Lexington Books (1978).

Eaton, Jonathan, and Eckstein, Zvi. "Cities and Growth: Theory and Evidence from France and Japan," *Regional Science and Urban Economics*, 27 (1997), pp. 442-47.

Ehrlich, Stephen, and Gyourko, Joseph. "Changes in the Scale and Size Distribution of Metropolitan Agglomerations in the United States During the 20th Century," *Urban Studies* (forthcoming).

Glaeser, Edward, Kallal, Hedi, Scheinkman, Jose, and Shleifer, Andrei. "Growth in Cities" *Journal of Political Economy,* 100 (1992), pp. 1126-53.

Garnick, Daniel, and Renshaw, Vernon. "Competing Hypotheses on the Outlook for Cities and Regions: What the Data Reveal and Conceal," *Papers, Regional Science Association*, 45 (1980), pp. 105-24.

Leven, Charles L. "The Emergence of Maturity in Metropolis," in C.L. Leven, ed., *The Mature Metropolis*. Lexington, Mass.: Lexington Books (1978).

Mills, Edwin S., and Hamilton, Bruce, W. *Urban Economics.* New York: Harper Collins (1994).

Mieszkowski, Peter, and Mills, Edwin S. "The Causes of Metropolitan Suburbanization,"

Journal of Economic Perspectives, 7 (1993), pp.135-47.

Shorrocks, A.F. "The Class of Additively Decomposable Inequality Measures." *Econometrica*, 48 (1980), pp. 613-25.

Theil, H. *Economics and Information Theory*. Amsterdam: North Holland Publishing Company (1967).

Table 1: Theil Indices for Density

Total Employment Density

	1996	1989	1979	1969	1959	1951	%change
Total	0.9606	1.0498	1.1013	1.3173	1.4230	1.5730	-39%
Between MSA	0.6135	0.6707	0.6941	0.8492	0.9229	1.0494	-42%
Within MSA	0.3471	0.3792	0.4072	0.4681	0.5001	0.5236	-33%

Manufacturing Employment Density

	1996	1989	1979	1969	1959	1951	%change
Total	1.0315	1.1670	1.3213	1.6048	1.7615	2.0110	-49%
Between MSA	0.7494	0.8462	0.9489	1.1485	1.2572	1.4806	-49%
Within MSA	0.2821	0.3209	0.3724	0.4563	0.5043	0.5304	-47%

Non-manufacturing Employment Density

	1996	1989	1979	1969	1959	1951	%change
Total	0.9834	1.0685	1.0918	1.2787	1.3548	1.4627	-33%
Between MSA	0.6104	0.6603	0.6550	0.7815	0.8296	0.9071	-33%
Within MSA	0.3730	0.4082	0.4368	0.4971	0.5252	0.5556	-34%

Population Density

	1990	1980	1970	1960	1950	%change
Total	0.7397	0.7911	0.7648	1.1281	1.0320	-30%
Between MSA	0.5286	0.5622	0.4930	0.8423	0.7545	-29%
Within MSA	0.2111	0.2289	0.2718	0.2858	0.2774	-25%

Table 2: Theil Indices for Size

Total Employment

	1996	1989	1979	1969	1959	1951	%change
Total	0.9132	0.9964	1.0342	1.1863	1.2867	1.3786	-34%
Between MSA	0.4181	0.4574	0.4503	0.5130	0.5619	0.6101	-14%
Within MSA	0.4952	0.5390	0.5839	0.6733	0.7248	0.7685	-20%

Manufacturing Employment

	1996	1989	1979	1969	1959	1951	%change
Total	0.8338	0.9514	1.0554	1.2752	1.4355	1.6076	-48%
Between MSA	0.4349	0.4965	0.5224	0.6185	0.6995	0.8063	-23%
Within MSA	0.3988	0.4549	0.5330	0.6568	0.7360	0.8012	-25%

Non-manufacturing Employment

	1996	1989	1979	1969	1959	1951	%change
Total	0.9769	1.0636	1.1003	1.2427	1.3234	1.3956	-31%
Between MSA	0.4386	0.4770	0.4676	0.5222	0.5577	0.5833	-10%
Within MSA	0.5382	0.5866	0.6327	0.7205	0.7657	0.8123	-20%

Population Size

	1990	1980	1970	1960	1950	%change
Total	0.6973	0.7018	0.7922	0.8196	0.8211	-15%
Between MSA	0.3975	0.3782	0.4077	0.4121	0.4182	-02%
Within MSA	0.2998	0.3236	0.3845	0.4075	0.4030	-13%

Table 3: Regression of Growth on Initial MSA Density, by Major Region[a]					
	Frostbelt[b]			Sunbelt[c]	
	Employment	Population		Employment	Population
Constant	507.7 (10.1)	111.6 (82.9)		1159.4 (9.2)	394.4 (55.5)
Log Initial Density	-81.7 (-6.85)***	-13.5 (-3.93)***		-219.2 (-5.20)***	-69.7 (-3.69)***
R^2	0.25	0.10		0.15	0.08
F	47.0	15.5		26.3	13.6

[a]Growth is calculated for the period 1951-96 for employment and 1950-90 for population.
[b]Consists of MSAs located in the New England, Mideast, Great Lakes, and Plains regions.
[c]Consists of MSAs located in the Southeast, Southwest, Rocky Mountain, and Far West regions.
*** significance at 1% level.

Table 4: Regression of Growth on Initial MSA Density, by Major Region[a]					
	East of Mississippi River[b]			West of Mississippi River[c]	
	Employment	Population		Employment	Population
Constant	1138.5 (11.4)	396.0 (8.3)		864.0 (7.6)	273.3 (6.5)
Log Initial Density	-219.0 (-8.68)***	-74.3 (-6.15)***		-140.9 (-3.66)***	-40.6 (-2.82)**
R^2	0.29	0.17		0.11	0.06
F	75.4	37.8		13.4	8.0

[a]Growth is calculated for the period 1951-96 for employment and 1950-90 for population.
[b]Consists of MSAs located east of the Mississippi River.
[c]Consists of MSAs located west of the Mississippi River.

***, and ** indicate significance at 1% , and 5% levels, respectively.

Table 5: Regression of Growth on Initial MSA Size, by Major Region[a]					
	Frostbelt[b]			Sunbelt[c]	
	Employment	Population		Employment	Population
Constant	867.1 (6.5)	176.1 (4.8)		2360.4 (412.9)	722.1 (4.0)
Log Initial Size	-62.9 (-5.19)***	-10.8 (-3.24)***		-177.2 (-4.39)***	-51.0 (-2.87)**
R^2	0.16	0.06		0.11	0.05
F	26.9	10.5		19.3	8.2

[a]Growth is calculated for the period 1951-96 for employment and 1950-90 for population.
[b]Consists of MSAs located in the New England, Mideast, Great Lakes, and Plains regions.
[c] Consists of MSAs located in the Southeast, Southwest, Rocky Mountain, and Far West regions.
***, and ** indicate significance at 1% , and 5% levels, respectively.

Table 6: Regression of Growth on Initial MSA Size, by Major Region[a]					
	East of Mississippi River[b]			West of Mississippi River[c]	
	Employment	Population		Employment	Population
Constant	2290.9 (8.4)	880.8 (6.2)		1392.1 (3.4)	276.2 (1.8)
Log Initial Size	-183.8 (-7.30)***	-63.6 (-5.41)***		-89.1 (-2.23)**	-11.1 (-0.74)
R^2	0.22	0.14		0.04	0.01
F	53.3	29.3		5.0	0.6

[a]Growth is calculated for the period 1951-96 for employment and 1950-90 for population.
[b]Consists of MSAs located east of the Mississippi River.
[c] Consists of MSAs located west of the Mississippi River.
***, and ** indicate significance at 1% , and 5% levels, respectively.

339