The Problem with Central City-Suburb Comparisons

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Abstract

The classic central city-suburb comparisons within metropolitan areas is rendered problematic by the widely varying proportions of metropolitan populations included within the boundaries of the central cities. A consistent definition of the older, inner portions of urban areas and the newer, outer portions, the urban core and suburban periphery, is presented. That division is compared to the central city-suburb distinction for large urban areas. The percentage of the urban area population in the central city versus the urban core varies a great deal for some urban areas. Rates of population growth and population density differ between urban cores and central cities and between suburban peripheries and suburbs outside central cities. Relationships of incomes and levels of racial and ethnic diversity between the inner and outer areas likewise differ when using the alternative divisions of the urban areas.

Introduction

A staple of urban research has been the comparison of social, economic, and other characteristics of central cities and suburbs within metropolitan areas. The Census had designated one or more of the largest cities in each metropolitan area as central cities and reported information for these cities and for the portions of the metropolitan areas outside the central cities. Researchers have taken to calling this remainder the suburbs and contrasted these areas with the central cities in the hearts of the metropolitan areas. (Note that the Bureau of the Census never described these areas as the suburbs and indeed has no definition of suburbs.)

This distinction between central cities and suburbs even predates the initial definition of metropolitan areas. For nearly half a century before to that, the Census defined Metropolitan Districts and identified central cities within those areas. Harris (1943) provided an analysis of the suburbs defined as those areas of the Metropolitan Districts outside the central cities.

The Bureau of the Budget (forerunner to the Office of Management and Budget) first delineated Standard Metropolitan Areas in the late 1940s, and the Census used those areas in reporting the results of the 1950 Census (U.S. Bureau of the Census 1952).

This established the context for the central city-suburb comparisons that soon followed. These addressed a wide variety of topics. Schnore (1962a) examined central city-suburban income differentials, one of the most frequently considered contrasts. The segregation between the foreign- and native-born populations in cities and suburbs was addressed by Lieberson (1962). Taeuber and Taeuber (1964) looked at white migration into, out of, and between central cities and suburbs. Studies using the central city-suburb distinction have continued. More recently, Frey (2015) focused on another subject often considered, racial and ethnic patterns and change.

The implication was that the central cities represented the older, inner portions of the metropolitan areas and the areas outside, the suburbs, represented the newer, outer parts. The suburbs were often seen as those areas of single-family subdivisions developed since sometime in the middle of the last century. The central cities were typically viewed as places built earlier in the century or before. Looking at the older large metropolitan areas of the Northeast and Midwest, this all seemed to be a reasonable interpretation for many urban scholars, most of whom were based in the Northeast and Midwest and were most familiar with these areas. Hill, Brennan, and Wolman (1998) suggest this led to a stereotypical view of metropolitan areas as a "central city dominated by poor residential neighbourhoods surrounded by wealthier suburbs," a view definitely not applicable to all metropolitan areas.

The extent of the areas included within the boundaries of central cities varied greatly. Some central cities had their final boundaries established in the nineteenth century. Development within many of the large central cities in the Northeast and Midwest was largely complete by the earlier decades of the twentieth century. Most newer parts of the metropolitan areas were therefore necessarily outside these central cities. This would include the areas that most people would consider to be suburban in character. But this was decidedly not the case for many other metropolitan areas. Other central cities have been able to continue to expand their boundaries as new development occurred. Significant amounts of more recent development—areas that most people would describe as being "suburban" in character—has taken place within those central cities. For these metropolitan areas, central city-suburb comparisons are hardly contrasts between the older, inner portions and the newer outer portions of the metropolitan area. Rather, they are comparisons between the older, inner portion plus a significant share of the newer, outer portion with the remainder of the newer, outer portion, often a much smaller area.

Differences in the extent of city boundaries are affected by a host of factors. Perhaps most significant are state laws governing the ease with which a city can annex adjacent territory and the ease with which those in areas outside can incorporate as new cities to resist annexation. In some cases cities have been able to encourage or even coerce acceptance of annexation using their power to provide or withhold some public service. State boundaries obviously limit the expansion of cities. Topography may play a role. And, of course, there is historical accident. But the bottom line is that city boundaries and their extent are to a considerable extent determined by factors that do not lead to a consistent division of metropolitan areas into inner and outer, older and newer areas that could most appropriately serve as the basis for comparisons consistent across metropolitan areas.

The extent of central city boundaries can change drastically virtually overnight as the result of government reorganization. Since 1963, four of the large cities considered in the current research have merged their governments with the county in which they were located: Nashville, Jacksonville, Indianapolis, and Louisville. This resulted in the immediate, extensive expansion of the central city limits. The merger of Louisville with Jefferson County in 2003 is one example. The map in Figure 1 shows the boundaries of the City of Louisville in 2000, before the merger, and in 2010, after. (The open areas in the post-merger city results from preexisting incorporated areas that became part of the merged government but retained their independence from the City of Louisville.) The 2000 population of Louisville was 256,231. In 2010, after the merger, the city's population was over twice that, 597,337.

The use of city boundaries becomes especially problematic when attempting to make comparisons over time because those boundaries can change, generally by expansion. This was addressed early by Schnore (1962b), who studied the effect of municipal annexations on the growth of the suburbs. A very simple but relevant

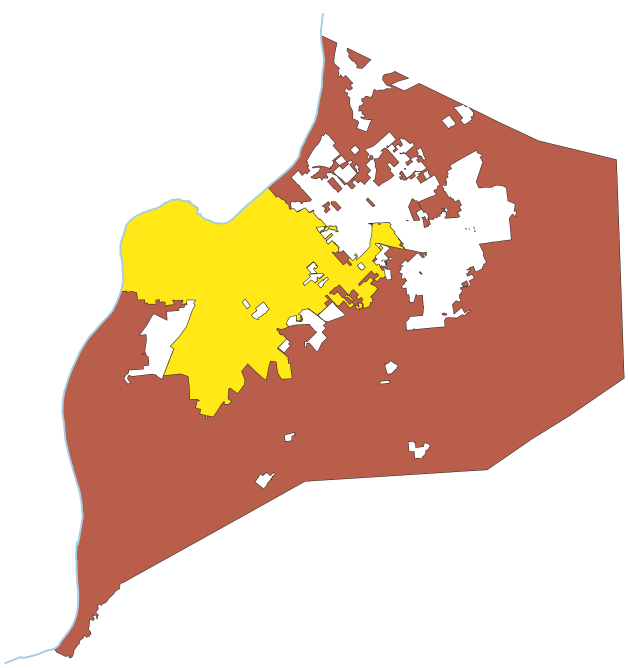

Figure 1. City of Louisville in 2000, before merger with Jefferson County, and in 2010, after merger.

example of the problem: Many central cities have seen their populations fall in recent decades. Growth or decline has come to be seen as a measure of the health of central cities. For cities where the boundaries remained unchanged, interpretation of the change in population is obvious and straightforward. But consider a city that has seen an increase in population but that has also increased its area through annexation. Is the increase a positive sign or simply the result of having annexed additional population? It is literally the case that population could have fallen both within the original city limits and in the area that was annexed while the population of the city increased.

Some authors have raised the issue of the problem of using central cities and defining the areas outside as the suburbs. Schmitt (1956) said that central city boundaries are “an exceedingly arbitrary measure of where the suburbs begin.” Discussing the problem of using ad hoc definitions of phenomena being studied and more specifically the problems with using central cities, Hadden (1969) argued that “the concept suburb remains largely undefined and at best ambiguously conceptualized.” Both Schmitt and Hadden correctly acknowledged that using central cities was appropriate when studying governmental organization, political processes, and topics such as public finance and regulation. But their areas did not work well for defining and distinguishing the suburban portions of metropolitan areas. Such critiques have not been widely acknowledged and have had little impact on the continuing use of the central city-suburb division.

Distinguishing between the older, inner portions of urban areas and the newer, outer areas is useful for broad investigations into the distribution of various phenomena within urban areas. I sought to do this for my urban patterns research examining variations within large urban areas in the United States from 1950 to 2010. Rejecting the central city-suburb division, I developed an alternative definition of the urban core and the suburban periphery to be uniformly applied to all of the urban areas. I have used this for making comparisons between those inner and outer parts of the urban areas with respect to density, multifamily housing, and racial and ethnic diversity (Ottensmann 2019, 2020a, b).

This paper compares the use of the urban core-suburban periphery definition with the central city-suburb division in terms of the area and population included and the implications for various comparisons between the inner and outer parts of the urban areas. This essentially takes core-periphery as a standard and examines the extent to which central city-suburb, with its problems, deviates from that. This is not to suggest that the core-periphery division is in any sense the “correct” way of dividing the urban area. Rather, given the clear problems with the central city-suburb distinction, this is looking at the extent to which that differs from a definition that is at least consistent across the urban areas.

The urban core-suburban periphery definition applies to and makes use of the urban areas delineated for the urban patterns research. The next section describes those areas and their definition and presents the core-periphery definition. Making the comparison requires establishing how the central city-suburban division can be made in a manner consistent with the urban areas, which is discussed next. The remaining sections do the actual comparisons: the extent of the area and population included in the inner and outer areas, basic demographic characteristics of population change and density, and 2 of the most frequently made comparisons, income and racial and ethnic composition.

The urban areas, urban core, and suburban periphery

The urban core and suburban periphery have been defined using the urban areas developed for the urban patterns research. The research examines variations within those urban areas from 1950 to 2010. This section describes the urban areas and the definition of the urban core and suburban periphery.

Urban areas

The urban areas have been defined to reflect their extent in each of the census years. They have been delineated within the 59 largest Combined Statistical Areas (CSAs) having populations in 2010 of over one million (U.S. Bureau of the Census 2013). CSAs were used rather than the more common Metropolitan Statistical Areas (MSAs) as the latter fail to include areas that I believe are more properly considered to be parts of the urban areas (Ottensmann 2017).[1] For some of the urban areas multiple urban centers around which urban development took place were identified where a second or third Urbanized Area (either in 2010 or the last year it was separate) had a population exceeding 28 percent of the largest area.[2]

The primary source of data for the research was the Neighborhood Change Database with census tract data for the censuses from 1970 to 2000 normalized to the 2000 tract boundaries (Urban Institute and Geolytics 2003). Population and housing unit counts from the 2010 census were added by aggregating the block data (U.S. Bureau of the Census 2012b).

Housing unit densities were used for delineating the urban areas rather than population densities for 2 reasons. Housing units are more fixed than population so they better characterize the urban pattern, an argument made by others as well (e.g., Galster, *et al.* 2001 and Paulsen 2014). The 1970 data on housing units by year built also

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[1] For those areas not included in a CSA, the MSA was used.

[2] The 3 Urbanized Areas with the lowest percent population were Akron at 32 percent of Cleveland and Tacoma and Providence, both at 28.5 percent of Seattle and Boston. Below was a big gap, with the next being Kissimmee, 21 percent of Orlando and Concord NC, 17 percent of Charlotte.

allowed the estimation of the numbers of units in tracts in 1950 and 1960, a method also used by Radeloff, *et al.* (2001), Theobald (2001), Hammer, *et al.* (2004), and Radeloff, Hammer, and Stewart (2005).

Urban areas have been defined for each census year from 1950 to 2010 consisting of those tracts contiguous to each urban center meeting a minimum housing unit density threshold. (This is comparable to the way in which the census defines Urbanized Areas using blocks and larger units and Paulsen (2012) defined urban areas using block groups. The Census used a minimum density of 500 persons per square mile in 2000 and 2010 (U.S. Bureau of the Census 2002, 2011). Using the population per housing unit for the nation, a density of 1 housing unit per 3 acres or 213.33 units per square mile is almost exactly equivalent and was used as the cutoff for including tracts in an urban area. The urban areas were delineated to represent cumulative growth over time. If a tract were not included in an urban area in any year, it would also not be part of the urban area in all preceding years.[3]

Urban core and suburban periphery

Defining the urban core-suburban periphery distinction took the opposite approach to that used for central cities and suburbs. For the latter, the central cities were identified within the metropolitan areas with the remainder being designated the suburbs. Here, the suburban periphery was defined first.

Identification of the suburban periphery was first undertaken for a study developing an alternative approach to the measurement of urban sprawl (Ottensmann 2018). Because sprawl is associated with development in the suburbs and indeed has been sometimes called "suburban sprawl," the plan was to examine patterns of development in suburban areas. This required the definition of those areas. It seemed that most people talking about the suburbs in this context were referring more or less to those areas developed since World War II. An influential report discussing suburban sprawl specifically referred to those areas (*Beyond Sprawl* 1995).

Using the urban areas developed for the urban patterns research described above, the suburbs were defined as the portions of the urban areas for 1960 forward that had been added to the urban areas since 1950. In other words, these were the parts of the urban areas outside the 1950 urban area.

Subsequently, when seeking to make comparisons of densities in the inner and outer portions of the urban areas, these suburban areas formed the basis for making the distinction. The suburban areas added since 1950 were termed the "suburban

[3] More detail on the construction of the dataset and the delineation of the urban areas is provided in Ottensmann (2014).

periphery," with the remainder, the 1950 urban area, becoming the "urban core" (Ottensmann 2019).

No doubt some will complain that this is an overly generous specification of the urban core. By central cities they may be thinking about considerably older portions of some metropolitan areas that were developed by the early twentieth century. This is the case for many of the central cities in metropolitan areas in the Northeast and Midwest. This is emphatically not true for many central cities in the South and West, as will be seen.

Defining a central city-suburb comparison

Comparing the classic central city-suburb division with the urban core and suburban periphery required the definition of the extent of the areas to be compared and the identification of the central cities. Current Metropolitan Statistical Areas (MSAs) could not be used because the urban areas used here have been defined differently and many include extensive areas not included in any single MSA. Using multiple MSAs would include too much additional area, including Urbanized Areas separate from the urban areas.

The extent of the total area included is not of critical importance. MSAs, delineated using entire counties, are often much larger than Urbanized Areas or my urban areas. Their populations, however, are not that much greater because the additional territory is largely rural, with small populations. Schnore (1963) chose to use the Urbanized Areas rather than the metropolitan areas for a comparison of the socioeconomic characteristics of cities and suburbs, designating the remainder outside the central city as the suburbs. He argued that this was preferable as this excluded rural populations. In practice, using the Urbanized Areas rather than the metropolitan areas made little difference and few have followed his example.[4] Because the choice of extent does not make a great deal of difference, the extent of the 2010 urban areas used for the urban core-suburban periphery analysis is used for the central city-suburb areas as well. This gives consistent areas and data.

The other issue is the selection of those cities to be considered as central cities for the comparison. Obviously the selection is very important, but the choice is made more complex because multiple definitions of central cities have been used. For the censuses from 1950 through 1980, central cities were defined in pretty much the same way. The central cities included the largest city in the metropolitan area and up to the 2 next largest cities if their populations exceeded one-third the population of the largest city. A

[4] An exception where the choice of the use of the metropolitan areas does make a difference is in the examination of density. Because of the arbitrary amounts of rural territory included, densities for metropolitan areas are nearly meaningless. Densities do make sense for Urbanized Areas and for the urban areas used in this research as they approximate the built-up urban territory.

city could also qualify if its population were greater than 250,000 (U.S. Bureau of the Census 1983).

Prior to the 1990 census, the definition of central cities was significantly changed. Without going into the details, two fundamental changes were made: Cities would be designated as central cities based on the relative concentration of jobs versus population, and the number of central cities in a metropolitan area was no longer limited to 3 cities (U.S. Bureau of the Census 1991). for the 1990 census, 80 cities were added as central cities in the 50 largest metropolitan areas, with a dozen or more new central cities in some of the largest areas. The additions had the effect of significantly affecting central city-suburb comparisons for some metropolitan areas. Some of the cities added were adjacent to the largest city, such as Cambridge, Massachusetts, and East St. Louis, Illinois and could reasonably be considered parts of the inner portion of the metropolitan area. But others, such as Arlington, Texas, were clearly newer, suburban areas in which nearly all of their growth had occurred since 1950. And Palm Springs, California, was exurban, separate from the greater Los Angeles urban area. Cities such as this hardly met the traditional understanding of being "central" (Ottensmann 1996). The U.S. Office of Management and Budget (2000) seems to have later recognized this, subsequently changing the name from central cities to principal cities.

Obviously dissatisfied with the new central city/principal city definition, the Brookings Institution chose to develop their own definition of central cities for their metropolitan area analyses. They chose to limit the number of central cities in a metropolitan area to no more than the 3 largest, with central cities added if their populations exceeded 100,000. This is similar to the old definition in using population size as the criterion for additional central cities and limiting the number to 3, but used an absolute threshold rather than one based on the size of the largest city. The suggestion was made that this "identifies only the most prominent cities …, consistent with common usage" (Frey 2005). It is not clear what this "common usage" might be nor why this justified a definition similar to but deviating from the old definition.

The new central city/principal city designation is clearly inappropriate for identifying the older inner portions and newer outer portions of urban areas. As described in the previous section, multiple urban centers were included in an urban area when an Urbanized Area had a population exceeding 28.5 percent of the population of the largest Urbanized Area. Urbanized Areas were used because of the arbitrary nature of city boundaries, exactly the problem being addressed with the central cities. A maximum of 3 urban centers were designated for any urban area, not by establishing a limit but because this was the largest number that met that standard. This is very similar to the old definition allowing the addition of cities with populations greater than one-third that of the largest city. The differences are the use of Urbanized Areas rather than cities and the slightly lower threshold. Given the similarity, the urban centers designated for the urban areas will also be considered to be the central cities for the comparison.

The set of all of the central cities of Standard Metropolitan Statistical Areas in 1980 (the last census using the old definition) that were within the 2010 urban areas were compared with the urban centers for those areas (U.S. Bureau of the Census 1983). For 39 of the 59 urban areas, the urban centers and central cities were identical. An additional 17 urban areas included central cities having populations less than one-third the population of the largest city and that would therefore have not qualified as a central city for the entire area. These cities were designated central cities in 1980 because they were located in Urbanized Areas separate from the area that included the largest city. This left 3 urban areas with other differences between the urban centers and the 1980 central cities. Long Beach was a central city in the Los Angeles area, qualifying with a population exceeding 250,000 but with a population less than one-third that of Los Angeles. West Palm Beach was the fourth largest central city in the Miami-Fort Lauderdale-West Palm Beach urban area. In 1980, 3 cities in addition to Virginia Beach had populations greater than one-third of Norfolk, the largest city in the Virginia Beach-Norfolk urban area. However, by 2010, Virginia Beach had become the largest city in the area by far, with only Norfolk having a population greater than one-third. Using the urban centers is therefore quite comparable to the application of the old central city definition to the 2010 urban areas.

The urban areas have been defined using census tracts. The tract data are aggregated to obtain the land area, population, and population characteristics for the total area, urban core, and suburban periphery. The tracts were also used to obtain the totals for the central cities because incomes for these areas were obtained by taking the weighted mean of tract median household incomes. It was considered more appropriate to obtained incomes for the central cities in the same manner rather that using the median incomes reported by the census. Then, for consistency, all of the values for the central cities were obtained by aggregating the data for tracts having centroids within their boundaries. While this introduces some error given that tracts can be split by city boundaries, the net effect should be minor because some split tracts will have centers within the cities and some outside, so errors should approximately balance out.

Urban core versus central city

The comparison of the central city-suburb division with the urban core-suburban periphery division in 2010 begins with basic summary statistics on the percentages of the land area and population of the urban areas included in the urban cores and central cities. Table 1 gives the mean percentages of the total urban area land area and population and the minimum and maximum differences in those percentages across the 59 urban areas. Those thinking that the definition of the urban core as the extent of the urban area in 1950 was more expansive than the central cities should be surprised that the average urban area had only 15 percent of the land area in the urban core but 26 percent in the central cities, over 10 percentage points more. But more important, and a point that will be emphasized throughout this comparison, are the differences in the percentages for individual areas. At one extreme, the percent of the land area in the central city was 20 percentage points less than in the urban core. The maximum difference was far greater in the other direction, with the percentage in the central city over 70 points higher.

Table 1. Mean percent of land area and population in urban core and central cities.

	Mean Percent in Urban Core	Mean Percent in Central Cities	Minimum Difference	Maximum Difference
Land area	15.2	26.4	-19.9	71.1
Population	28.7	38.9	-34.1	73.3

The percentages of the population in the urban core and central cities are higher than for area because population densities are generally higher in the inner portions of urban areas. The mean percent of the population in the urban core is nearly 30 percent, almost twice the mean percent area. For the central cities, the mean jumped from a little over 25 percent for area to nearly 40 for population. Again, some of the differences between the percent population in the central cities versus the urban core for individual urban areas were very large. At the extremes, these differences ranged from 34 points lower in the central city than in the core to 73 higher. Clearly the urban core and central cities encompassed very different populations in some urban areas.

For these large urban areas, the percentages of the area and population in the core and central cities were very closely related, with correlations of 0.89 and 0.95 respectively. The correlation of the differences between the core and central city percentages was an extremely high 0.98. From this point forward in the paper, the focus will be on the percentages of the population in the urban core and central cities and the differences. This is used because while the choice does not matter much with these urban areas, using the percentages of the area in central cities would not be appropriate when using MSAs, as their delineation using entire counties results in arbitrary amounts of rural land being included in those areas, making percentages of the areas in the central cities subject to this variation.

The histogram in Figure 1 shows the distribution of the urban areas by the percentage of the population in the central cities. The distribution is highly skewed to

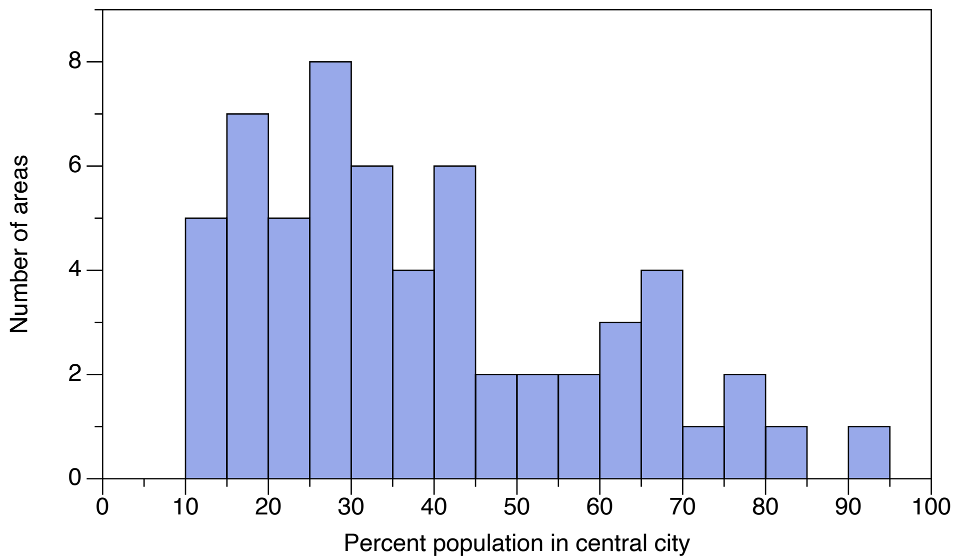

Figure 2. Distribution of urban areas by percent population in central cities.

the right, with a concentration of urban areas having lower proportions of their populations in the central cities and smaller numbers having very high percent in the central cities. Half of the urban areas had 33 percent or less of the population in the central cities.

How the differences in the percent of the population in the urban core and central cities varied and for which types of urban areas is illustrated by looking at the areas at the extremes, with the greatest differences. Table 2 lists the 5 urban areas for which the percentages in the central cities were lowest (most negative) relative to their urban cores and the 5 areas where the differences between the core and central cities were the highest. The urban areas with the greatest negative differences were larger urban areas in the Northeast and Detroit, in the Midwest. In each of these areas, the percentage of the population in the central cities was at least 20 points lower than the percentage in the urban core. These are older areas that had a lower proportions of their populations in the central cities. In 3 of the areas less than 20 percent of the population was in the central cities while 40 to 50 percent was in the urban core. The New York area did have over 40 percent of the population in New York City but also had an extremely high 70 percent of the total urban area population in the core. New York grew to become an extremely large urban area early, long before 1950.

At the other extreme were 5 urban areas in which the percentages in the central cities were at least 50 points greater than the percentages in the urban cores. All are somewhat smaller urban areas in the Sunbelt. These areas experienced most of their growth since 1950, having less than a quarter of their populations in the core. And

Table 2. Urban areas with the greatest differences in percent of population in the central cities versus the urban core.

Area	Percent Population in Urban Core	Percent Population in Central Cities	Difference in Percent
Boston-Providence	47.5	13.4	-34.1
Pittsburgh	51.6	19.7	-31.9
New York	69.9	41.1	-28.8
Buffalo	52.6	29.3	-23.2
Detroit	41.1	18.3	-22.8
...	...	...	...
Greensboro--Winston-Salem--High Point	21.1	74.8	53.7
San Antonio	23.4	77.4	54.0
Albuquerque	21.3	77.0	55.7
Jacksonville	15.7	82.7	67.0
El Paso	18.6	91.9	73.3

75 percent or more of the total population in these areas resided within the central cities. This combination produced the very large differences.

Maps showing the urban cores and central cities for 2 areas at the extremes illustrate the differences in the extents of the urban cores and central cities. Figure 3 shows such maps for Boston-Providence, with the greatest negative difference, and San Antonio, with the third highest percentage in the central city and the fourth highest positive difference. (Jacksonville and El Paso were not displayed because their proportions in the central city were so extreme.) The areas of the urban cores are shown in yellow and the areas of the central cities in purple. The grey areas are the parts of the urban areas outside both.

The cities of Boston and Providence are the very small areas inside the much larger urban cores. Exactly the reverse was the case for San Antonio. The city of San Antonio encompassed a large portion of the urban area (though with some holes, areas not included). The urban core was a much smaller area within the boundaries of the city. It is obvious that large portions of the current city of San Antonio were added to the urban area after 1950.

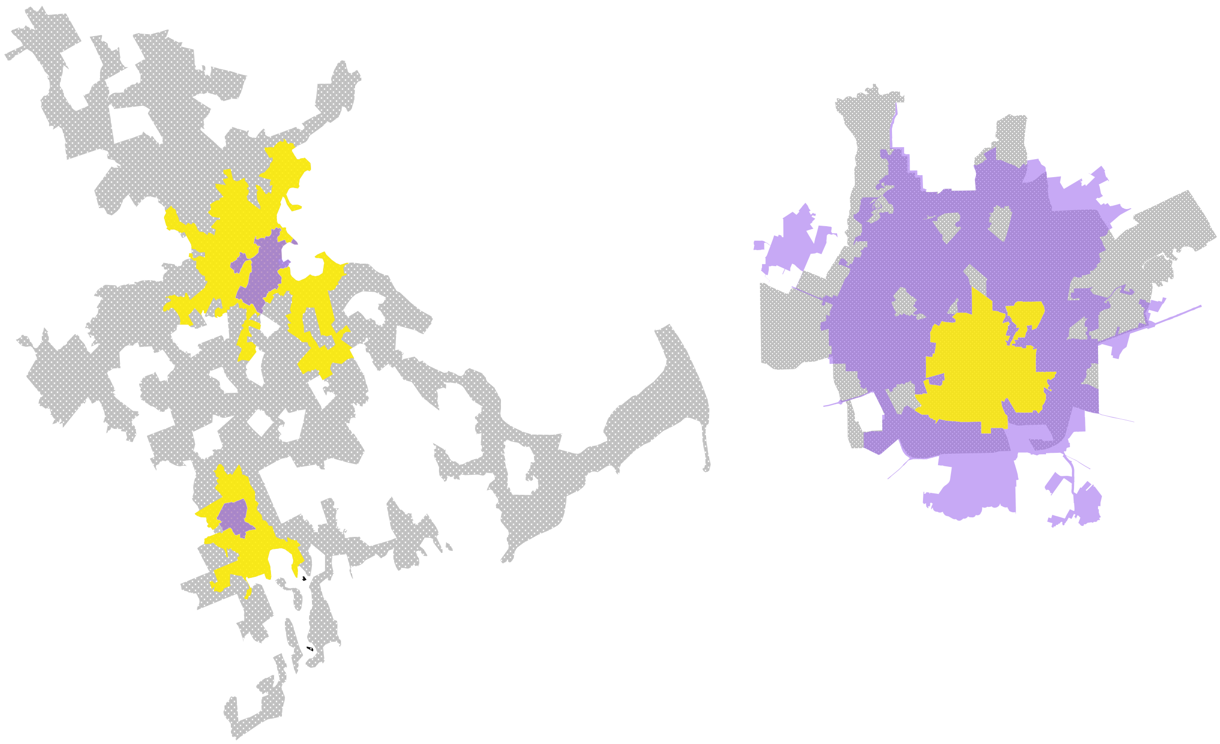

Figure 3. Boston-Providence urban area (left) and San Antonio urban area with urban cores shown in yellow and central cities in purple.

The list of the urban areas with the greatest differences in the percent population in the urban core and central cities suggests regional variation in the relative extent of these areas. Table 3 gives the mean percent total populations in the urban cores and central cities for the urban areas in each of the 4 census regions. The average urban area in the Northeast had just under half of the population in the central city compared to a quarter in the urban core, a mean of over 20 points less. At the other extreme it was just the reverse: For urban areas in the South, the typical central city had over twice the population of the urban core with a mean difference of over 25. This is about a 4 to 1 difference between the regions. Urban areas in the West were closest to those in the South, just not quite as extreme. The Midwest urban areas fell in the middle, with a smaller difference between the average percentages in the core and central cities, and a small mean difference (though some of the urban areas still had large differences). Differences in the means across the regions were all statistically significant.

Demographics

This section focuses on two population measures and how they vary when applied to central cities and suburbs as opposed to urban cores and the suburban

Table 3. Mean percent population in urban core and central cities by region

Region	Mean Percent Total Population		Mean Difference in Percent***
	Urban Core***	Central Cities*	
Northeast	47.2	25.7	-21.5
Midwest	35.8	31.8	-4.0
South	20.6	46.6	26.0
West	24.9	39.7	14.8

* Differences significant at the 0.05 level

*** Differences significant at the 0.001 level

peripheries. The first part examines the changes in the populations of the areas. The second looks at their population densities.

Population change

Table 4 presents the percent change in population from 1990 to 2010 for the inner and outer parts of the areas as delineated using the urban core and suburban periphery versus the central city and suburbs. The difference that immediately jumps out is that the mean population for the urban cores declined by a little over 2 percent, while the average central city population increased by nearly 10 percent. On average the outer areas grew at a rate of over 40 percent, with the suburbs outside the central cities growing somewhat more rapidly than the suburban peripheries.

In some of the areas. the central cities and their suburbs grew more slowly than the urban cores and suburban periphery, with the greatest differences in the percentages

Table 4. Mean percent population change from 1990 to 2010 in the inner and outer parts of the urban areas.

	Mean Population		Difference	
	Urban Core-Suburban Periphery	Central City-Suburbs	Minimum Difference	Maximum Difference
Inner area percent change	-2.3	9.7	-10.4	106.3
Outer area percent change	41.5	48.5	-12.7	153.3

being a little over 10. Some of the differences in the other direction, however, were extremely large, with the greatest difference showing the central city growth rate over 100 points more than the urban core and the suburbs growth rate higher by more than 150 percentage points compared to the suburban periphery. The differences in rates of growth were strongly related to the differences in the percentages of the populations in the central cities, with correlations for both the inner and outer areas of 0.67 and 0.59 respectively.

The explanation of these differences is best understood by examining the areas with the lowest and highest differences for the inner and outer areas, shown in Table 5. Starting with the differences in the percent change in population between the urban core and central city: Those areas with the most negative differences, where the rate of growth in the central city was lower than in the urban core, were generally older areas located in the Northeast and Midwest. The innermost portions of the urban areas were declining in population and the central cities corresponded more closely to those declining areas while the larger urban cores included areas that were either declining less rapidly, stable, or even increasing in population. At the other extreme, rapidly growing urban areas with very low proportions of their populations in the urban cores and high proportions in the central cities saw much higher rates of growth in the central

Table 5. Urban areas with the greatest differences in the percent population change from 1990 to 2010 in the inner and outer parts of the urban areas.

Urban Core and Central City		Suburban Periphery and Suburbs	
Area	**Difference**	**Area**	**Difference**
Detroit	-10.4	Cincinnati	-12.7
Washington-Baltimore	-8.6	Portland	-10.5
Hartford	-6.0	Oklahoma City	-10.2
Buffalo	-4.8	St Louis	-9.9
Cincinnati	-3.4	Chicago	-8.9
...	...	...	...
Orlando	36.7	Indianapolis	39.7
Jacksonville	37.6	San Antonio	56.2
El Paso	40.0	Memphis	64.9
Charlotte	60.4	Louisville	81.9
Las Vegas	106.3	Austin	153.3

cities. The central cities encompassed large areas outside of the urban core that were capturing a great deal of the growth of these urban areas, hence the large differences. Las Vegas is the extreme case, with its urban core including only 2 percent of the land area and 3.5 percent of the population of the urban area.

The areas with higher rates of growth in the suburbs than in the suburban periphery were likewise areas having high proportions of the population within the central city. The suburban periphery is all of the territory added to the urban area since 1950. The inner portions would have been largely developed in the earlier decades since that time and are now likely seeing lower rates of growth than the areas farther out, contributing to the slower growth in the periphery relative to the suburbs. The pattern among the 5 urban areas with the slowest growth in the suburbs relative to the suburban periphery was more mixed. In 4 of the 5 areas, the percentage of the population in the central city was lower than in the urban core. This could have been a factor in those suburbs growing less rapidly as they included areas developed before 1950 that were no longer seeing population increases. Oklahoma City was the clear outlier, with the percent of the population in the central city 40 more than in the urban core. Both the suburban periphery and the suburbs in 4 of the 5 urban areas grew more slowly than the average urban area. That might have contributed to the slower growth in the suburbs compared with the suburban periphery. Portland was the exception to this, growing at a rate well above average, especially in its suburban periphery. Its urban growth boundary might have played a role in the difference observed.

Density

The densities of the inner and outer parts of the urban areas are also compared for the urban core-suburban periphery and the central city-suburb divisions. It is appropriate to consider the densities of the suburbs in this context as the urban areas have been defined to include (and be limited to) developed areas meeting the minimum density threshold. Suburban densities would not be meaningful for the areas outside of central cities of metropolitan areas defined using entire counties, as these include arbitrary amounts of rural territory.

The population densities of the inner areas were, of course, greater than the densities in the outer areas as shown in Table 6. The mean densities did not differ greatly between the urban cores and central cities or between the suburban peripheries and the suburbs outside the central cities. Correlations across the urban areas were high, 0.79 between core and central city density and 0.86 between periphery and suburbs. But the differences for some of the urban areas were again very great, with the minimum and maximum differences in density ranging from about half the mean density up to the extreme difference of over 3 times the mean density.

Table 6. Mean population density in 2010 in the inner and outer parts of the urban areas.

	Mean Population Density		Difference	
	Urban Core-Suburban Periphery	Central City-Suburbs	Minimum Difference	Maximum Difference
Inner area density	4,820	5,006	-3,083	16,565
Outer area density	2,121	2,089	-1,711	1,011

The areas where the central city density was greater than the density for the urban core were led by the New York area with the maximum difference of over 16,000 persons per square mile. New York City, the central city, had an extremely high density of over 38,000 persons per square mile. Density in the urban core, still the highest among all urban areas, was far less, at 12,000. The urban core encompassed large areas outside New York City. Some of these were older dense cities like Newark, but others were effectively suburban areas developed before 1950, some with very low densities. The areas with the next largest differences between their central cities and larger urban cores were likewise large older areas—Boston-Providence, Philadelphia, and Chicago.

Those urban areas where the central city densities were much lower than the densities in the urban core were in the Sunbelt, led by San Diego, Las Vegas, and Salt Lake City-Ogden-Provo. These were areas in which the smaller urban cores had higher densities than the much larger central cities. They were not, however, the urban areas in which the percentages of the population in the central cities were the highest. Those areas generally had much lower densities in both the core and central city, leading to smaller differences.

El Paso and Albuquerque led the list of urban areas with low density in the suburbs outside the central cities relative to the suburban peripheries. These were areas with high proportions of their populations in the central cities and large differences between the central city and urban core percentages. Since the central cities included the areas that had been built earlier that were more fully developed, the suburbs were composed of the newest areas, perhaps only partially developed, hence the lower densities compared to the suburban peripheries.

The suburbs outside New York City, which included denser cities that had been developed by the middle of the last century were far more dense than the smaller suburban periphery developed since that time. It led the list of urban areas with more dense suburbs outside their central cities and was followed by Los Angeles and Boston-Providence, and other larger, mainly older urban areas. All were distinguished by having among the greatest differences between the percentages of the population in the central cities compared to the urban core. And that was the key factor affecting all differences in densities between the suburbs outside the central cities and the suburban peripheries. The correlation was -0.85.

Social and economic characteristics

The central city-suburb distinction has perhaps been used most often to compare the social and economic characteristics of their populations. This is exemplified by the short book by Schnore (1972), *Class and Race in Cities and Suburbs*. This section contrasts the differences in income and racial and ethnic diversity between urban core and suburban periphery with the differences between central cities and suburbs.

Income

The measure of income starts with median household income by census tract for 2008 through 2012 from the American Community Survey (U.S. Bureau of the Census 2019). Tract data had to be used because the areas had been defined using tracts. Income for the areas, urban core and so forth, were then computed as the mean of the tract incomes weighted by the number of households in each tract. While this is not strictly a measure of median income for the larger areas, this approach seemed more reasonable than aggregating the grouped income data and estimating the medians from those broad groups.

Incomes were expected to be higher in the outer areas than the inner areas and this was indeed the case, as shown by the means across the urban areas in Table 7. The means were very similar for the urban cores and central cities, 45,000 and 47,000 and were virtually identical at 65,000 for the suburban peripheries and suburbs. But this equivalence definitely did not hold for individual urban areas, with the greatest differences between core and central cities being -18,000 and 30,000 and for the periphery and suburbs, around 15,000 in both directions.

The question of interest is the comparison of the incomes for the inner and outer areas. To examine this, the ratios of the outer- to inner-area incomes are computed. The means for the periphery-core and suburb-central cities incomes ratios were very close, both slightly under 1.5. But it was also the case that some the differences in the ratios for the 2 sets of areas were very large, ranging from 1.22 less for the central city-suburb ratio to 0.85 more.

Once again looking at the low and high areas helps in understanding the causes of the variation. Table 8 lists the urban areas with the greatest declines and the greatest increases from the periphery-core ratios to the suburb-central city ratios. The areas with the largest decreases in their ratios were all rapidly growing areas in the Sunbelt that

Table 7. Mean income for 2008-2012 and ratios of incomes for the inner and outer parts of the urban areas.

	Mean		Difference	
	Urban Core-Suburban Periphery	Central City-Suburbs	Minimum Difference	Maximum Difference
Inner area income	44,918	47,020	-18,009	29,808
Outer area income	64,675	65,336	-15,930	14,624
Ratio outer area to inner area income	1.48	1.44	-1.22	0.85

had lower percentages of their populations in the central cities and large differences between the central city and urban core percentages. This resulted in the small urban cores having high concentrations of lower-income households compared to the suburban peripheries, resulting in high ratios. The large central cities encompassed areas of more recent development including households with higher incomes, reducing the income disparities with the suburbs.

At the other extreme, in the areas with the largest increases in the income ratios, the central cities were smaller and had the higher concentrations of lower-income households, producing higher ratios of outer- to inner-area income. The larger urban cores included areas of older suburbs that contributed to lower periphery-core income ratios.

On average, the outer areas had higher incomes than the inner areas, the standard conclusion produced by the central city-suburb comparisons. The results here show that this was not true for all urban areas. For the urban core-suburban periphery comparison, incomes in the Las Vegas area were essentially identical in the inner and outer areas, with a ratio of 1. And 5 areas had ratios of 1.15 or less, with incomes in the periphery not that much higher than in the core. The central city-suburb comparisons were more striking, illustrating the effect of using that division. Income in the suburbs of El Paso was much lower than income in the central city, with a ratio of only 0.71. Four urban areas had suburban incomes at least slightly lower than central city incomes. The suburb-central city income ratios were less than 1.15 for 12 of the urban areas.

Table 8. Urban areas with the greatest differences in the ratios of household income for the suburban periphery and urban core and for the suburbs and central city.

Area	Income Ratio		Difference in Ratios
	Suburban Periphery-Urban Core	Suburb-Central City	
Las Vegas	2.24	1.01	-1.22
El Paso	1.76	0.71	-1.05
Phoenix	1.75	1.20	-0.54
Fresno	1.95	1.45	-0.50
Virginia Beach-Norfolk	1.49	0.99	-0.49
...	...	...	...
Rochester	1.69	1.99	0.30
Cleveland-Akron	1.52	1.85	0.33
Harrisburg-York	1.50	1.94	0.44
Detroit	1.55	2.16	0.61
Hartford	1.50	2.35	0.85

Racial and ethnic diversity

For decades, comparisons have been made of the proportions of the population African-American and white in the central cities and suburbs, as in the classic article "Chocolate City, Vanilla Suburbs" (Farley, *et al*. 1978). Given the increasing racial and ethnic diversity in urban areas and the nation, such a limited comparison is no longer sufficient. This section examines the proportions of the population in 4 major racial and ethnic groups, non-Hispanic whites, African Americans, Latinos, and Asians and Pacific Islanders.[5]

The population data are for census tracts from the American Community Survey for 2008-2012 (U.S. Bureau of the Census 2019). The numbers of members of each group were aggregated to each of the areas and the percentages of the totals were calculated. The mean percentages for the urban core and suburban periphery, central cities and suburbs, are reported in Table 9. Differences between the urban core and central city

[5] Those persons reporting American Indian, other race, or listing 2 or more races were not included. These represent much smaller portions of the population than the 4 groups being considered.

Table 9. Mean percent of the population in 4 racial and ethnic groups in 2008-2012 and mean index of diversity in the inner and outer parts of the urban areas.

		Mean		Difference	
		Urban Core-Suburban Periphery	Central City-Suburbs	Minimum Difference	Maximum Difference
Percent non-Hispanic white	Inner area	48.4	45.8	-39.6	25.8
	Outer area	65.7	67.9	-10.7	18.1
Percent African-American	Inner area	25.3	28.2	-21.7	38.7
	Outer area	12.9	11.4	-17.8	11.5
Percent Latino	Inner area	22.2	20.9	-24.4	15.8
	Outer area	15.9	15.6	-11.0	6.5
Percent Asian & Pacific Islander	Inner area	4.1	5.1	-1.9	7.8
	Outer area	5.5	5.2	-4.8	1.2
Diversity index	Inner area	73.5	76.5	-37.6	28.0
	Outer area	61.3	58.3	-28.7	14.8

means and the suburban periphery and suburb means were small, never exceeding 3 percentage points and were often much less. Whites and Asians had higher percentages of the populations in the outer areas. African-American and Latino shares were higher in the inner areas.

As with other measures, similarities in average values with the core-periphery and central city-suburb divisions contrast with large differences for individual urban areas. Percent white in the inner areas varied from being 40 points lower in the central cities compared to the urban core up to 26 higher. The range of differences for African-Americans in the inner areas extended from -22 to 39. Percentages for Latinos and Asians also varied considerably though not quite as dramatically. Minimum and maximum differences were less in the outer areas than in the inner areas with the exception of minima for Asians.

To examine racial and ethnic diversity overall, an index of diversity was used. The index was calculated by taking the differences between the proportions in each group from the proportion if the population were evenly distributed among the groups, 0.25, and squaring and summing those differences. These values were then scaled so the index ranges from 0 for minimum diversity, the entire population in a single group, to 100 for maximum diversity, equal proportions in each group. More detail on the index and the examination of the diversity of the urban areas and the urban core and suburban periphery is provided in Ottensmann (2019a, b).

The final rows of Table 9 give the summary statistics for the diversity index. Mean diversity in the inner areas was around 75, slightly higher in the central cities than in the urban cores. The outer areas had average diversities of about 60, slightly higher in the suburban peripheries. As with the percentages in each group, the differences between core and central city and between periphery and suburbs could be very large in both directions, varying by as much as about 30 points or more for the inner areas and 15 to 30 points for the outer areas.

Table 10 lists the cities with the minimum and maximum differences in the diversity index values for the inner areas and the outer areas. Differences between urban core and central city diversity seemed to depend on the specific situations in each urban area rather than varying by region, size, or the differences in the percentages of the population in the central cities versus the urban cores. For Detroit and Washington-Baltimore, large African-American populations were concentrated in the central cities, leading to lower diversity in those areas. But in Oklahoma City, lower proportions of Latinos in the larger central city reduced diversity. At the other extreme, lower levels of Latinos in the larger central city increased diversity in San Antonio. But in Boston-

Table 10. Urban areas with the greatest differences in the diversity index between the urban core and central city and between the suburban periphery and suburbs.

Diversity in Urban Core and Central City		Diversity in Suburban Periphery and Suburbs	
Area	**Difference**	**Area**	**Difference**
Detroit	-37.6	Jacksonville	-28.7
Washington-Baltimore	-11.0	Tulsa	-25.1
Oklahoma City	-7.6	Indianapolis	-22.1
Knoxville	-7.3	Nashville	-19.0
Atlanta	-6.2	Columbus	-16.4
. . .	. . .	. . .	. . .
Buffalo	15.4	Cleveland-Akron	8.1
El Paso	15.7	Philadelphia	8.3
Orlando	17.8	St Louis	8.5
Boston-Providence	22.1	Pittsburgh	9.3
San Antonio	28.0	New York	14.8

Providence, higher proportions African-American, Latino, and Asian in the smaller central city reduced the proportion white from two-thirds of the population to under one-half, increasing diversity. There was no significant correlation between the differences in diversity and the differences in the percentages of the population in the urban cores and central cities.

The situation was very different for the differences in diversity between the suburban periphery and the suburbs of the central cities. These differences were strongly inversely related to the differences in the percent of the population in the core and central cities, with a correlation of -0.73. The 5 urban areas where diversity in the suburbs was lowest compared to the periphery all had over half of their populations in the central city, with Jacksonville, Indianapolis, and Nashville having undergone city-county consolidation. In all of these areas, higher percentages white and lower percentages in the other groups in the larger central cities resulted in the lower levels of diversity.

For the urban areas where diversity increased the most from the suburban periphery to the suburbs of the central cities, the situation was just the reverse. The percent of the population white was less in the larger suburbs outside the smaller central cities. These suburbs included older, more diverse areas that were parts of the urban cores. The result was greater diversity in those suburbs compared with the urban peripheries.

Conclusions

Many of the central cities encompassed very different areas and populations than the urban cores, and the suburbs of the central cities likewise differed from the suburban peripheries. The average differences between central city-suburb comparisons and urban core-suburban periphery comparison were sometimes small. However, the differences for individual urban areas were very large. The "typical" metropolitan area is far from representative of the full range of metropolitan areas which include dramatically different proportions of their areas and populations in the central city as compared to the urban core.

While the average central city-suburb difference may sometimes be similar to the urban core-periphery difference, one cannot rely on this to be the case in all situations. Getting a similar average difference requires that the errors produced by the varying proportions in the central cities will be distributed such that they cancel out. In addition, it is insufficient to report only average differences without also reporting variations in the differences across urban areas. At this point, the effect of the different proportions in the central cities looms large.

The analysis has shown large, regular differences in the proportions of the area and population in the central cities between older urban areas in the Northeast and some of the newer, more rapidly growing areas in the Sunbelt. Given the very different histories of development between these areas, it would not be surprising if comparisons between their inner and outer areas would different. But given the variation in the proportions in the central cities, there is no way that central city-suburb comparisons could show this.

Relying on results from central-city suburb comparisons leads to the possibility of drawing spurious conclusions that are actually the product of the differences in the proportions of the area in the central cities. One example where this could have been the case: Schnore (1963) examined socioeconomic differences between central cities and suburbs. He concluded that differences between central city and suburban incomes were greater in larger and older metropolitan areas, implying that size and age affected city-suburban differences. However it is entirely possible that the greater differences he observed were the result of lower proportions of the population in the central cities of the larger and older areas.

Why has the central city-suburb distinction persisted for as long as it has without more discussion of the limitations? It was not unreasonable when looking only at the large, older cities in the Northeast and Midwest. Urban researchers have always devoted more attention to the largest cities. If perceptions of city size have lagged behind the dramatic changes in the system of cities, continuing focus on these older areas and the more general application of the central city-suburb distinction might have seemed reasonable. In 1950, 9 of the 10 largest cities were in the Northeast or Midwest (if you count Washington DC in the Northeast) with Los Angeles the only exception. By 2010, only New York, Chicago, and Philadelphia remained, with the other areas in the top 10 in the South and West (U.S. Bureau of the Census 2012a). An extreme example of the focusing on the large cities of the Northeast, almost a parody, is the urban history by Warner and Whittemore (2012). They take the unusual approach of describing the development of a hypothetical city "to identify patterns and trends common to the history of many American cities over the past three hundred years." Their hypothetical city is based on the history of just 3 cities—Boston, Philadelphia, and New York. In response to anticipated criticism that these cities are hardly representative, they offered the lamest of justifications: "All American cities, however, began at the end of something: a trail, a landing along a river or lake, a railroad."[6]

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[6] This rationale is so unreasonable that some might consider that I must be lifting it out of context. To demonstrate that this is not the case, this is the entire paragraph in which this sentence appeared:

> One might argue that the situation of our three cities—located as they are on the Atlantic seaboard, at one end of the continent—made them unique. All American cities, however, began at the end of something: a trail, a landing along a river or lake, a railroad. Although each city has a unique history and character, therefore, it also shares physical, economic, and social trends and experience common to all American cities.

I am not suggesting that comparisons should never be made between central cities and suburbs. Data availability may make this more convenient and, for some cases, the only option. But those making such comparison should begin by acknowledging the limitations resulting from the use of nearly arbitrary city boundaries. Given the changes and alternative definitions, the choice of cities to be considered central cities must be addressed. In reporting results, while the initial focus may be on average differences, it will be necessary to acknowledge and address what will likely be wide variation in those differences across metropolitan areas. And finally, consideration should be given to whether those differences might be related to the proportions of the metropolitan area population included in the central cities, to identify whether any of the results might be the product of that variation.

It is also important to remember that average differences between central cities and suburbs across metropolitan areas do not represent the stereotypical difference between the much older parts of the metropolitan areas and the remainder, as in the older areas in the Northeast. Rather, the average is a product of results that include not only these areas but also metropolitan areas at the other extreme where the central cities encompass large portions of the metropolitan areas. Instead, that average represents something much closer to the distinction between the urban core and suburban periphery.

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