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From Side Street to Ghetto: Understanding the Rising Levels and Changing Spatial Pattern of Segregation, 1900-1940

John R. Logan, Benjamin Bellman, and Elisabeta Minca
Brown University

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Abstract

Residential segregation between African Americans and whites is a long-standing feature of the spatial structure of American cities. This study examines the levels and trends of segregation in 134 cities during 1900-1940 at multiple spatial scales, ranging from the household and dwelling to city wards. We report three main findings. First, racial segregation was already high at a local scale in 1900 and increased greatly in nearly all cities. Second, the scale of segregation in all kinds of cities shifted from individual streets with many black residents toward entire wards that were more highly divided by race. Third, among the many Northern cities with modest black populations, those with greater black presence were more segregated, consistent with a "group threat" hypothesis. In Southern cities and major Northern Destination cities, however, there is no support for this explanation. These findings lead toward a conclusion that the main trends creating the black ghetto by the mid-20th Century were national in scope, and future research should focus less on why some cities differed from others than on why such similar trajectories are found everywhere.

From Side Street to Ghetto: Understanding the Rising Levels and Changing Spatial Pattern of Segregation, 1900-1940

We study the emergence of the black ghetto as the chief form of African Americans' urban settlement by the middle of the 20th Century. Cutler, Glaeser and Vigdor (1999) reported that in 1890 only one city had a ghetto, but 55 cities had ghettos by 1940. Those decades, they wrote, "saw the birth of the ghetto" (p. 456). Relying on numerous earlier studies using census data for wards, Massey and Denton (1993, p. 17) conclude that urban blacks "in the aftermath of the Civil War … were not residentially segregated from whites." By mid-century, though, they describe "American apartheid" as fully established. Using recently available data at a finer scale, Logan and Zhang (2015) studied the emergent ghetto in Chicago and New York from 1880 through 1940. Their maps at the scale of enumeration districts (EDs) showed that in both cities black neighborhoods grew by expanding their boundaries while also becoming more racially homogeneous. In 1880, Chicago's South Side was already known as the site of the city's small African American population, though the area was less than 10% black. But by 1940, it covered a much larger area, it was nearly all-black, and over 80% of the city's black residents lived within its borders. Both the changing scale and increasing homogeneity of black residential areas identify them as ghettos in this period.

The present study carries out a comprehensive survey of black urban settlement patterns in the United States, including sample of 134 cities for every decade from 1900-1940. It measures segregation at multiple spatial scales, not only city wards but also smaller neighborhoods within wards, streets within neighborhoods, and even buildings within streets. The analysis clearly reveals that African Americans were already highly segregated from whites by 1900 at the scale of buildings and streets, not only in the South, where this has been observed

before, but in most cities. It also demonstrates for the first time how the spatial scale of segregation expanded to encompass much larger and more racially homogeneous zones by 1940.

Cities like New York and Chicago may be unusual cases due to their great size and position as premier destinations for the Great Migration. Most Northern cities had small black populations in this period. Was the level and spatial scale of segregation different in those cases? And was the pattern different in Southern cities, most of which had much larger shares of black residents already in the 19th Century than found in the North even in 1940? Logan and Martinez (2018) have shown that in 1880 Southern blacks were highly segregated at a spatial scale corresponding to back yards, alleys, and side streets, but that segregation at the scale of EDs or wards was modest. How did that pattern evolve in the early decades of the next century? When and in what kinds of cities did segregation in side streets grow into larger scale ghettoization? These are the questions that motivate this study.

The timing and spatial scale of segregation

Past studies agree that segregation rose in American cities from the late 19th Century through the mid-20th Century. They disagree on when segregation reached a "very high" level because they rely on data at different spatial scales. Like previous researchers, Cutler, Glaeser and Vigdor (1999) used published population counts for city wards to measure segregation. They reported, for example, that the average value of the Index of Dissimilarity (D, weighted by black population) rose from .39 in 1890 (a level interpreted as low/moderate in contemporary studies), reaching the very high level of .61 finally in 1940. A few scholars have objected that ward data are misleading because wards in many cities are very large and often internally segregated. For example, Philpott (1978, pp. 120-121) noted that the 1900 ward map for Chicago showed blacks "scattered over" many areas of the city. Data at a finer scale, he argued, showed

that “the residential confinement of the blacks was nearly complete at the turn of the century.” In line with this critique, a more recent longitudinal study of ten large Northern cities (Logan et al 2015) used data at a finer spatial scale, the ED. They reported a similar trend over time but at a much higher initial level of segregation, with the average value of D rising from .59 in 1880 (already very high) to .89 in 1940. Logan and Zhang (2015) confirmed the differential by spatial scale using geocoded census microdata from 1880. In that year, for example, the Index of Dissimilarity in New York City was .46 at the ward level, .61 at the tract level, and .83 at the level of the street segment – moderate at one scale, extremely high at another.

Early segregation scholars like Duncan and Duncan (1955) were aware of the importance of the spatial scale of segregation measures. They emphasized that the solution is not simply to use the smallest possible unit, but to find units that correspond to the actual spatial pattern at which segregation occurs. “For example, if all nonwhites resided on alleyways and all whites in street-front structures, then even a block index would fail to reveal the high degree of segregation” (1955, p. 216). Recent studies using 1880 geocoded microdata argue that the “real” pattern of segregation in some Southern cities (Logan and Martinez 2018) and in Philadelphia (Logan and Bellman 2016) was in fact organized at a scale smaller than city blocks.

Relying on segregation measures based on inappropriately large areal units, such as city wards, can lead to misleading interpretations of the underlying sources of residential separation. Logan et al (2015, p. 32) point out that many scholars have focused on “conditions specific to the period after World War I as the causes of segregation: the wave of bombings in Chicago in the 1920s, the creation of racial covenants in housing, redlining by federal officials, and exclusion of blacks from most early housing subdivisions outside the urban core.” That focus is consistent with the timing of the rise of segregation observed in ward-based studies. But if segregation was

already very high before 1900, evidently "the roots of the ghetto can be found much earlier. These mechanisms did not originate the ghetto, rather they supplemented the strong boundaries that were already in place" (2015, p. 32).

One illustrative example of the potential for misdirection is found in a study of the effects of restrictive covenants on racial segregation in Kansas City, MO, in the period 1900-1950 (Gotham 2000). Relying on ward data, Gotham observed that in 1880 blacks mostly lived in "small heterogeneous residential clusters, usually with whites and other minorities … in a ward that was only 13% black" (2000, p. 619-620). It was well after 1900, coinciding with the first efforts to establish racially restrictive covenants, coupled with an ill-fated initiative to create racial zoning laws, that segregation as measured by the isolation index moved sharply higher. This temporal sequence is the logical basis for arguing that residential segregation was caused by a 20th Century racialization of real estate market institutions. Our analysis (described below) shows that Kansas City was very highly segregated in 1900, with a value of D nearly .70 at the spatial scale of single streets within EDs. At a time when only 10% of residents in this city were black, the average African American lived on a street that was 45% black. Segregated housing was well established before the first restrictive covenant. It is a compelling hypothesis to expect that restrictive covenants played a role in reinforcing the trajectory of segregation after 1900. We return to this hypothesis in the conclusion. But the timing of the onset of segregated housing cannot be cited as evidence of this effect.

Past studies offer several tentative findings about the creation of the black ghetto as it was observed by the mid-20th Century: 1) segregation was already high in post-bellum America in the form of many small black concentrations intermixed with white settlements in nearby areas; 2) segregation rose at every spatial scale through mid-century; and 3) by 1940 the

predominant form of settlement had become much larger and more racially homogeneous zones that could be identified at the scale of city wards. Unfortunately, the evidence is fragmentary. The trajectory over time for a large national sample of cities has been documented only at the scale of wards, while the trajectory at the finer ED scale is available only for a set of ten of the largest Northern cities. The most comprehensive analyses based on census microdata with rich geographic detail have been conducted only for 1880, and only for a handful of Southern cities and for Philadelphia. Our goal here is first to fill out the record for most American cities in the 1900-1940 decades with analyses at multiple spatial scales. Doing this will allow us to identify possible variations across cities, comparing the urban South with the North and West, and comparing the largest Destination cities of the Great Migration with other cities that received less in-migration of black residents. Second, we supplement this descriptive analysis with multivariate models that begin to test the effects of time and changing size and share of black residents in cities. Third, we put forward and test the hypothesis that the changes during this period involved not only increasing segregation but also a tendency to replace the street by the ghetto as the modal form of black settlement throughout the nation.

The changing scale of segregation – a Philadelphia example

Previous studies have not emphasized variability in the spatial scale of segregation. They could not because they lacked data at multiple scales in this period. Yet Duncan and Duncan (1955, p. 215) observed long ago that "it is common knowledge that in some cities - e.g. Chicago - the non-white population is predominantly clustered in a 'Black Belt,' whereas in other cities nonwhite occupancy takes the form of scattered 'islands' or 'pockets.'" We posit that these two spatial forms may have tended to appear in a sequence over time in many cities, where the initial "pockets" are replaced by "Black Belts." This phenomenon can be visualized in maps of the

location of white and black residents. Such maps are not readily available. Here we draw on the example of one city, Philadelphia, that was mapped at the address level by the Urban Transition HGIS Project in 1880 (Logan et al 2011), and for which we have developed a comparably detailed map in 1940. Data sources are described below. The 1880 map aggregates persons to specific street segments based on their geocoded address. We map residents' 1940 locations at approximately the street segment scale in 1940. To accomplish this we created a historically accurate 1940 street grid and enumeration district (ED) map (Logan and Zhang 2017), aggregated the 100% census microdata for Philadelphia to the scale of streets within EDs (as described below), and divided these populations into individual street segments by interpolation (based on the segment's length).

Philadelphia was the Northern city with the largest black population in the late 1800s with nearly 32,000 black residents in 1880 (3.7% of the total). By 1940 the number had grown to nearly 250,000 (12.6% of the total). Figure 1 displays the location of disproportionately white and black streets in 1880 and 1940 for the main populated areas of the city. Street segments are categorized as being above or below the city's overall black population share in either year (3.7% or 12.6%, respectively). In fact, most segments below this threshold were below 1% black in each year, and most identified as "black streets" were close to or above majority black. Using these simple dichotomies is necessary in order to create a readable map where the identification as a disproportionately black street has the same meaning in each year. Parallel maps with multiple categories of black share (not shown here) reveal the same pattern of change. The maps show the location of black street segments in the main populated area of the city (panels A and C) and in higher resolution in the central core including the well-known Seventh Ward (panels B and D). Ward boundaries from 1940 are superimposed with thick black lines.

Figure 1 about here

In the 1880 map the segregation of black residents at the ward scale is apparent. Some wards have very few black streets while black streets are numerous in other wards, especially around the famous Seventh Ward. However, panel B shows that even in this section of the city, the disproportionately black street segments are intermixed with white segments. On closer inspection, blacks tended to live on alleys and short streets in this part of the city, although they also occupied consecutive segments of some major streets (Logan and Bellman 2016). Most major street segments were nearly all-white. In the mostly white wards, there is a large predominance of white street segments but typically these have black segments interspersed among them. This spatial configuration represents a city with considerable segregation at the ward scale but limited by the common presence of white segments in wards with a larger black population and of black segments in wards with a larger white population.

The 1940 map shows that this pattern was disappearing. By then wards in sections of the city with larger black populations have many fewer white streets, while black streets have nearly disappeared in wards with larger white populations. It became rare for a white street to be adjacent to a black street within any ward. This pattern is even clearer if one takes note of clusters of black streets within specific sections of the whiter wards. The maps show that Philadelphia's wards have moved in the direction of being more homogeneously either black or white, making the ward a more important spatial scale of segregation. In the final section of this study, we confirm this observation by measuring this trend systematically for all 134 cities in the study.

Research design

This study draws on the 100% microdata samples from the Census of Population for every decade 1900-1940, made available by the Minnesota Population Center's IPUMS and NAPP projects (Ruggles et al 2010). It includes all 134 identifiable cities that had a population of at least 30,000 and at least 1,000 black residents in one of these decades. The racial classification has been simplified to white, black (combining Negro and Mulatto in the earlier decades), and other.

1. Sample of cities and residents

Because this was a period of rapid urban growth and redistribution of the black population, cities that greatly exceeded the population criteria in one year may have been quite small or may have had few black residents in an earlier year. An example is Oklahoma City, which had less than 100 residents in 1900 but over 200,000 residents in 1940, including a black population of nearly 20,000. A Northern example is Flint, MI, with over 6,000 black residents in a population of over 150,000 in 1940, but a small town under 15,000 (and with only 260 black residents) in 1900. To describe the trends in the magnitude and spatial scale of segregation, we present average values across cities weighted by the number of black residents, so cities like Oklahoma City and Flint would count negligibly in 1900 but moderately by 1940. We include all cities equally in the analysis of predictors of segregation, though we found that Northern cities that were not major destinations for black migration need to be modeled separately from others.

Like most studies of residential segregation, we include persons of all ages in our tabulations. Households and buildings were nearly racially homogeneous in all cities and years. A major exception was when African Americans lived as domestic employees in white-headed households. Such cases do not represent "neighbors" in the usual sense, and we omit them from

all counts. This was more common in 1900 (20.8% of employed blacks in New York City were live-in domestics and in most cities the share was over 5%), but it was a negligible factor by 1940. Hence, including domestic servants could bias measures of segregation downward in earlier decades.

We provide results for all cities combined, but in addition we divide cities into four categories that might be expected to experience different levels and trends in segregation due to their regional location, size, and black population share. These categories are intended as an exploratory effort to examine variation among cities, and future research may develop more useful classifications based on trajectories such as the ones we identify in this study.

Southern cities. We categorize 38 cities (those in former Confederate states plus Baltimore, Washington, and cities in the border states of West Virginia, Kentucky, and Oklahoma) as "Southern." These cities stand out for their much higher share of black residents than found elsewhere in the country. Of 32 cities with more than 10% black residents in every decade, 29 are Southern (the exceptions are Atlantic City, NJ; Chester, PA; and Kansas City, KS). Of 25 cities that exceeded 20% black in 1940, only two (Atlantic City, NJ and East St. Louis, IL) are outside the South. Five Southern cities exceeded 50% black at some point (Savannah, GA; Montgomery, AL; Charleston, SC; Shreveport, LA; and Jacksonville, FL), and six had black populations above 100,000 in 1940 (Washington, DC; Baltimore, MD; New Orleans, LA; Memphis, TN; Birmingham, AL; and Atlanta, GA).

Destination cities. We treat 13 cities as Destination cities: New York, Chicago, Philadelphia, Detroit, St. Louis, Cleveland, Los Angeles, Pittsburgh, Cincinnati, Indianapolis, Newark, Kansas City (MO), and Columbus. These cities had much smaller shares of black residents than found in the South (most well below 10%), but by virtue of their size and attraction to black migrants in

this period they are the ones that developed the largest black communities. Together, they had nearly as many black residents by 1940 (1.6 million, up from only a quarter million in 1900) as all the Southern cities combined (1.8 million).

Northern white and Northern mixed cities. We refer to the many remaining smaller cities outside the South as "Northern" although some are in the West. For exploratory description we classify them as "white" (cities that remained below 4% black in 1940) and "mixed" (cities with larger than 4% black share in 1940). In a subsequent multivariate analysis we combine them and estimate how their segregation trajectories covaried with their black population size and share. The 55 "Northern white" cities ranged mostly between 1% and 2% black in 1900, and between 1% and 3% black in 1940. The 28 "Northern mixed" cities were more varied in 1900. At one extreme Atlantic City NJ was 19.9% black, while Toledo's black share was only 1.2%. But they experienced considerable black growth, and most were in the 8-12% range by 1940, while several were above 15% black.

2. Spatial scale

Efforts to map cities in the prewar period (like those presented above for Philadelphia) are incomplete, and we do not have access to such maps for most of them. Nevertheless, using available non-map sources, we have located residents at each of the following spatial scales. The only other geographic identifier provided for all cities in all these years is the enumeration district (ED), an area that is typically about half the size of a contemporary census tract.

Household and building. Households and buildings are the fundamental units in people's locations. We found that households and buildings were both nearly 100% homogeneous by race in all cities and years in this study. Therefore, we do not analyze segregation at this scale in this study, but we rely on household and building information for other scales. IPUMS provides

the household's address (house number and street name) in all years. We were able to use the IPUMS assignment of persons to dwelling units (buildings) except in 1900. In this year family members were sometimes placed in separate dwelling units, an error that we resolved by assigning all members of a single household to the dwelling where the majority of members had been placed. A thornier problem was to identify separate buildings when the house address (house number) and building number were omitted, which is a common occurrence in these data files. In many cases it is unclear whether two sequentially enumerated households lived in the same building or adjacent buildings. Our approach was to assume that no more than one household in a building could be an owner. Therefore, in a sequence of households where only the first household had a reported house number, all subsequent renters were assigned to the same building. But if one of these households were listed as a homeowner, we created a new house number and imputed a new building for this household that is then applied to subsequent renters in the sequence.

Building group. Some researchers have experimented with a measure of segregation that relies only on the sequence of enumeration to establish the race of people's "next door neighbors." Having cleaned and imputed street addresses in the microdata, we are able to assess the racial composition of neighbors more precisely, knowing who lives in the same building and who lives in a building on either side. The "building group" includes one's own dwelling plus residents in the buildings on the same street and in the same ED that were enumerated before and after it. Hence all residents of one's own building and the adjacent buildings on either side can considered to be "next door neighbors." Note that building groups are overlapping. A building is the focal building for its own group, and it can also be counted as a neighbor for the building

groups on its left and right. For this reason, one of the measures of segregation used here, the Index of Dissimilarity, cannot be defined at this scale.

Street. The lack of historical GIS street grids and address ranges for most cities in this study prevents measuring segregation at the scale of single street segments in the way that we did for Philadelphia above. We created an alternative by identifying people who lived *on the same street and in the same ED*. This required considerable effort to standardize street names (dealing with multiple forms of misspelling and different formats to represent the direction, name, and street type) to determine who lived on the same street. Often residents on one side of the street were enumerated in a different sequence than those on the opposite side, and often the street name was originally written differently or transcribed differently in each sequence. We relied heavily on a resource provided by the SteveMorse.org genealogy website that lists the names of all streets found within every ED of all cities included in this study. We used data mining and fuzzy matching methods to match street names in the microdata to these listings. We treated residents of streets where a street name was missing and could not readily be imputed from a previous address in the sequence of enumeration as living on "missing street." Typically, there was no more than one "missing street" in an ED, and this procedure placed all its residents together in a useful spatial unit. This spatial unit is the same as a traditional street segment in the case of alleys, which are often densely populated in this period. In the more typical case, it refers to a set of two to three connected segments. Many streets were boundary streets between EDs. In these cases, the people in one ED (on one side of the street) are treated as living on a different "street" than those on the opposite side. In these cases, the street is similar to a face block.

Enumeration district. The enumeration district (ED, an area assigned to a single professional for enumeration) is available in the IPUMS files in all decades and all cities. It is typically an area including two to six census blocks. (Unfortunately block numbers are only available in 1930, and not for all cities.) Due to its ready availability and relatively small size, like a contemporary census tract, the ED is becoming a standard areal unit for historical segregation studies.

Ward. The largest areal unit in this study is the city ward. It is not available for all cities or years in the IPUMS microdata. Some cities did not have wards in any year, some had wards in one year but not another, and in some cities a different spatial unit replaced it. In New York City, for example, Assembly Districts were treated by the Census Bureau as the standard spatial unit larger than the ED, while in some other cities the relevant unit was a precinct, voting district, or council zone. For most of the cities in this study, we created ward data (or data for the comparable large spatial unit) by combining EDs. For this purpose, we relied heavily on listings prepared by Ancestry.com that identify the relevant areal units in each city and year and provide a list of the EDs found within their borders. In 1900, we also rely on ward information in the IPUMS microdata.. For 88 cities, the ward or a comparable unit is available in all five decades. For 21 cities, it is available in four of the five years, and in other cities, it is defined in only one to three decades. For descriptive analyses of average segregation, missing data at the ward level is not consequential because statistics are presented as average values weighted by the size of the black population, and the missing cities typically had small black populations. In multivariate models predicting ward-level segregation (where there is no weighting), cities are included in all years for which a ward measure is available. For analyses where we decompose segregation into shares that are uniquely contributed by the street, ED, and ward, we include only the 88 cities for

which the ward or a comparable unit is defined in all five years. The most important missing case is Washington, DC, where the precinct is the relevant unit, but it is not available in 1900.

3. Measures of segregation

We employ the most often used measures of segregation, the Index of Dissimilarity (D_{bw}) and the Isolation Index (P^*_{bb}), both of which can be calculated without mapped data. Although these measures are not explicitly spatial, when calculated at multiple spatial scales, they reveal whether clusters of black residents are relatively small and dispersed or relatively large and homogeneous. D_{bw} measures how evenly whites and blacks are distributed across areas. It reaches a minimum if every area has the same share of the city's total white and black residents, and a maximum of 1 if there is no overlap at all in where whites and blacks live at a given scale. Values above .60, by convention, are described as "very high." Values in the range of .20-.30 are considered modest and are often found in the contemporary metropolis for tract-level segregation between whites of different European ancestry. P^*_{bb} is a variant of exposure indices, specifically the percent black in the area where the average black person lives. By its nature P^*_{bb} is higher in cities with larger shares of black residents. This complicates comparisons between cities with different black population shares or over time in a city with a substantially changing black share, but it is nevertheless a meaningful descriptive statistic, and it has the advantage that it can be calculated for overlapping building groups. [1]

4. Methods of analysis

Our purpose is to examine the trajectories of segregation in cities over the period 1900-1940 at multiple spatial scales. We compare patterns for four types of cities: Southern cities and non-Southern cities that we categorize as Destinations, Northern mixed cities, and Northern white cities. The first part of the analysis presents the average levels of segregation on indices of

isolation and dissimilarity at each spatial scale for each type of city, weighted by the size of the black population in a given year. In effect these averages are the level of segregation in the city where the average African American resident lived. The second part of the analysis estimates multivariate models that pool data across years, predicting the level of segregation by the size and share of black residents in the city. The third section assesses evidence for a changing spatial scale of segregation over time.

This third section requires that segregation be partitioned into the components that can be attributed uniquely to each scale, which to our knowledge has not been done before for a large sample of cities. Recent advocates of "spatial measures of segregation" (e.g., Lee et al 2005) point out that some cities may be segregated to a greater degree at larger distances, while in others the pattern of segregation may be organized at a more micro scale. They introduce spatial scale by establishing distance gradients around every census tract, and report to what degree races are separated at varying scales such as 100, 500, or 1000 meters. We approach spatiality differently, calculating a measure of "total" segregation at the smallest spatial unit, and then how much of the total derives from segregation across larger spatial units. We draw here on the approach of Wong (2003), who describes how the Index of Dissimilarity (D) can be decomposed into a component at a smaller scale (we will refer to this as level 1, which might be census tracts) and a component at a larger scale (level 2, which might be wards). The racial make-up of a ward mathematically constrains the composition of tracts within it. At the extreme, in an all-white ward, all tracts must be all-white. If all wards were racially homogeneous, there could be no segregation within them. Conversely, if every ward's racial composition were like the city as a whole, there would be no segregation at the ward scale, and all segregation would arise from differences among neighborhoods within them. Following Wong, we define the "ward

contribution" to D as the observed value of D at the ward scale. The "ED contribution" refers to the average segregation across EDs within wards. The "street contribution" refers to the average segregation across streets within EDs. The total D is the observed value of D at the smallest scale (the street), and it is equal to the sum of these three components.

5. Hypotheses

As noted above, we carry out the analyses in three parts. To convey the purpose of each step more concretely, we can describe our theoretical expectations as hypotheses.

Hypothesis I. Segregation between blacks and whites increased on average at every spatial scale. We make comparisons between different kinds of cities, testing whether segregation was generally lower in the South than in the North and whether the prominent Northern cities that housed the largest black populations or those with higher black shares experienced the highest segregation. These are standard expectations based on research later in the 20th Century when most studies were being conducted at the census tract scale (Taeuber and Taeuber 1965; Van Valey, Roof and Wilcox 1977; Farley and Frey 1994). Their main theoretical basis is the notion of "group threat" put forward by Blalock (1956), who argued that segregation is a response of the white community to a sense of threat or competition from a rising black presence in the city.

Hypothesis II. To complement the descriptive analyses, we also carry out multivariate analyses that are intended to account for variation in segregation between cities and over time. We expect to find differences between Southern cities, Destination cities, and other Northern cities, possibly associated with their different and changing black population sizes and black share. We also model the independent effect of time, which we interpret as the impact of nationwide changes in urban settlement processes that affect all cities, and that cannot be accounted for by the size and share of black populations.

Hypothesis III. Segregation was greatest early in the period at smaller spatial scales, while larger areal units were typically much more racially mixed. By 1940, however, we expect to find that the spatial scale of segregation had extended to larger areas. This hypothesis gives a more explicit meaning to the observation by Cutler, Glaeser and Vigdor (1999) that this period witnessed the "birth of the Ghetto." Their definition of ghettos does not encompass the spatial scale of segregation. We measure changing spatial scale as changes in the relative contribution of street-level, ED-level, and ward-level segregation to the overall level of segregation in cities.

Results: Rising levels of segregation at multiple scales

Both black isolation (P^*_{bb}, the black share of residents in the location where the average black person lives) and the Index of Dissimilarity (D) provide useful descriptive information about settlement patterns. We begin with the P* measure of isolation for the full set of cities, reported in Table 1. Since the value of P* depends heavily on the black share in the entire city, Table 1 also lists the average black share in these cities (weighted by the size of the black population), showing little average change. In 1900, the average black person in our study sample lived in a city that was 23.3% black, declining to 17.9% by 1940. Both the white and black populations of American cities grew substantially in this period, as the nation was transformed from a predominantly rural country in 1880 to majority urban by 1940. In the Southern cities, where most African Americans lived in 1900, there had been a marked upsurge in black population after the Civil War (documented by Logan and Martinez 2018), and the Great Migration caused a shift in the regional distribution of urban blacks. But on average, if black urban residents became more racially isolated at a national level after 1900, it was not due to growing black population share.

Table 1 about here

Isolation did increase dramatically, however, due to changes in where whites and blacks lived. African Americans already lived in households and buildings that were nearly all black in 1900 (not shown), and there was little change in these measures after that time. But Table 1 shows that isolation increased substantially at every other scale. African Americans lived in majority-black areas in 1900 at the scale of the building group (75.4%) and street (57.8%). Because the building group includes residents' own building, homogeneity at this scale partly reflects homogeneity in their own building, but it is reinforced by a tendency of majority black buildings to be adjacent to one another. Blacks lived where they were a clear majority at the street scale (64.0%) by 1910, and at the ED scale by 1930 (58.3%). Meanwhile isolation also grew at the scale of whole city wards. In 1900, African Americans lived in wards where they were only about a quarter of the population – comparable to their citywide share – suggesting minimal segregation across wards. But by 1940, they lived in wards that were disproportionately though not quite majority black.

Table 2 reports comparable data for cities in the South, Destination, Mixed North and White North cities. It reveals that the overall decline in black urban share was limited to Southern cities. In the large Northern destinations, the city of the average black resident rose from 4.2% to 9.0% black, more than doubling. The average in smaller Northern cities that we classify as racially mixed rose from 8.5% to 10.9%. Cities in the "White North" had smaller black populations and less change, with black share rising from 2.0% only to 2.6%. The absolute size of the African American population increased in most non-Southern cities, but there were large differences among them in both their initial share and rate of change.

Black isolation was highest in the South due to their high black presence. A more striking result is how isolated African Americans were even in cities with modest black

populations. At the extreme, in Northern White cities, where black share was mostly in the range of 1-3%, the average African American lived in a majority black building group as early as 1900 and in a majority black street by 1940. Isolation was not as great in these cities as in the Destination and Mixed North cities, but it was more highly disproportionate to the actual share of black residents.

Table 2 about here

The other major pattern in Table 2 is the remarkable increase in black isolation across decades in every type of city and at every scale from the building group to the ward. Increasing isolation appears to be disconnected from changing overall black population share, since it occurs both in the South (where black share was declining) and in the Mixed North and White North (where it was increasing only modestly).

We turn now to trajectories for the Index of Dissimilarity, which by construction is unaffected by the black share. Table 3 presents national averages, weighted by black population size. The pattern runs parallel to black isolation in several respects. At the street scale, the average D was already .713 in 1900, and it rose toward an apartheid level of over .90 by 1940. The same trend but at lower levels is shown at the ED scale. Ward measures (replicating past findings) show that segregation was minimal in 1900 and 1910, but then rose steadily to approach the .60 level that most contemporary scholars perceive as "very high" by 1940.

Table 3 about here

Table 4 reports trends separately by city type. There is a uniform pattern of increasing average level of segregation at all scales, with values lower at the ward than at the street scale. Southern cities stand out for lower segregation at every scale in 1900. Yet by 1940, their average values at the street and ED scales are quite close to those of non-Southern cities. In this

respect, the trend could be described as a leveling of regional differences, with cities of all types moving toward very high levels of segregation. A major remaining difference is that ward-level segregation was still only moderate in the South by 1940, while it had reached near to or above .60 outside the South. While we cannot formally test an explanation for this phenomenon, it is likely rooted in the deep legacy of slavery in the urban form of Southern cities. Slave quarters were built near the homes of white slave owners, creating a geographic spread of black residents across town. While the institution of slavery was formally abolished in 1865, the built environments and racial hierarchies of these cities endured, and black urban residents of the South continued to live in slave quarters and back alleys across most city wards.

Table 4 about here

It is surprising that there are not greater differences among non-Southern city types. There would seem to be more potential for creation of predominantly black neighborhoods in cities with larger black shares or faster growing black populations. Yet, the White North follows a trajectory very similar to the Destination cities. At the street scale, the average D in the White North was .808 in 1900 and rose to .903 in 1940. In the Destination cities, it was .814 in 1900 and rose to .928 in 1940. At the ward scale, the corresponding averages in the White North are .447 and .638, compared to .440 and .659 in the Destination cities.

Results: Effects of black presence and time trend on segregation

In these tabulations, we have made use of a simple categorization of cities to probe for similarities and differences among them. The dichotomy between South and non-South is intended to reflect possible differences associated with the history of slavery, the specific urban structures associated with Southern cities in the 19th Century, the post-bellum Jim Crow laws, and the much larger black presence in the urban South. All these features could affect the

trajectory of segregation. Many of the other city characteristics that one would want to examine more specifically cannot be readily measured for a large sample of cities over time. However, two time-varying predictors are included in our database: the absolute size of the black population and the share of black residents. The three categories of non-Southern cities involve differences in both. We anticipated that the very large numbers of new black residents in the main Destination cities could be consequential and that in other cities segregation might be responsive to the size and share of black residents.

We present results from models that predict cities' level of segregation (the Index of Dissimilarity) during 1900-1940 using time (a set of dummy variables representing year) and black population variables. Having experimented with several variations of longitudinal models, we present here models based on pooled cross-sections.[2] We found consistently that there are differences in relationships between Southern cities, Destination cities, and Other Northern cities. This leads us to present results separately for each set of cities.

For each of three sets of cities, and measures of segregation at three spatial scales (streets, EDs, and wards) we present two models in Table 5. One model is an OLS regression. In this model, the effect of population predictors reflects a comparison of the black population size or share in a given city with other cities (e.g., are cities with larger numbers of black residents more segregated?). The other model introduces city fixed effects. In the fixed effects model, all comparisons are made in relation to the city itself (e.g., in this city, in years when the black population is larger, is segregation higher?). Both models are informative, but they have different substantive meaning. They both pool data across cities and years, including dummy variables to represent year and time-varying measures of black population size and share. Population predictors are measured as deviations from the mean in a given set of cities. As noted

above, not all cities have identifiable wards in each year; models at the ward scale include every city and year in which a ward-level (or comparable) unit is available.

Table 5 about here

1) Temporal effects

The effects of time are consistently large and capture rising segregation at every spatial scale. Time is the predictor with the largest effects in these models for every category of city. The constant term in these models sets an average starting point in 1900 (the omitted year category). The coefficient for a given year represents the increase from 1900; the increment at each decade can be calculated as the difference in coefficients between consecutive years. The change over all four decades is represented by the 1940 coefficients: about 10-20 points at the street scale, 20-35 points at the ED scale, and 10-40 points at the ward scale.

- At the **street scale**, segregation was lower in the South in 1900 but it increased more than in other cities by 1940 (closing the gap in relation to others). Nearly half of the increase in the South occurred in the first decade, with smaller increases after 1910. Increases in Destination cities were smaller and more evenly spread over time; increases in Other Northern cities were also smaller and evenly spaced.
- Segregation at the **ED scale** had a considerably lower starting point. It also increased more over time. In the South the increases tended to be larger in earlier decades. Again they were more evenly spaced in Destination and Other Northern cities.
- Segregation at the **ward scale** had a lower starting point than at finer scales. It increased most in the Destination cities (more than 30 points) but very modestly in Other Northern cities. In these cities, in fact, increases in the early decades were not statistically significant.

2) Population predictors

The results for population predictors differ by type of city in ways that are not easily interpretable, in part because there is not a strong theoretical rationale from past research to account for these differences. We review each city type in turn.

Southern cities. In the South, neither black population size nor black share is associated with segregation in either the OLS or fixed effects model at the scale of streets or EDs. At the ward scale, the black share has no significant effect among Southern cities, and the effect of black population is found only in the OLS model, and it is negative and small – an increase of as much as 5,000 black residents is associated with less than a one-half point increase in ward segregation. The model results show that there is indeed variation among Southern cities, as the explained variance increases by about half in the fixed effects models compared to the OLS models. But little of this variation is associated with – one might say, responsive to – the absolute or relative size of the black population in these cities.

Destination cities. Among Destination cities, the OLS model results show that cities with larger black populations – in comparison with those with smaller black populations – do not have higher segregation at any scale. However, the fixed effects models reveal a significant negative effect, meaning that as a city's black population grows (which is the uniform direction of change in these cities), its segregation level declines. This relationship holds at all three spatial scales. It is opposite to the hypothesized effect from a racial threat perspective. However, it is also small. The fixed effects models suggest that if a Destination city's black population grows by as much as 10,000 (a very large change in this period), segregation would decline by less than one-half point.

Among Destination cities, the association with black population share is more consistent and stronger. It is negative in five of the six models, again opposite to the expectation based on

racial threat. It is largest in the ward models, where having a black share that is just 1% less than another city is associated with a 1.5-point lower value of D (OLS model), and an increase of 1% in a given city is associated with a 2.2-point lower value (fixed effects model).

Other Northern cities. The pattern is somewhat different for Other Northern cities. The OLS models show that cities with larger black populations are more segregated at every scale, but those with larger shares of black residents are less segregated (as we found in Destination cities). The different directions of these effects are not due to collinearity, since the same directions are also found in models that include only one of these predictors. We note also that these effects are not small. For example, at the ward scale, a moderate difference of just 1,000 in black population is associated with a 1.3-point higher segregation, and a difference of 1% in black population share with a one-point lower segregation.

The fixed effects models have few significant coefficients. Effects at the street scale are not significant. At the ED scale, if a city's black share is 1% larger in a given year, it is predicted to have a 1.4-point higher segregation. At the ward scale, in a year when a city in this category has 1,000 more black residents, it is predicted to have a 1-point higher segregation value.

3) Interpreting the multivariate results

What is the meaning of these findings? They are consistent with the descriptive tables in some ways. First, independent of the size and share of their black populations, cities in the South had lower segregation than other U.S. cities. This difference is not simply because they were segregated at a finer spatial scale than others, as has been suggested by previous studies, but it holds at every scale. Second, also independent of their racial composition, cities became considerably more segregated over time, a trajectory that was especially pronounced at the

beginning of the century in Southern cities and one that brought their segregation levels close to those of other cities by 1940.

To the extent that one expects segregation to be a response by the white population to discomfort with having a larger black population (in terms of absolute size or share), the multivariate results are surprising. The models show that segregation levels in Southern cities were unrelated to the presence of blacks. We might think of Southern cities as having a distinctive regime of segregation carried over from the 19th Century, but nevertheless following a national trajectory of growing separation at every scale. Outside the South, this trajectory also cannot be accounted for in terms of racial composition. In the major Destination cities, where the notion of black threat might be expected to have the best application, the only significant relationships are in the opposite direction (larger black shares result in lower segregation). In Other Northern cities, there are contradictory findings: larger black population is associated with greater segregation, but a larger black share is associated with lower segregation.

Results: Analysis of changing spatial scales

Segregation is found at all spatial scales. The descriptive tables showed that the observed value of D is always higher at the street scale than at the ED or ward scale. This is the expected pattern. We now turn our attention to a different phenomenon that has not been studied directly before now. Our hypothesis is that in the early 20th Century, as segregation increased from decade to decade, there was also a shift toward organizing segregation at larger spatial scales. We expect to find that the "ward contribution" to segregation tended to increase while the "street contribution" declined. Or to state the pattern differently, the share of total segregation attributable to wards increased while the share of segregation attributable to separation at the

street scale declined. This is the pattern illustrated in the maps of Philadelphia in 1880 and 1940 (Figure 1 above).

To assess the decomposition of segregation fully, it is preferable to have data on comparable spatial units in all five decennial years. Not all cities had wards or a comparable unit in all years, and in some cities the available unit varies from year to year. For this reason, the following analysis reports results for a smaller constant set of 88 cities. Here, we return to the original set of four categories of cities. The sample includes all the Destination cities (except Los Angeles), 21 of 38 Southern cities, 18 of 28 Northern Mixed cities, and 37 of 55 Northern White cities. Not reported here, we repeated the analysis with the maximum number of cities in each year, including every city for which we could identify a ward or ward-equivalent areal unit in that year. Results are nearly identical.

Table 6 reports the average values of total segregation for all cities in each year (this is the value of D at the street scale), and the unique contribution of segregation at the street, ED, and ward scales to that total. The sum of the unique contributions equals the total segregation. There is a clear pattern. First, as we saw before, "total" segregation increased regularly from .718 in 1900 to .909 in 1940. Second, the unique contributions of segregation at the ward and ED levels both increased over time, while the street contribution declined. The ward contribution increased the most, from .346 to .585 in these cities. The ED contribution increased more modestly from .163 to .244. The street contribution, however, diminished from .209 to .081.

Table 6 about here

Another way of thinking about these findings is to ask what share of total segregation (as it changed decade by decade) was attributable to every geographic scale (so that the sum of

ward, ED, and street contributions would add to 100% in every year). Viewed this way, the ward contribution accounted for 48.2% of total segregation in 1900, but 64.4% in 1940. The ED contribution accounted for 22.8% of the total in 1900, rising slightly to 26.9% in 1940. The street contribution added considerably in 1900 (29.1%) but much less (8.9%) by 1940.

This does not mean that micro-level segregation fell; the opposite is true. But much segregation across streets could be understood as simply reflecting the changing racial composition of the wards and EDs that streets were located in. We see here that within each ward and ED, as the wards and EDs became more segregated among themselves, differences among streets became somewhat muted. Table 7 shows that a similar trend is found in all four city types. The result for Southern cities is particularly significant, because previous studies of 1880 microdata (Grigoryeva and Ruef 2015, Logan and Martinez 2018) have argued that Southern cities were distinctive at that time in the importance of micro-level segregation, where whites and blacks lived in close proximity but still in separate locations. Table 7 confirms this observation. For example, let us compare results for Southern and Destination cities. In 1900, the unique contribution of the street to total segregation in Southern cities (.355) was greater than in Destination cities (.196). In that same year, conversely, the ward contribution was lower in Southern cities (.433) than in Destination cities (.541). While segregation in Southern cities subsequently rose considerably, narrowing the gap with other cities, this distinction between the street and ward scales remained – still in 1940, the street contribution was greater in Southern cities (.143) than in Destination cities (.053), while the ward contribution was smaller in Southern cities (.514) than in the total set of cities (.712).

Table 7 about here

The more general pattern displayed in Table 7 is that, without exception, the average ward contribution increased in Southern cities, Destination cities, Mixed North and White North cities, while the average street contribution declined in all of them. These findings offer strong support for our hypothesis that there was a reconfiguration for the spatial pattern of segregation during this forty-year period, which can be described as an increasing spatial scale of separation between whites and blacks in all kinds of cities.

Conclusions

This study takes advantage of newly available census microdata to clarify the dimensions of segregation, its timing, its spatial scale, and its variation around the country. The main findings are: 1) As shown before with smaller samples of cities, segregation was much higher at the beginning of the 20th Century than was long believed. 2) Segregation increased at every spatial scale – from adjacent buildings to wards – over the decades. These changes were mostly unrelated to changes in black presence in cities, and isolation reached very high levels even when the black population was small. 3) Segregation clearly evolved from what we may call more micro (street level) to more macro (ED and ward level) scales, resulting in the black ghettos that were evident by the 1940s. 4) Southern cities, initially much less segregated despite their large black populations, tended to converge with other cities by 1940.

The census data offer limited possibilities to test theoretical hypotheses about the causes of rising segregation. As an initial step, we examined whether segregation responded to the size and population share of African Americans. Greater black presence has been interpreted as threatening to whites, leading to stricter control of where they are able to live (Blalock 1956). This "group threat" hypothesis is consistent with the pattern in contemporary comparisons across metropolitan areas that show higher segregation in locales with larger black populations (Farley

and Frey 1994). It is also consistent with a common narrative in which increases in segregation were modest until after the First World War, at which time Northern whites reacted negatively to the first surge of the Great Migration with violence, restrictive covenants, and redlining.

Our analysis of average levels of segregation in specific types of cities contradicts this point of view. First, segregation at all scales was already rising in the two decades leading up to 1920, well before the acceleration of black migration to the North. Second, segregation in Southern cities shows the opposite pattern, since segregation at every scale was lower than other cities in 1900 despite having the largest black populations, and the subsequent trajectory of segregation in the South was very similar to the trajectory in the North, despite the falling share of blacks in Southern cities. Third, segregation was high and rose similarly both in Northern White cities with very small shares of black residents and in Northern Mixed and Destination cities.

The results of multivariate analyses also run counter to the group threat hypothesis. We found no relationship of black population presence to the level of segregation among Southern cities. Among Destination cities, the relationship is in the opposite direction, lower segregation where black presence was greater. Only among other non-Southern cities is there evidence that a larger black population was associated with higher segregation. It's possible that this relationship is found in these cities because most of them began the period with modest black populations, and possibly the effect of black population size is evident only when it is relatively small, yet that is not a claim that has been made before now. Additionally, it is hard to reconcile with another finding, that there are statistically significant negative associations with the share of black residents in these same cities.

If not mainly a response to population shifts, why was there such a strong upsurge in segregation? At the most general level, we are left with the question of why a housing market that was already highly racialized experienced such an intensification of racial separation. This is not a new concern, but it is posed now in the context of new information about these patterns. We now know that race was a major determinant of the organization of urban space from an early time. We know that its spatial pattern was initially highly local, but that it shifted toward separation on a larger spatial scale during this period. We know that similar changes occurred in both the North and the South, and that it was experienced both in the major destinations of the Great Migration and in cities where the black population was never more than one or two percent of the total. Although there was much variation among cities in these patterns, there is a very clear overall national pattern.

This observation leads toward the conclusion that explanations for the rise of the black ghetto need to be formulated at a national scale, even though the processes were carried at a local level, neighborhood by neighborhood. An important direction for further research is to understand how housing markets were racially structured in urban America. Studies could examine how changing transportation infrastructure and relocation of manufacturing industries encouraged white flight to newly built areas of cities. They could also examine in more depth – both quantitatively and qualitatively – how people made decisions about where to live. How did the racial composition of neighborhoods became so relevant to their choices that whites would so strongly avoid racially mixed neighborhoods and exert such pressure to block entry of African Americans into white areas? Studies could examine how restrictive covenants and mortgage redlining influenced racial change in neighborhoods within individual cities, but they would need to consider how the same outcomes were found in cities with fewer restrictive covenants and

where redlining maps were never published. We have learned that the outcomes are nearly universal in the decades of 1900-1940, and we should prioritize research that can account for how they could occur in any city through processes that developed in every city in this time period.

Footnotes.

1. We also considered alternative measures based on the sequence of enumeration (Grigoryeva and Ruef 2015, Logan and Parman 2017). Advantages of these measures are that they reflect racial patterns at a fine geographic scale, and they are readily calculable from public microdata. Given our interest in the spatial scale of segregation, our main concern is that, although they are built from information about pairs of neighbors, the sequences also reflect segregation at larger scales. In the cities studied here, sequence-based measures are highly correlated with segregation as measured by D or P* not only at the adjacent building scale, but also at the scale of streets, EDs, and wards. In other words, they measure segregation at all scales, but they cannot be used to distinguish between scales.

2. We also examined models where the dependent variable was defined as change in segregation, predicted by change in size and share of black population. A challenge is how to disentangle and interpret the associations that are revealed in all these model variations. They all yield comparable estimates of the differences across decades that were shown in the tables above. The meaning of the effect of time is ambiguous because many conditions changed during these decades, including changes in the black population size and share. That is, the absolute size of the black population generally grew in each set of cities, while the black population share tended to decline in Southern cities while increasing in most non-Southern cities. By the same token, however, some effects that are due to other temporal changes could be incorrectly attributed to the black population predictors. Models using stepwise procedures, varying which predictor is included first, suggest that time alone has the most substantial impact, but the population predictors also contribute to explained variance.

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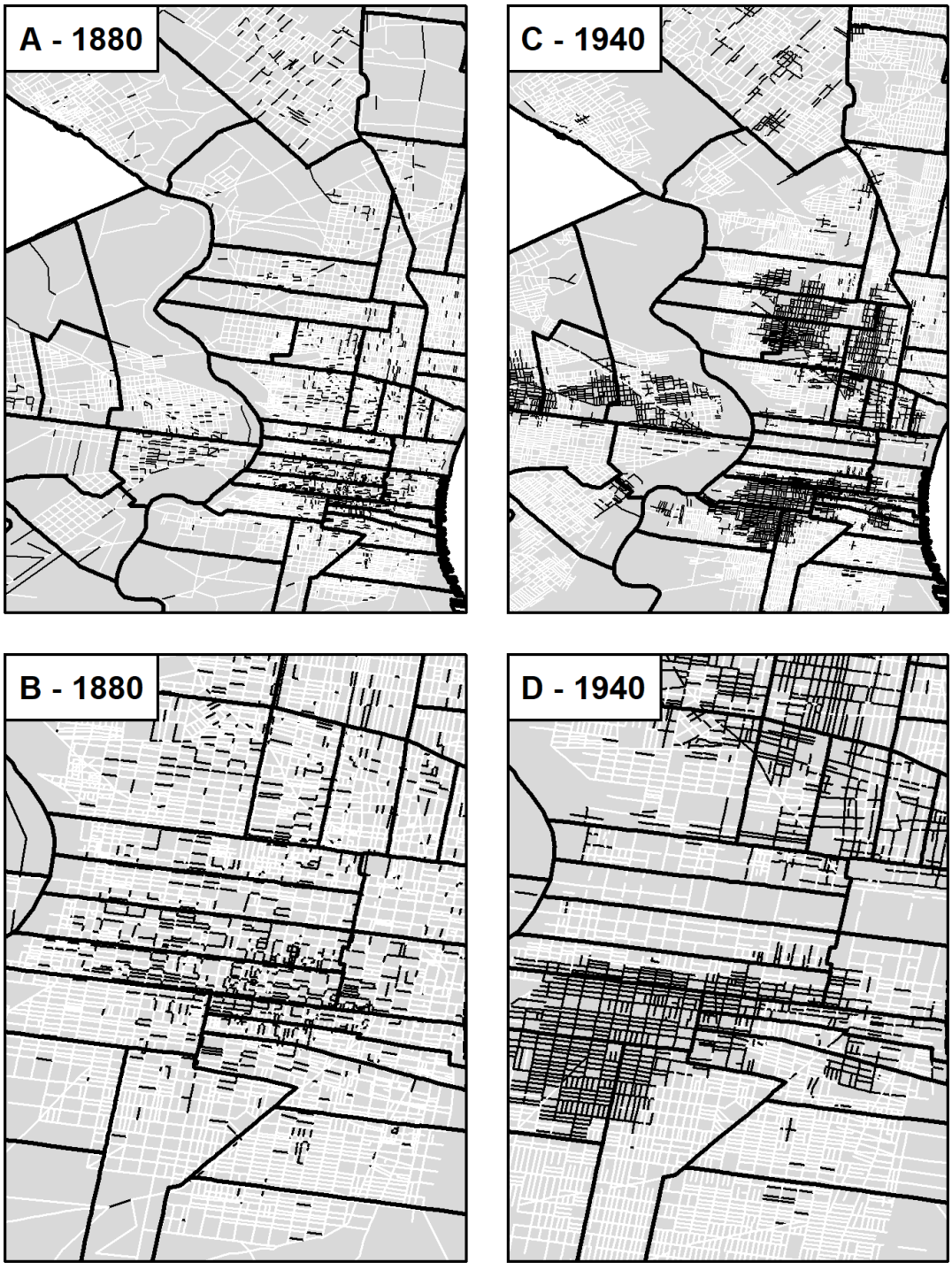

Figure 1. Location of disproportionately black streets in Philadelphia in 1880 (over 3%) and 1940 (over 14%), with 1940 ward boundaries. Panels B and D show the central core of the city (including the Seventh Ward) in higher resolution.

Table 1. Trajectories of segregation: black isolation (P^*_{bb}), 1900 1940
Mean values for all cities, weighted by black population

	City black share	Ward	ED	Street	Building group
1900	0.233	0.276	0.383	0.579	0.754
1910	0.211	0.289	0.424	0.640	0.791
1920	0.183	0.303	0.499	0.679	0.814
1930	0.170	0.358	0.583	0.755	0.842
1940	0.179	0.422	0.705	0.818	0.862

Table 2. Trajectories of segregation: black isolation (P^*_{bb}), 1900 1940
Mean values by city type, weighted by black population

	City black share	Ward	ED	Street	Building group
South					
1900	0.338	0.403	0.484	0.678	0.830
1910	0.317	0.401	0.525	0.748	0.879
1920	0.293	0.394	0.579	0.771	0.901
1930	0.283	0.431	0.661	0.832	0.932
1940	0.290	0.495	0.742	0.869	0.944
Destination					
1900	0.042	0.100	0.227	0.429	0.617
1910	0.044	0.124	0.311	0.510	0.651
1920	0.057	0.239	0.474	0.627	0.724
1930	0.079	0.330	0.566	0.738	0.769
1940	0.090	0.400	0.733	0.818	0.791
Mixed North					
1900	0.085	0.136	0.204	0.423	0.681
1910	0.082	0.132	0.229	0.475	0.732
1920	0.082	0.168	0.291	0.520	0.762
1930	0.101	0.259	0.448	0.637	0.828
1940	0.109	0.290	0.559	0.718	0.868
White North					
1900	0.020	0.048	0.106	0.286	0.550
1910	0.020	0.056	0.112	0.294	0.572
1920	0.021	0.070	0.168	0.333	0.603
1930	0.024	0.118	0.247	0.411	0.666
1940	0.026	0.158	0.337	0.503	0.728

Table 3. Trajectories of segregation: dissimilarity, 1900-1940
Mean values for all cities, weighted by black population

	Ward	ED	Street
1900	0.343	0.492	0.712
1910	0.373	0.577	0.787
1920	0.453	0.666	0.822
1930	0.516	0.740	0.873
1940	0.573	0.821	0.906

Table 4. Trajectories of segregation: dissimilarity, 1900 1940
Mean values by city type, weighted by black population

	Ward	ED	Street
South			
1900	0.286	0.425	0.664
1910	0.314	0.517	0.760
1920	0.363	0.602	0.795
1930	0.405	0.693	0.856
1940	0.480	0.771	0.888
Destination			
1900	0.440	0.653	0.814
1910	0.489	0.710	0.840
1920	0.574	0.774	0.866
1930	0.618	0.794	0.895
1940	0.659	0.880	0.928
Mixed North			
1900	0.338	0.483	0.730
1910	0.363	0.550	0.776
1920	0.435	0.623	0.807
1930	0.517	0.718	0.856
1940	0.561	0.795	0.894
White North			
1900	0.447	0.599	0.808
1910	0.464	0.627	0.832
1920	0.505	0.680	0.841
1930	0.564	0.741	0.868
1940	0.638	0.806	0.903

Table 5. Predictors of segregation (D) by black population size and share and year												
OLS and city fixed effects models												
	South				Destination				Other North			
	OLS		City fixed effects		OLS		City fixed effects		OLS		City fixed effects	
STREET												
Black population (1000s)	0.03		-0.01		0.01		-0.02	**	0.50	***	0.20	
Black percentage	-0.03		0.05		-0.44		-0.76	*	-0.71	***	0.09	
Year (reference: 1900)												
1910	11.07	***	11.18	***	3.02		3.50	**	2.85	**	3.11	***
1920	14.63	***	15.22	***	5.36	**	7.21	**	3.82	***	4.08	***
1930	19.86	***	20.93	***	9.97	***	14.26	***	6.06	***	6.10	***
1940	22.44	***	23.78	***	13.39	***	18.81	***	9.75	***	9.71	***
Constant	64.87	***	64.24	***	79.04	***	76.63	***	78.89	***	78.79	***
Adj. R^2 or R^2 within	0.50	***	0.82	***	0.46	***	0.84	***	0.34	***	0.53	***
n (city-years)	189		189		65		65		414		414	
ENUMERATION DISTRICT												
Black population (1000s)	0.03		0.04		0.02		-0.04	***	1.44	***	0.10	
Black percentage	-0.03		0.48		-0.99	*	-1.30	*	-1.11	***	1.38	*
Year (reference: 1900)												
1910	13.70	***	13.87	***	7.20	*	7.96	***	4.54	**	5.32	***
1920	20.66	***	22.36	***	13.44	***	16.17	***	9.25	***	10.42	***
1930	29.18	***	31.40	***	20.89	***	27.27	***	13.89	***	15.14	***
1940	35.74	***	37.78	***	27.81	***	35.89	***	20.63	***	21.83	***
Constant	39.38	***	38.15	***	59.78	***	56.19	***	54.01	***	53.13	***
Adj. R^2 or R^2 within	0.56	***	0.78	***	0.54	***	0.86	***	0.50	***	0.69	***
n (city-years)	189		189		65		65		414		414	
WARD												
Black population (1000s)	-0.07	*	0.06		0.00		-0.05	**	1.34	***	1.00	*
Black percentage	-0.16		-0.10		-1.55	**	-2.23	*	-1.17	***	-0.36	
Year (reference: 1900)												
1910	7.89	*	3.74		3.96		4.73	*	0.92		0.60	
1920	12.38	**	8.60	*	12.88	**	15.99	***	3.82		2.84	
1930	16.62	***	11.51	*	24.58	***	31.76	***	6.27	*	4.87	
1940	24.55	***	18.33	*	30.94	***	39.98	***	12.70	***	10.74	***
Constant	27.54	***	31.26	***	39.91	***	35.89	***	41.56	***	42.48	***
Adj. R^2 or R^2 within	0.26	***	0.37	***	0.39	***	0.77	***	0.21	***	0.33	***
n (city-years)	160		160		65		65		364		364	

Table 6. Decomposition of D: Unique contributions at the ward, ED, and street scales, all cities, by year

		Share contributed by:		
	Total	**Ward**	**ED**	**Street**
Total				
1900	0.718	0.482	0.228	0.291
1910	0.787	0.495	0.253	0.255
1920	0.825	0.564	0.259	0.177
1930	0.875	0.614	0.240	0.146
1940	0.909	0.644	0.269	0.089

Table 7. Decomposition of D: Unique contributions at the ward, ED, and street scales, by city type and year

		Share contributed by:		
	Total	**Ward**	**ED**	**Street**
South				
1900	0.654	0.433	0.213	0.355
1910	0.744	0.417	0.271	0.311
1920	0.781	0.448	0.303	0.250
1930	0.851	0.493	0.316	0.191
1940	0.881	0.514	0.339	0.143
Destination				
1900	0.814	0.541	0.262	0.196
1910	0.840	0.586	0.243	0.161
1920	0.866	0.665	0.229	0.106
1930	0.893	0.688	0.197	0.114
1940	0.927	0.712	0.235	0.053
Mixed North				
1900	0.745	0.487	0.192	0.321
1910	0.786	0.473	0.246	0.281
1920	0.816	0.526	0.241	0.233
1930	0.857	0.579	0.243	0.178
1940	0.895	0.598	0.278	0.123
White North				
1900	0.823	0.559	0.205	0.237
1910	0.847	0.580	0.191	0.229
1920	0.852	0.601	0.224	0.177
1930	0.877	0.671	0.193	0.136
1940	0.910	0.706	0.197	0.097