The Wrong Side(s) of the Tracks:
Estimating the Causal Effects of Racial Segregation on City Outcomes

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Abstract

There is a strikingly negative city-level correlation between residential racial segregation and population outcomes—particularly for black residents—but it is widely recognized that this correlation may not be causal. This paper provides a novel test of the causal relationship between segregation and population outcomes by exploiting the arrangements of railroad tracks in the 19th century to isolate plausibly exogenous variation in a city's susceptibility to segregation. I show that, conditional on miles of railroad track laid, the extent to which track configurations physically subdivided cities strongly predicts the level of segregation that ensued after the Great Migration of African-Americans to northern and western cities in the 20th century. Prior to the Great Migration, however, track configurations were uncorrelated with racial concentration, income, education and population, indicating that reverse causality is unlikely. Instrumental variables estimates find that segregation leads to negative characteristics for blacks and high-skilled whites, but positive characteristics for low-skilled whites. Segregation could generate these effects either by affecting human capital acquisition of residents of different races and skill groups ('production') or by inducing sorting of race and skill groups into different cities ('selection'). The findings are most consistent with the view that more segregated cities produce better outcomes for low-skilled whites and that more segregated cities are in less demand among both blacks and whites, implying that Americans on average value integration.

I. Intro

Residential segregation by race is one of the most visible characteristics of many American cities. Although African-Americans represent just over one-tenth of the U.S. population, the average urban African-American lives in a neighborhood that is majority black (Glaeser and Vigdor 2001). Cities vary in the extent to which their black populations live in black neighborhoods, and more segregated cities on average have worse characteristics than less segregated cities, on measures ranging from infant mortality to educational achievement (Massey and Denton 1993).

The causal relationship between segregation and city characteristics is a long-standing question in economics, and a number of papers have attempted to measure the effects of segregation on outcomes (cf. Massey and Denton 1993, Wilson 1996, Polednak 1997, Cutler and Glaeser 1997). Skepticism abounds about these results, for two reasons: omitted variable bias and endogenous migration (for a rich discussion, see Cutler and Glaeser 1997). In the first, some economic, political, or other attribute[1] may lead some cities to have more segregation and also more negative city characteristics. This will cause omitted variable bias when estimating the bivariate relationship between segregation and city outcomes. In the second, although segregation must affect aggregate city characteristics through some effect on individuals, there at least two different ways it can do so. Segregated cities may be less productive, leading to lower accumulation of capital (human and otherwise) for its citizens. Alternatively, people may respond to segregation itself, and to any effects segregation has on production, by sorting between cities in ways that alter average city characteristics. Both of these phenomena are of economic interest, but only the former can be considered a causal effect of segregation on the outcomes of *people*. The combination of the two, which is easier to observe, must be considered an effect of segregation on *places*.

Instrumenting for a city's level of segregation can address the problem of omitted variable bias, thereby allowing the effect of segregation on macro city-level outcomes to be estimated. In this paper I address concerns about omitted variable bias by using a function of 19th-century railroad configurations, conditional on total length of railroad, to instrument for the extent to which cities became segregated as they received inflows of African-American during the 20th century. I formalize the widely observed phenomenon of the "wrong side of the tracks" by showing that cities that were subdivided by railroads into more defined neighborhoods—which arguably serve as a technology for creating segregation—became more segregated during the Great Migration. This instrumental variable strategy allows me to identify the causal effect of segregation on *places***.**

I present evidence that there is little possibility of contamination of this instrument. Railroad division satisfies the instrumental variable validity requirements outlined in Angrist and Imbens (1994). Unlike variation used in other work on segregation (Cutler and Glaeser 1997), it strongly and robustly predicts metropolitan segregation and does not separately predict confounding metropolitan outcomes.

The paper proceeds as follows. In section II, I discuss the historical framework, data and first-stage relationships. In section III, I examine the causal relationship between segregation and urban outcomes and the robustness of the first-stage and two-stage estimates. In section IV, I compare my results to approaches used in other studies, including those using ordinary least squares, those using other sources of variation, and those that focus on the behavior and outcomes of individual people.

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[1] For example, greater political corruption or a more industrial economy.

II. Historical framework, data, and first-stage relationships

To motivate the empirical work, Table 1 reports the 1990 characteristics of cities with 19th-century railroad division indexes above and below the median. The isolation index, a standard measure of racial segregation (Cutler, Glaeser, and Vigdor 1999), is twice as high in cities with above-median railroad division. Moreover, outcomes by race follow an interesting pattern that is consistent with the disparate resources that segregation could lead to: in cities with greater railroad division, the white population appears to have better characteristics in some cases, while the black population appears to have worse characteristics in all cases. Many of the differences are statistically significant, even using this crude approximation of the variation in railroad division. Next, I argue for the plausibility of railroad division as a determinant of segregation.

A. Historical framework

Stylized facts about the history of US segregation

The history of urban American racial segregation can be divided into four periods. In the 19th century, very few African-Americans lived outside of the South. This changed rapidly during the Great Migration (roughly 1915 to 1950), when large numbers of African-Americans migrated into Northern and Western cities from the South. Cities became highly segregated as their urban black populations grew (Cutler et al. 1999). This process was unique to African-Americans; despite popular images of “Little Italy” and the like, for no other stigmatized group was it at any time true that most of its members lived in neighborhoods consisting mostly of other members of the group.[2] Much of black segregation resulted not from market forces but from deliberate government policies and collective action by white residents (Massey and Denton 1993). Government policy towards segregation changed gradually during the civil rights era, and a clear break in housing policy came in 1968 with the Fair Housing Act, which made discrimination illegal. Since 1968, however, high levels of segregation have continued to characterize most American cities (Cutler, Glaeser, and Vigdor 1999).

Mechanics of the relationship between railroad division and segregation

I am not familiar with any explicit explanation for why it is that railroads tend to define neighborhood boundaries, although in many cities it is self-evident that they do. One likely possibility is that a railroad provides a clear demarcation that facilitates collective agreement on neighborhood boundaries by residents, real estate agents, police, and others. When a community is interested in remaining separate from a particular group, railroads could facilitate collective action in enforcing segregation by reducing coordination costs.

As the black population of a city grew over the Great Migration, the physical size of the city's ghetto had to increase if segregation were going to be maintained. Since railroads generate neighborhood divisions, cities that were subdivided by railroads into many small insular neighborhoods could expand on a ghetto one neighborhood at a time

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[2] "[European ethnic] immigrant enclaves in the early twentieth century…differed from black ghettos in three fundamental ways. First, unlike black ghettos, immigrant enclaves were never homogeneous and always contained a wide variety of nationalities, even if they were publicly associated with a particular national origin group…A second crucial distinction is that most European ethnics did not live in immigrant 'ghettos,' as ethnically diluted as they were…The last difference between immigrant enclaves and black ghettos is that whereas ghettos became a permanent feature of black residential life, ethnic enclaves proved to be a fleeting, transitory state in the process of immigrant assimilation." (Massey and Denton 1993, pp. 32-33)

and still practice “containment,” whereby the black population remained concentrated and contiguous. On the other hand, in cities where railroads were not configured in such a way as to define many neighborhoods, expanding a ghetto meant breaching a main divide. Once the black population increased enough that spillover was inevitable, segregation could no longer be as easily maintained in the open area on the other side.[3]

Figure 1 illustrates this concept. Binghamton, NY, and York, PA, were similar in total quantity of railroad tracks laid by 1900 (shown in red, circumscribed by a four kilometer-radius circle). They also had similar industrial bases and substantial changes in African-American population (these characteristics are discussed in detail later in the paper). But York’s railroads were configured such that they created many insular neighborhoods, particularly in the center of the city. Its Census tracts, in the year 2000, show a black population more concentrated in this set of small, railroad-defined neighborhoods (tract percent black is represented by darkness of tract shading). In Binghamton, on the other hand, railroads are tightly clustered, leaving some areas too long and narrow to encompass neighborhoods and others too wide open to create meaningful population restrictions. In contrast to York, Binghamton’s year 2000 Census tracts show its black population dispersed lightly and evenly throughout much of the city.

The process of extracting railroad information from a city map is illustrated in the example of Anaheim, CA (Figure 2). For each city, its map or maps were used first to identify its physical size, shape and location at the time its map was made. A Geographic Information Systems program, ArcGIS, was used to create a convex polygon that was the smallest such polygon that could contain the entire densely inhabited urban area. Dense

[3] In *The Strategy of Conflict*, Schelling (1963) claimed that an army in retreat must find a landmark—a river, a wall—around which to regroup. An army retreating on a featureless plane, he predicted, will soon

habitation, defined as including any area with houses and frequent, regular cross-streets, was identified by visual examination. ArcGIS was then used to identify the centroid of this polygon, and this point was defined as the historical city center. A four-kilometer radius circle around this point became the level of observation for the measurement of railroads. This approach meant that differences in initial city area would not distort the measurement of initial railroads: cities that were, at the time, very small would still be coded with railroads that affected later development, after the population had expanded; cities that were already large would have only those railroads in their center cities included. It should be noted, however, that about 75% of the cities were smaller than 16π square kilometers when mapped, and many were much smaller, so for most cities this measure includes railroads that were laid on unoccupied land without need to consider habitation.

Visual examination reveals that the historical city center created in this way is typically quite close to what would be identified as the current city center if using a current map. Within this four-kilometer circle, every railroad was identified, its length measured, and the area of the "neighborhoods" created by its intersections with each other railroad calculated. Historical railroads predict the borders of current neighborhoods as identified by the Census quite well (Figure 2f). The actual land area within the circle was also calculated, so that measurement could be adjusted for available observed land when working with maps that truncate city observations or include substantial bodies of water.

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find that all is lost. Thanks to Glenn Loury for bringing this argument to my attention.

From the data generated this way, I create a measure of a city's railroad-induced potential for segregation. I define a "railroad division index," or RDI, which is a variation on a Herfindahl index that measures the dispersion of city land into subunits.

$$(1) \quad RDI = 1 - \sum_i \left(\frac{area_{neighborhoodi}}{area_{total}} \right)^2$$

The RDI quantifies the extent to which the city's land is divided into smaller units by railroads. If a city were completely undivided by railroads, so that the area of its single neighborhood was 100% of the total city area, the RDI would equal 0. If a city were infinitely divided by railroads, so that each neighborhood had area near zero, the RDI would equal 1. The more subdivided a city, the more "sides" there are to its tracks, and the more possible boundaries between groups are available to use as barriers enforcing segregation. In particular, if railroads created many small neighborhoods, it would have been possible during the Great Migration to relieve pent-up housing demand by allowing a ghetto to expand into an adjacent neighborhood, while still maintaining a new railroad barrier between the ghetto and the rest of the city. This should have facilitated persistent segregation even as the black population increased.

In contrast with the quasi-random variation in segregation technology I am capturing here, in the ideal case one would test for the effects of segregation on city outcomes using two initially identical cities with small open economies. One, the treatment city, would be assigned perfect residential segregation, while the control city would be assigned perfect residential integration. At time zero, each city would receive the same total number of blacks and the same total number of whites, with individuals assigned randomly to one city or the other. By virtue of random assignment, each city's within-race and overall skill distribution would start out equal to that of the other city.

Restricting individuals from moving, one could then observe, over generations, the overall and within-race outcomes in each city. Absent migration, differences in these outcomes would reflect *both* the effect of segregation on individuals and the effect on the population characteristics of places—since population would be fixed, the two effects would not be conceptually different. Within-race outcomes would identify whether segregation was beneficial or harmful for each group; which city had better aggregate outcomes would identify whether segregation is more or less efficient than integration for society as a whole.

B. First-stage relationship

Three assumptions are necessary in order to postulate that the quasi-experiment generated by railroad configuration approximates the ideal and that therefore it is a valid instrument for segregation. First, the railroad division index must induce meaningful variation in degree of racial segregation, i.e. there must exist a strong first stage. In fact, column 1 of Table 2 shows that, controlling for track per square kilometer in the historical city center, the neighborhood RDI generated by the configuration of track strongly predicts the metropolitan isolation index in 1990. An increase of one standard deviation in the RDI (0.141) predicts an increase in isolation of one-third of a standard deviation (0.067, t-statistic=4.70). Moreover, it strongly predicts three of the other four aspects of segregation provided in Cutler, Glaeser, and Vigdor (1999).

Second, it must be the case that railroad configuration affected city outcomes through segregation and not through some other channel. In particular, railroad-induced segregation technology should have proved differentially important in cities with high exogenous inflows of blacks. In cities with large exogenous changes in African-American population, which therefore had high demand for segregation, available segregation technology would have made more of a difference in the resultant degree of separation of blacks and whites. In cities with low inflows, where segregation did not become a salient demand (Weaver 1955, Massey and Denton 1993), differences in the technology for producing segregation would have been less relevant to the equilibrium dispersion of blacks and whites and to city outcomes.

This has the empirical implications that RDI should have both a stronger first-stage relationship with segregation and a stronger reduced-form relationship with outcomes in cities expected to have larger black inflows. To test for these implications, I use proximity to the South to proxy a city's expected black inflows.[4] Cities in my sample that are 100 miles closer to the South averaged half a percentage point higher black population by 1940 (the t-statistic for the correlation is 5.26). Controlling for the direct effect of proximity to the South, the interaction between proximity and RDI should measure the added importance of railroad division for determining segregation where black inflows were higher. The results of this test are shown in the right-hand panel of Table 2. The interaction does, as hypothesized, predict greater segregation than does the RDI alone. Therefore as my main first-stage specification I use the proxies for supply and demand for segregation technology as my complete set of instruments, as shown in column 6 of Table 2.[5]

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[4] Alternatively I have used a city's WWII war contracts per capita as a predictor of black inflows (Dresser 1994), but subsequent literature has raised concerns with the excludability of that measure (Collins 2001).

[5] The F-statistic for the joint significance of the three variables is 15.37, well above the Stock and Yogo (2002) threshold for three instruments and a single endogenous regressor.

In Table 6, discussed in detail below, I provide evidence for the second implication: that railroads only affect outcomes where segregation was made salient by large black inflows. In particular, I find that the RDI much more strongly predicts outcomes in cities within 400 miles of the South than in those that are farther away.

The third assumption necessary in order for railroad division to be a valid instrument is that railroads and people were assigned to cities orthogonally to one another. A thorough review of the available evidence reveals nothing suggesting that railroads were configured in any planned way (see Appendix A: The History of U.S. Railroad Construction). Moreover, Table 6 also provides evidence that cities look similar on observables in the pre-period; therefore, there would have been no plausible reason for individuals to initially sort into cities based on railroad division.

Finally, in order to believe that railroad division can identify the effect of segregation on *people*, it would be necessary to assume that individuals do not move. This assumption is plainly not credible; however, it is also not necessary to identify effect on *places*.

D. Sample

My major data sources are U.S. Census Bureau reports on metropolitan demographics (various years), information on 19^{th} century railroad configuration extracted from archival maps, measures of metropolitan segregation from Cutler and Glaeser (1997) and Cutler, Glaeser, and Vigdor (1999), and proximity of the city to the nearest former slave state.

Ideally, my sample would include all places outside the South that were incorporated prior to the Great Migration, so that they were potential destinations for African-Americans leaving the South. Then the growth of the place itself into an MSA could be treated as an outcome of its potential segregation. Because the Census only provides data for large places, however, it is not possible to get pre-period information for places that were small at the time of the Great Migration.[6]

My sample of cities is chosen as follows. Cutler and Glaeser (1997) provide data for MSAs with at least 1000 black residents. Of these MSAs, I include only those in states that were not slave-owning at the time of the Civil War, because these were the states that had few African-Americans prior to the Great Migration.[7] Further, my sample was limited by the set of historical maps held by the Harvard Map Library.[8] The library depends on donations and estate purchases, etc., to collect maps, and therefore there are gaps in its collection. I have compared the full Cutler and Glaeser (1997) sample to the sample available from the Harvard Map Library. The cities for which the library could

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[6] Note that if segregation reduces economic development, then more towns will fail to achieve MSA status and therefore be censored in the treatment group than the control group. This will cause an upward bias in the treatment effect estimate, attenuating it towards zero. Alternatively, if segregation increases economic development, the bias will run in the other direction; since the coefficient sign is now reversed, it is again an attenuation bias. Thus censoring on eventual MSA status should bias, if at all, towards a finding of no result.

[7] Specifically, I exclude Delaware, Maryland, Washington, DC, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Tennessee, Kentucky, Missouri, Texas, and Arkansas. Nearly 90% of African-Americans resided in one of these states in 1910 (author's calculation from 1910 IPUMS data).

[8] The maps that provide railroad placement information were created by the U.S. Geological Survey as part of an effort to document the country's topography, beginning in the 1880s.[8] These maps display elevation, bodies of water, roads, railroads, and (in many cases) individual representations of non-residential buildings and private homes.[8] The edges of a 15-minute map are exogenously defined in round 15-minute units, so that, for example, a map will extend from -90°30'00'' longitude and 43°45'00' latitude (in the southeast corner) to -90°45'00' longitude and 44°00'00' latitude (in the northwest corner).

Because the Harvard Map Library collection is incomplete, there are 77 cities in non-South states available in the Cutler and Glaeser data for which I do not have the necessary map observations. In addition, in 15 cities I observe only some fraction of the four-kilometer-radius land area I wish to observe, since the cities overlap two or more 15-minute areas and I have maps only for some subset of those areas. Finally, in 40 cases the city overlaps multiple areas and I observe all of the areas.

not provide maps appear quite similar in both historical and current characteristics measured by Cutler, Glaeser, and Vigdor (shown in Table 3), differing at the 5-percent significance level on only 4 of 46 measures. My final sample consists of 121 urban areas. A scatterplot of the cities, with RDI on the x-axis and segregation index on the y-axis, is shown in Figure 3.

E. Data

Segregation is captured by an isolation index, which measures the extent to which blacks live near other blacks rather than non-blacks. Isolation is defined as

$$\text{(2)} \quad \text{Index of isolation} = \frac{\sum_{i=1}^{N}\left(\frac{black_i}{black_{total}} \cdot \frac{black_i}{persons_i}\right) - \left(\frac{black_{total}}{persons_{total}}\right)}{\min\left(\frac{black_{total}}{persons_i}, 1\right) - \left(\frac{black_{total}}{persons_{total}}\right)}$$

where $i = 1 \ldots N$ is the array of census tracts in the area. It varies from zero to one. Note that an index of zero is improbable in the absence of central planning.

I use the Cutler/Glaeser/Vigdor segregation data provided online by Vigdor (2001). These data come from various decennial Censuses, and include 19th and 20th century historical segregation indices and metropolitan characteristics from Cutler and Glaeser (1997), 1990 GIS-dependent measures of segregation based on Census data from Cutler, Glaeser, and Vigdor (1999), and additional data from the 2000 Census from Glaeser and Vigdor (2001). These data include isolation indices for every decade from 1890 to 2000. In addition, they provide four other measures of segregation, all based on those developed in Massey and Denton (1988). These include an index of dissimilarity, available for every decade from 1890 to 2000, which provides a different way to organize the same information contained in the isolation index and is highly correlated with the isolation index. Supplementary measures of clustering, concentration, and centralization—all of which rely on geographical data about the proximity, size, and location of a city's census tracts—are available for 1990. Isolation is a standard measure of segregation in the literature, and I use the isolation index throughout the paper because it exhibits a slightly stronger relationship with railroad division than do the other measures. The results, however, are broadly robust to the use of the other standard measures.

Aggregate city[9] characteristics by race are taken from published Census reports. Outcomes, represented by *Y* in equation (2), include the proportions of a city's blacks and whites who are poor, unemployed, high-school dropouts, college graduates, or who have household incomes above $150,000. The first three outcomes should reflect primarily characteristics of a city's low-skilled population, who are more likely to be on the margin of poverty, unemployment, and dropping out of high school. The last two outcomes should reflect primarily characteristics of a city's high-skilled population. Proxies for aggregate demand for cities by race include percent of the black and white populations that are new to the MSA, median rent by race, and crowding.

F. Econometrics

[9] I collect city outcomes from published Census reports (U.S. Census Bureau 2005). Although at the time that tracks were laid each of these cities was physically separated by open space from other cities, over the last century urban growth has meant that many once-distinct metropolitan areas are now conglomerates. To surmount this problem, I collect data for the reporting area which best centers on the original city center without containing other original city centers. Thus I use MSA-level data for the 64 cities that have remained independent MSAs. For MSAs in which multiple city centers are each in a separate county, I assign to each city the characteristics for the county that holds that city's original urban center. Doing so allows me to differentiate between the effect of an original center on its county level outcomes and the combined effect of several centers on MSA-level outcomes (e.g. outcomes for the New York-Northern New Jersey-Long Island Consolidated MSA). Fifty-three cities are in unique counties but share an MSA

Because RDI-induced segregation is virtually randomly assigned, the relationship between segregation and outcomes can be captured using simple equations. Segregation can be modeled as a classic endogenous regressor affecting outcomes at the city level,

$$(1)\ Seg = \alpha_1 Z + \alpha_2 X + \mu$$

$$(2)\ Y = \beta_1 Seg + \beta_2 X + \varepsilon,$$

and then estimated using two-stage least squares analysis. The right-hand side variable of interest in equation (2), Seg, represents a city's current level of segregation. Z is a vector of instrumental variables, including: proxies for the supply of segregation technology, i.e. the RDI; the demand for segregation technology, i.e. black inflows as predicted by proximity to the South; and the interaction of supply and demand, i.e. the product of RDI and proximity.

III. Results and interpretation

A. Two-stage least squares estimates

Table 4 shows two-stage least squares estimates of the effects of racial segregation on a variety of current urban characteristics. Black outcomes and white outcomes are shown separately. The top panel of Table 4 demonstrates that RDI-induced segregation causes a truncation of the left tail of the distribution of outcomes for a city's white population. A 10-percent increase in segregation predicts a 1.2-percentage point decrease in the white poverty rate, a 1.3-percentage point decrease in the white high-school dropout rate, and a 0.7-percentage point decrease in the white unemployment rate; all of these effects are statistically significant at conventional levels. In contrast, RDI-

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with at least one other city. Finally, for the 17 cities that share a single county with another city, I assign induced segregation causes a fattening of the left tail of the distribution of outcomes for a city's black population. A 10-percent increase in segregation predicts a 2.3-percentage point increase in the black poverty rate, a 2.0-percentage point increase in the black high-school dropout rate, and a 0.2-percentage point decrease in the black unemployment rate; the first two effects are statistically significant at conventional levels.

The middle panel of Table 4 shows that RDI-induced segregation has negative effects on the characteristics at the upper end of the skill distribution for both blacks and whites. A 10-percent increase in segregation lowers the fraction of a city's whites who are college graduates by1.8 percentage points and the fraction of blacks by 2.5 percentage points. Similarly, it lowers the fraction of whites with household incomes above $150,000 by 0.6 percentage points and the fraction of blacks by 0.4 percentage points. The negative effects on these characteristics are highly significant for blacks and marginally significant for whites.

The bottom panel of Table 4 shows migration and housing market characteristics by race from 2000 Census statistics reported at the urban level. Cities with more RDI-induced segregation have significantly fewer new residents, both black and white. A 10-percent increase in segregation leads to 1.1 percentage points fewer new white residents and 2.4 percentage points fewer new black residents.

Unfortunately, because the Census does not supply data on city-level out-migration, I cannot distinguish between low demand and low supply as explanations for this result. It may be that there are fewer new residents because out-migration is lower, leading to few vacancies. However, the evidence on housing values in Table 5 suggests

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the characteristics of the politically-defined city itself to the observation.

that segregated cities are in fact in less demand. First, more segregated places have significantly lower median rents for both blacks and whites (results are similar for mortgage costs and home values). These effects do not appear to be driven by lower cost of living in more segregated cities, since rents are also lower as a fraction of income (significantly lower for whites). Second, lower expenditures on housing also do not seem to reflect lower consumption of housing in more segregated cities; blacks and whites in more segregated cities are significantly less likely to live in crowded homes (that is, homes with more than one person per room).

In sum, segregation causes *places* to have low-skilled whites who are better off, and blacks and high-skilled whites who are worse off. On all but one measure, the magnitude of this difference is greater for blacks than for whites. In addition, segregated cities have lower rents and less in-migration, suggesting that they may be in less demand.

B. Robustness and falsification checks

As discussed above, for the RDI to be a valid instrument for segregation, it must not predict city characteristics in times or places without black population inflows. Table 5 presents a series of tests of this hypothesis. In the left-hand panel are shown tests of the predictive power of the RDI, proximity to the South, and the interaction between them on a variety of characteristics of cities in 1910, prior to the start of the Great Migration. These include 1910 segregation of European ethnic immigrants[10], population, percentage black, and physical size. In the next panel are shown tests for predictive effects on a variety of 1920 characteristics, measured after the beginning of the Great

[10] European ethnic immigrant segregation was then at its (relatively low) historical peak, according to Massey and Denton (1993).

Migration. These include percentage black just after black inflows commenced, the literacy rate, labor force participation, and the share of employment in trade, manufacturing, and railroads. Only one of the thirty coefficients of interest, that of closeness to the South on 1910 physical area, is significant at the five-percent level.

The bottom panel of Table 5 tests the proposition that the railroad division should more strongly predict outcomes in cities that are expected to have greater black inflows. Here, instead of interacting proximity to the South with the RDI, I present the reduced-form effects of railroad division on outcomes separately by whether cities are within 400 miles of the South (400 miles is the median distance in the sample). Because the total sample size is cut in half for each regression, many of the estimates become insignificant. Nonetheless, it is clear that overall the relationships reported in Table 4 persist in those cities within 400 miles of the South, and are uniformly weaker in cities more than 400 miles away.

In sum, the instruments do not predict segregations in times and places where there were not large black inflows. They do not predict pre-period characteristics, including the segregation of groups that were stigmatized prior to the arrival of blacks and the structure of industry. After the Great Migration, railroad division does not predict outcomes in places that were too far from the South to receive large black inflows. These results provide evidence that railroad division drives current city characteristics through racial segregation rather than through some other mechanism.

C. Comparison to OLS results

Ordinary least squares estimates of the relationship between segregation and outcomes are shown in Table 6. OLS estimates do not find strong correlations between segregation and white outcomes; only the estimate on white poverty is statistically significant. OLS does find strong negative relationships between segregation and black outcomes across the board.

Relative to two-stage least squares estimates, OLS estimates do not differ significantly from IV for educational outcomes or for black unemployment. However, OLS estimates appear to significantly understate the positive effects of segregation on the low end of the white outcome distribution, specifically segregation's role in reducing white poverty and unemployment. In addition, OLS significantly understates the negative effect of segregation on black poverty and understates the negative effects on the income of high-skilled whites and blacks. Overall, correlations between segregation and outcomes seem to understate the extent to which segregation drives better outcomes at the low end of the white distribution at the expense of the average characteristics of others.

IV. Discussion

Overall, segregated cities seem to have low-skilled whites with better characteristics and other groups with worse characteristics. These equilibrium characteristics could reflect differences in the effect of segregation on *people*—for example, segregated cities could transfer resources to low-skilled whites at the expense of blacks and the high-skilled. Alternatively, it could reflect strictly the effect of segregation on *places* through differential migration—for example, whites with low education could prefer segregated cities, while other groups prefer less segregated cities.

Moreover, these effects could reinforce each other so that in equilibrium both are at work.

Previous research on this topic has failed to identify these effects of segregation on places because researchers have lacked a good instrument for segregation. They have therefore been unable to separate the effect of segregation on aggregate city outcomes from reverse causality and omitted variables. Cutler and Glaeser (1997) identify this problem but are unable to surmount it.[11] Instead, for their main results they rely on a differences-in-differences strategy, using whites in more vs. less segregated cities as a control group. This strategy requires two identifying assumptions that preclude the results I find. First, they must assume that segregation only affects blacks; therefore they cannot estimate effects of segregation on whites. Because this strategy misses the positive effects of segregation on whites, it overstates the negative effects of segregation on black poverty, unemployment, and high-school dropout rates. Second, they must assume that city populations are fixed; therefore they cannot estimate effects of segregation on city demand. They limit their analysis to the characteristics of 22- to 30-year-olds on the premise that doing so sidesteps concerns about migration.

However, when I replicate their analysis by using individual data on 22- to 30-year-olds, I again find that the main effects of RDI and the interaction of RDI and proximity to the South predict positive outcomes for low-skilled whites and negative effects on high-skilled whites. Again, I find that the net effect of RDI, RDI*proximity, and the interactions of those with being black predict negative effects on African-American characteristics. I am, however, hesitant to ascribe these results to effects on

[11] One instrument they attempt to use, rivers (Hoxby 199?), has only a weak relationship with segregation, and fails to meet the excludability criterion for validity.

individual people rather than places. After all, these outcomes could be affected by selective migrations of previous generations as well.

Other recent research has examined residential preferences for neighborhoods within cities, examining the question: why has segregation persisted since the Fair Housing Act? Boustan (2006) argues that segregation within metropolitan areas between municipalities is an efficient mechanism for differences in willingness to pay for public goods. Bayer, Fang, and McMillan (2005) argue that individuals prefer neighborhoods that are racially and economically homogeneous, and Snow (2006) finds evidence that individuals prefer racially homogeneous municipalities.

My results suggest reinterpreting these findings as coping strategies that are relevant *within* segregated urban areas. As modeled by Schelling (1971), segregated equilibria may be difficult to change through individual market action. But Cutler, Glaeser, and Vigdor (1999) find that Americans are differentially migrating to less segregated MSAs, and my results suggest that this migration occurs in the face of higher prices in less segregated MSAs. It is plausible that the tastes for integration reported in survey research (Bobo et al. 1994) are real, but that within segregated areas people prefer to live in neighborhoods with others like themselves rather than in neighborhoods where they are isolated. Such decisions would reinforce segregation, but would represent the type of market failure outlined in Schelling (1971) rather than preferences for segregation.

Collins and Margo (2000) have argued that ghettoes only became bad for black outcomes only after the civil rights movement. Although that question is beyond the scope of this paper, recent results are consistent with such a hypothesis: Ananat and

Washington (2006), using railroad division to predict segregation, show that the rise of black political power has been weaker in more segregated cities. In future research, I will further explore the mechanisms through which segregation appears to affect city characteristics. Besides political power, plausible channels through which segregation may affect city outcomes include the location of amenities and disamenities, economic redistribution, and school finance.

Appendix. The History of U.S. Railroad Construction: Why were tracks laid where they were laid?

Taylor and Neu (1956) argue that the first practical railroads, in the early 19th century, were a product of pre-capitalist mercantilism. Typically, a city and its leading businessmen would fund the building of a short-distance line from an agricultural area to its downtown as an incentive to farmers to choose it as a shipping destination.[12]

Wellington, in the encyclopedic *Economic Theory of the Placement of Railways* (1911), goes into great detail about how the exact routes of railroads were selected. At this point in American history, both labor and capital were scarce, while land was plentiful (Atack and Passell 1994). Consequently, Wellington focuses on land gradient and physical obstructions as the economic determinants of placement. These factors determined the necessary quantity of track, labor intensity of construction, and fuel efficiency, the costliest aspects of building and maintenance. As Atack and Passell (1994) note, "American railroads avoided topographic obstacles rather than level them, bridge them, or tunnel through them" (p. 444).

To insure that other cities did not benefit from their railroad investments, cities often deliberately chose unique track gauges. In Portland, Maine, the developers of a through line to Montreal consciously chose a gauge incompatible with existing Portland-Boston lines, for fear that otherwise "Boston would capture their trade and make them merely a satellite city" (Taylor and Neu, 1956, p.18). The Maine legislature forbade existing lines to change their gauges in response.

During the Civil War, it became clear that having hundreds of short unconnected roads rather than a national network inhibited military activities. In addition, by the post-bellum period railroad transport had become a consumption good in itself rather than merely a subsidy used to capture trade (for one thing, trains by this point were people-movers as much as goods-movers). Therefore railroad companies became interested in connecting urban railways through town, in order to save "switching costs," that is, the cost of unloading and reloading passengers and freight.

This combination of economic and security interests in the post-bellum period led Congress to impose a standard gauge on all railroads and to subsidize private companies to create a single network throughout the country. Much of the placement of railroads was determined by this goal of a national network.

Many people resisted the movement to standardize and connect railroads in towns that had these discontinuities. A clear threat to the independence between railroad placement and other town characteristics would exist if differential resistance was based on concerns about city topography—that citizens objected that railroads would divide neighborhoods or cause other disamenities. In fact, however, the historical record makes no mention of railroads' use and effects as a social barrier at the time they were being laid (one reason may be that most towns were small enough that such barriers or local disamenities didn't have significant meaning). The main objection instead was to connection *per se*. Businesses complained because towns with disconnected trains had developed an economy of middlemen, such as handlers for freight and service establishments for waiting crew and passengers (Taylor and Neu 1956).

The strong incentives for connection, however, eradicated the switching industry, and at the same time development in the West drove the construction of a truly

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[12] For instance, the Boston and Worcester line was designed by Boston merchants to divert trade between Worcester and Providence (Taylor and Neu 1956, p. 4).

transcontinental network. Here, a clear threat to the independence of the initial positioning of railroads and other neighborhood characteristics would arise if railroads had systematically been built on land with depressed prices because it was less desirable. At the time, however, land was so plentiful that Congress was literally giving it away under the Homestead Act and other public land liberalizations. In fact, government gave land to railroads just to get them to build, and in many cases had to give massive amounts—up to 40 miles on alternating sides of the road—because the land was worth so little when undeveloped (Atack and Passell 1994, chapters 9 and 16). Thus, it made poor business sense to emphasize land cost over the cost of materials, labor, and energy consumption, which were functions of the factors emphasized by Wellington (1911).

By the end of 19th century, the national network of railroads was nearly complete: over three-quarters of all U.S. tracks ever laid were in place by 1900. All populated areas were completely included in the network. All of the cities from which I draw my sample—defined as those that later grew large enough to become MSAs with at least 1000 blacks—had railroads by 1900.

From this evidence on the relationship between railroad placement and other local characteristics, I argue that relative railroad subdivision of a city's topography is uncorrelated with other relevant city characteristics, and therefore that it satisfies the exclusion restriction as an instrument for the effect of segregation on cities.

References

Acemoglu, Daron; Johnson, Simon; Robinson, James A. "The Colonial Origins of Comparative Development: An Empirical Investigation." American Economic Review, 91(5): 1369-1401.

Atack, Jeremy; Passell, Peter (1994). *A New View of American Economic History, 2nd Edition*. New York, NY: W.W. Norton and Company.

Bayer, Patrick; Fang, Hanming; McMillan, Robert (2005). "Separate When Equal? Racial Inequality and Residential Segregation." NBER Working Paper no. 11507.

Bobo, L.; Johnson, J.; Oliver, M.; Farley, R.; Bluestone, B.; Browne, I.; Danziger, S.; Green, G.; Holzer, H.; Krysan, M.; Massagli, M.; C. Charles, C.; J. Kirschenman, J.; Moss, P.; Tilly, C. (1994). *Multi-City Study of Urban Inequality*. Ann Arbor, MI: Inter-University Consortium for Political and Social Research Study #2535. http://data.fas.harvard.edu

Card, David; Rothstein, Jesse (2005). "Racial Segregation and the Black-White Test Score Gap." NBER Working Paper no. ????.

Collins, William (2001). "Race, Roosevelt, and wartime production: Fair employment in World War II labor markets." *The American Economic Review*. 91(1): 272-187.

Cutler, David M.; Glaeser, Edward L. (1997). "Are Ghettoes Good or Bad?" *Quarterly Journal of Economics*, 112(3): 827-72.

Cutler, David M.; Glaeser, Edward L.; Vigdor, Jacob L. (1999). "The Rise and Decline of the American Ghetto." Journal of Political Economy, 107(3): 455-506.

Cutler, David M.; Glaeser, Edward L.; Vigdor, Jacob L. (1997). "The Rise and Decline of the American Ghetto." NBER Working Paper no. 5881.

Dresser, Laura (1994). "Changing Labor Market Opportunities of White and African-American Women in the 1940s and the 1980s." Ph.D. dissertation, University of Michigan.

Glaeser, Edward L.; Vigdor, Jacob L. (2001). "Racial Segregation in the 2000 Census: Promising News." Washington, DC: Brookings Institution Center on Urban and Metropolitan Policy Survey Series.

Goering, John; Feins, Judith D.; Richardson, Todd M (2002). "A Cross-Site Analysis of Initial Moving to Opportunity Demonstration Results." *Journal of Housing Research* 13(1):1-30.

Hoxby, C. M. (1994)."Does Competition among Public Schools Benefit Students and Taxpayers?" NBER Working Paper No. 4979.

Massey, Douglas S.; Denton, Nancy (1993). *American Apartheid: Segregation and the Making of the Underclass*. Cambridge, MA: Harvard University Press.

Massey, Douglas S.; Denton, Nancy (1988). "The Dimensions of Residential Segregation." *Social Forces* 67(2):281-316.

Polednak, Anthony P. (1997). *Segregation, poverty, and mortality in urban African Americans*. New York : Oxford University Press.

Ruggles, Steven; Sobek, Matthew; Alexander, Trent; Fitch, Catherine A.; Goeken, Ronald; Hall, Patricia Kelly; King, Miriam; Ronnander, Chad (2004) *Integrated Public Use Microdata Series: Version 3.0*. [machine readable database] Minneapolis, MN: Minnesota Population Center [producer and distributor]. http://www.ipums.org.

Schelling, Thomas C. (1971). "Dynamic Models of Segregation." *Journal of Mathematical Sociology* 1(1971):143-186.

Taylor, George Rogers; Neu, Irene D. (1956). *The American Railroad Network, 1861-1890*. Cambridge, MA: Harvard University Press.

U.S. Census Bureau (2005). "American Factfinder" database, generated by author using American Factfinder software, August 2005. http://factfinder.census.gov.

U.S. Dept. of Justice, Federal Bureau of Investigation. "Uniform Crime Reporting Program Data: [United States], 1975-2002" [Computer file]. Compiled by the U.S. Dept. of Justice, Federal Bureau of Investigation. ICPSR09028-v4. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [producer and distributor], 2005-04-15.

Weaver, Robert C. (1955). "The Effect of Anti-Discrimination Legislation upon the FHA- and VA-Insured Housing Market in New York State." *Land Economics*, 31(4): 303-313.

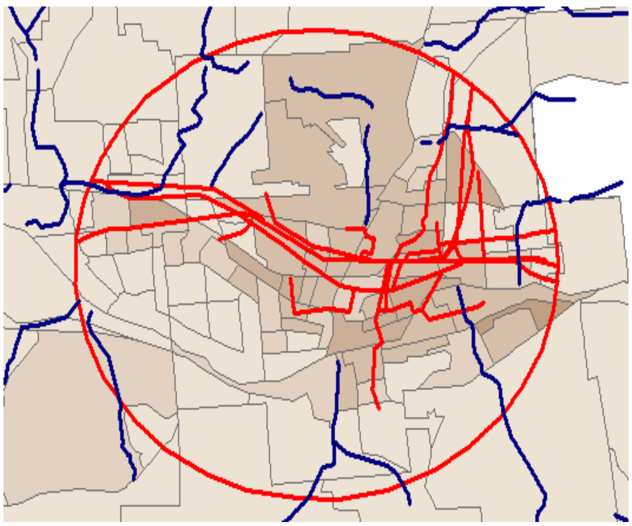
Wellington, Arthur Mellen (1911).*The Economic Theory of the Location of Railways, 6th Edition*. New York, NY: John Wiley and Sons.

Wilson, William Julius (1996). *When Work Disappears: The World of the New Urban Poor*. New York, NY: Vintage Books.

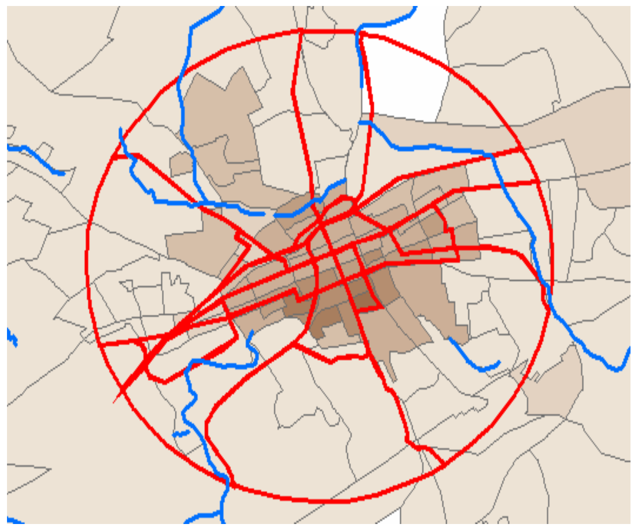
For figures in color, see
http://econ-www.mit.edu/graduate/candidates/download_res.php?id=250

Figure 1.

Binghamton, NY



York, PA



19th century railroads, shown in red within the 4-kilometer radius historical city center, divide York, PA into a larger number of smaller neighborhoods than do the railroads in Binghamton, NY. Thus, even though the two cities had similar total lengths of track, similar World War II labor shortages, and similar manufacturing bases (in fact, Binghamton was somewhat more industrial than York), York became more segregated, as can be seen from the smaller, more concentrated area of African-Americans near the railroad-defined neighborhoods at the city's center. Rivers are shown in blue.

Figure 2. Measuring the railroads of Anaheim, CA

Figure 2a. 1894 15' map showing Anaheim, CA, which is marked in green.

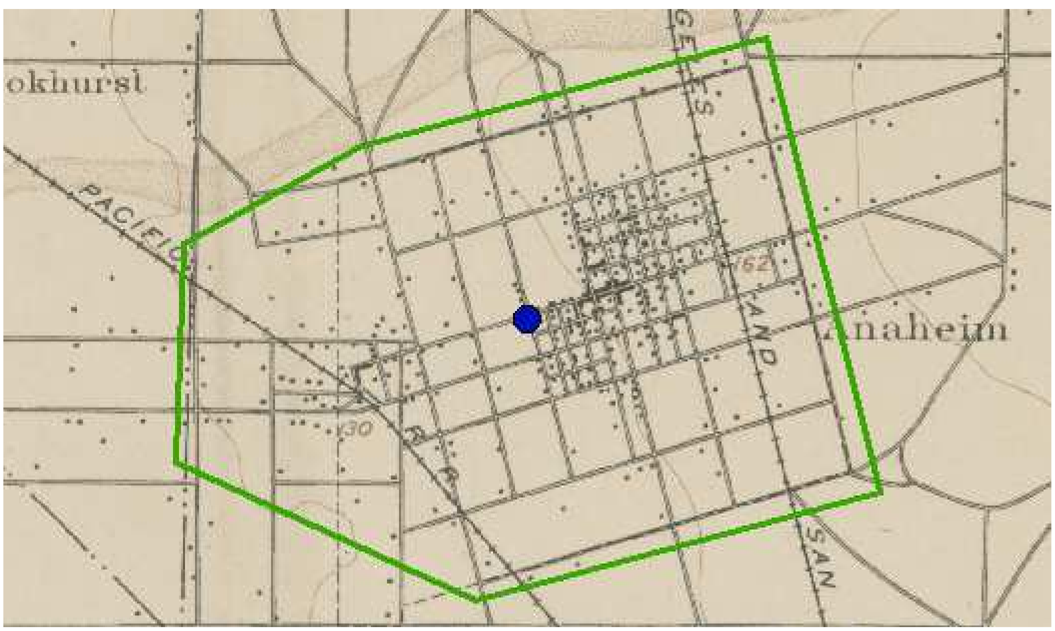


Figure 2b. The outline of the densely occupied area of Anaheim, defined as dense housing (each house is represented by a dot) and regular streets. The centroid of the occupied area is marked in blue.

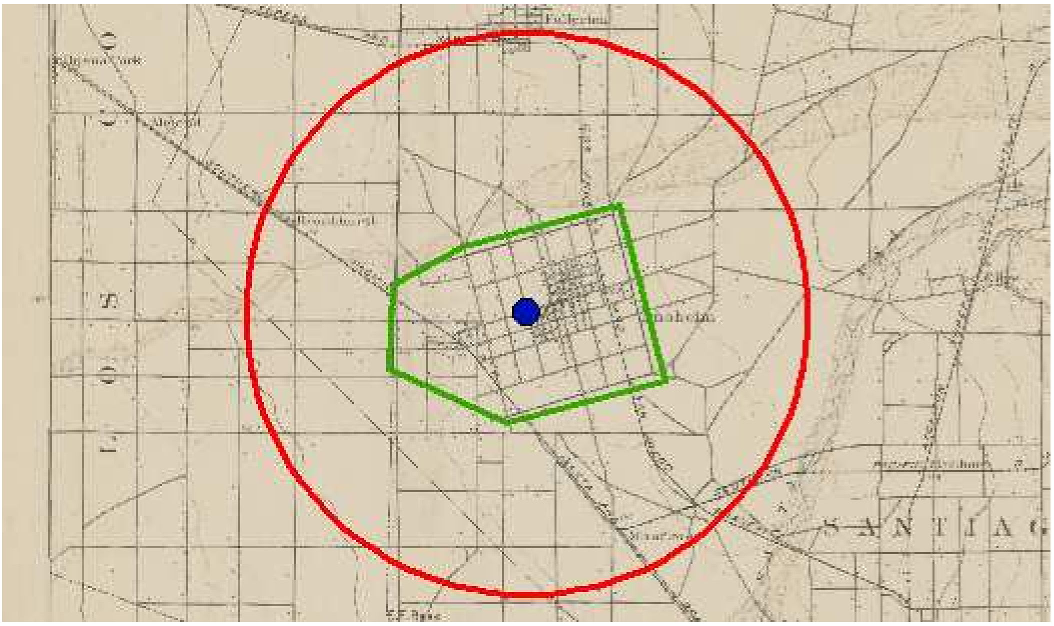


Figure 2c. The historical city center is defined as the 4 kilometer-radius circle around the centroid of the historical city, and is shown here in red.

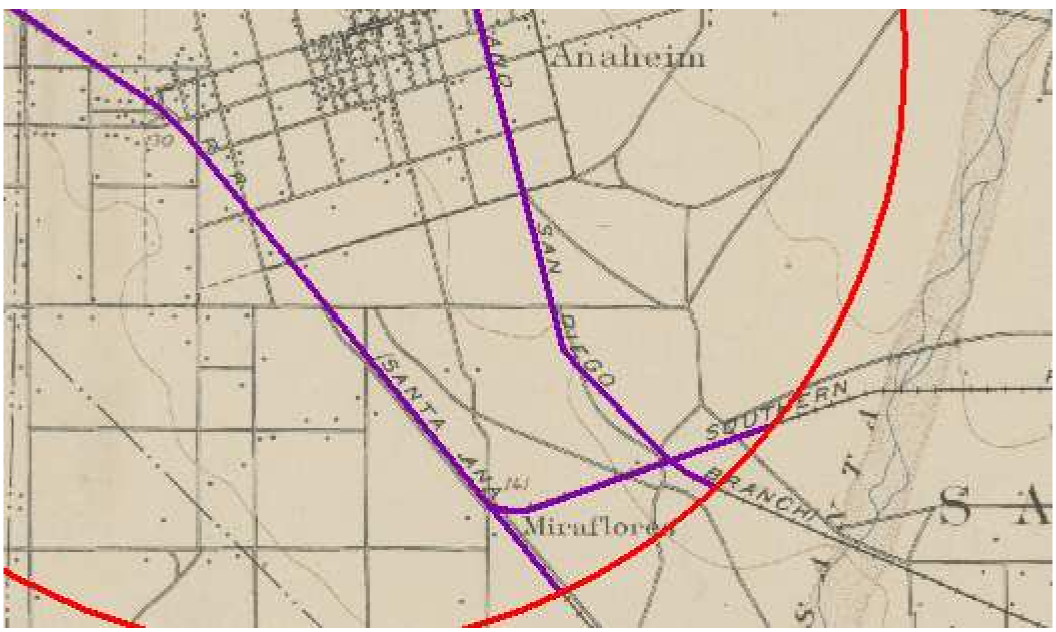


Figure 2d. Every railroad within the 4-kilometer circle is marked and measured—detail is shown here in violet.

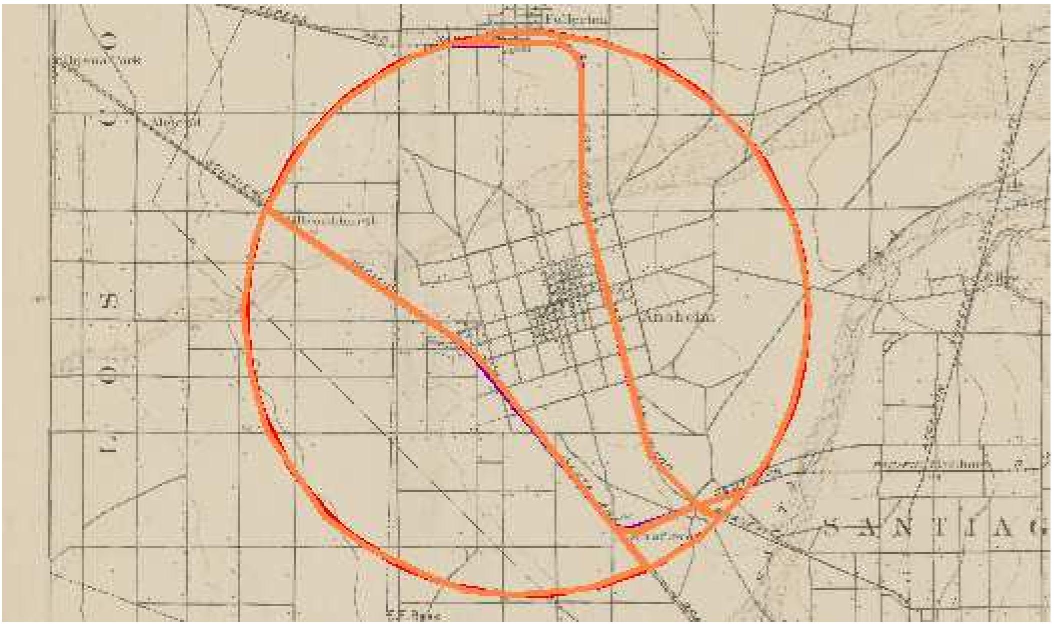


Figure 2e. Neighborhoods are defined as polygons created by the intersection of railroads with each other and with the perimeter. Anaheim contains five neighborhoods, shown here in orange. The area of each neighborhood is calculated and used to calculate a RDI measuring the subdivision of the historical city center.

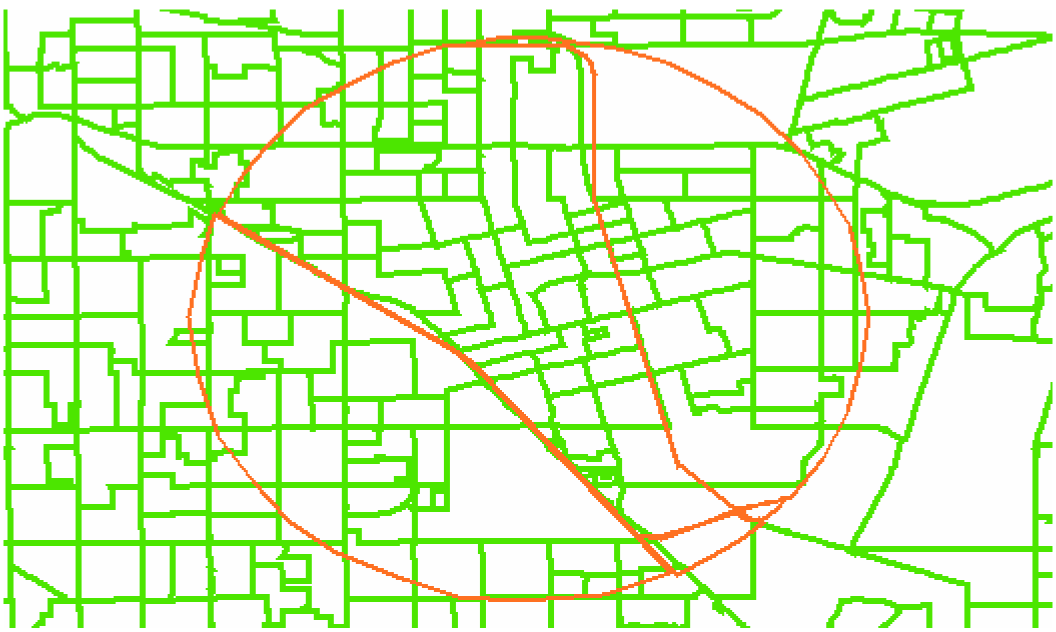
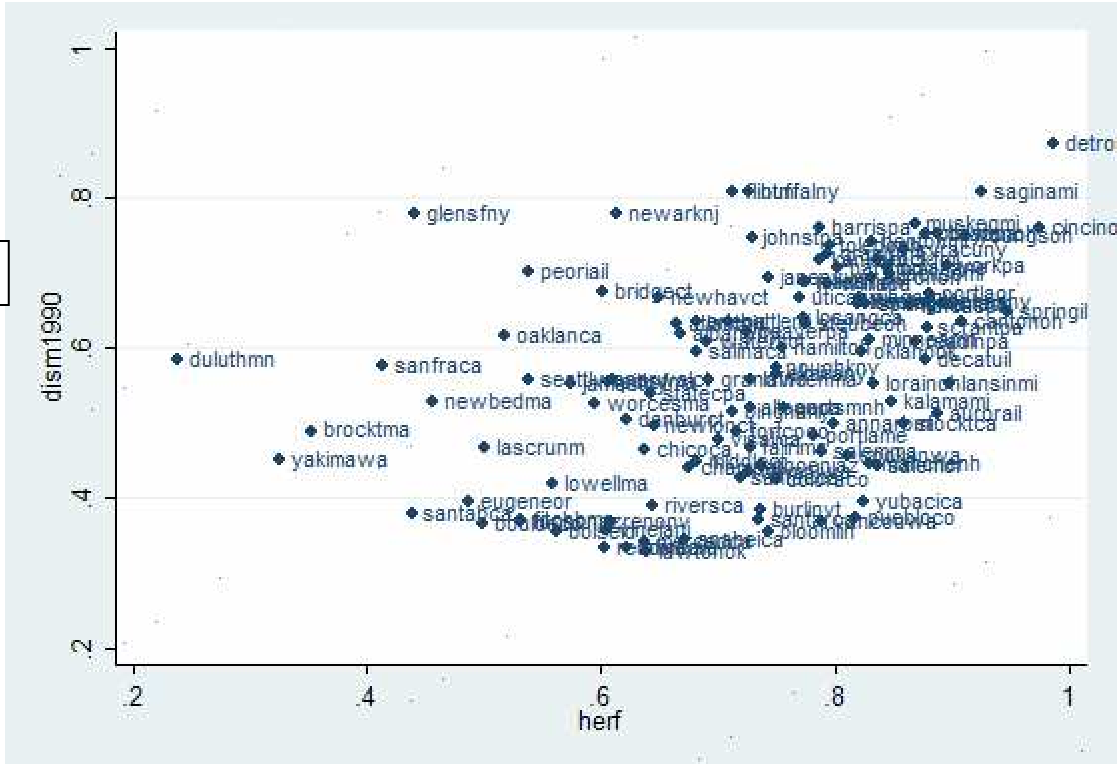


Figure 2f. Year 2000 census tracts are shown in green. Note that current neighborhood borders, as defined by the US Census Bureau in 2000, closely follow historical railroad tracks.

Figure 3. Final sample of MSAs

Segregation



RDI

Table 1. Mean outcomes for cities with above- and below-median railroad division

		Low-RDI cities	High-RDI cities	t-stat for significance of difference in means
Segregation (isolation index)		0.143	0.285	-4.466
Outcomes:	among:			
Poverty rate	whites	0.106	0.083	3.953
	blacks	0.253	0.275	-1.570
Percent of adults who are high school dropouts	whites	0.168	0.147	1.860
	blacks	0.240	0.263	-1.334
Unemployment rate	whites	0.055	0.048	2.735
	blacks	0.124	0.126	-0.312
Percent of adults who are college graduates	whites	0.267	0.244	1.313
	blacks	0.166	0.135	2.209
Percent of households with more than $150,000 in income	whites	0.045	0.038	1.245
	blacks	0.020	0.015	2.220

Table 2. First stage relationship between railroad configuration and segregation

	Isolation	Dissimilarity	Clustering	Concentration	Centralization	Isolation	Dissimilarity	Clustering	Concentration	Centralization
RDI	0.472	0.357	0.511	0.506	0.285	0.680	0.493	0.780	0.751	0.317
	(0.100)	(0.088)	(0.120)	(0.188)	(0.152)	(0.161)	(0.126)	(0.197)	(0.280)	(0.196)
Proximity to the South						-0.00032	-0.00021	-0.00043	-0.00039	-0.00005
						(0.00019)	(0.00014)	(0.00018)	(0.00036)	(0.00029)
RDI*proximity						0.00068	0.00049	0.00078	0.00078	0.00004
						(0.00026)	(0.00020)	(0.00027)	(0.00048)	(0.00037)
Track length per square kilometer	35.514	18.514	56.263	-0.668	-7.183	29.511	13.319	51.149	-7.103	-6.355
	(13.962)	(10.731)	(14.355)	(10.956)	(4.601)	(11.208)	(8.512)	(11.870)	(8.009)	(4.654)

Table 3. Mean characteristics of cities in and out of sample

Cutler-Glaeser-Vigdor variable	Not in sample	In sample	p-value of t-test for the difference in means
Isolation index--1890	0.049	0.053	0.698
Isolation index--1940 (tract-level)	0.355	0.310	0.498
Isolation index--1940 (ward-level)	0.234	0.203	0.424
Isolation index--1970	0.343	0.365	0.572
Isolation index--1990	0.229	0.214	0.584
Dissimilarity index--1890	0.385	0.383	0.956
Dissimilarity index--1940 (tract-level)	0.736	0.745	0.771
Dissimilarity index--1940 (ward-level)	0.570	0.575	0.896
Dissimilarity index--1970	0.744	0.741	0.883
Dissimilarity index--1990	0.574	0.569	0.805
Percent black--1890	0.030	0.027	0.532
Percent black--1940	0.058	0.040	0.029
Percent black--1970	0.056	0.061	0.502
Percent black--1990	0.067	0.061	0.669
Population--1890	129,829	66,044	0.242
Population--1940	390,895	203,708	0.203
Population--1970	919,239	680,997	0.371
Population--1990	689,768	587,824	0.525
# of wards--1890	17.778	13.421	0.288
# of wards--1940	15.929	14.238	0.542
# of tracts--1940	146.059	101.583	0.389
# of tracts--1970	211.118	162.013	0.430
# of tracts--1990	203.687	137.439	0.128
Total area--1900	19,283	11,748	0.143
Total area--1940	32,855	26,909	0.592
Total area--1970	2,344	1,626	0.187
Total area--1990	2,387	1,819	0.253
Per capita street car passengers--1915	204.214	174.429	0.247
Percent of blacks employed as servants-1915	0.210	0.210	0.984
Increase in urban mileage in 1950s	0.237	0.248	0.703
# of local governments--1962	62.925	56.114	0.587
Inter-governmental revenue sharing--1962	0.262	0.249	0.264
Centralization index--1990	0.741	0.771	0.244
Clustering index--1990	0.207	0.178	0.248
Concentration index--1990	0.556	0.657	0.001
Income segregation--1990	0.230	0.217	0.061
Black income segregation--1990	0.554	0.548	0.653
Educational exposure index--1990	-0.084	-0.088	0.615
Manufacturing share--1990	0.172	0.189	0.121
Median income	31,484	31,647	0.857
Median education	-0.162	-0.143	0.390
Share of moms who are single	0.236	0.261	0.320
Average commuting time	0.823	-0.452	0.040
Person-weighted density	1808.075	1271.729	0.047

Table 4. 2SLS estimates of relationship between segregation and city outcomes

	Poverty rate		Percent of adults who are high school dropouts		Unemployment rate		Percent of adults who are college graduates		Percent of households with more than $150,000 in income	
	white	black	white	black	white	black	white	black	white	black
Segregation (instrumented)	-0.118	0.228	-0.013	0.205	-0.067	0.016	-0.180	-0.254	-0.062	-0.037
	(0.036)	(0.077)	(0.058)	(0.091)	(0.018)	(0.042)	(0.104)	(0.070)	(0.034)	(0.012)
Track length per square kilometer	0.775	-8.543	-0.403	-2.948	3.064	1.436	2.170	2.460	1.849	1.153
	(1.388)	(3.405)	(3.102)	(3.808)	(1.184)	(2.212)	(5.069)	(3.174)	(1.611)	(0.630)

	Percent of residents who are in-migrants		Median rent		Median rent as a percent of income		Share of households with more than one person per room	
	white	black	white	black	white	black	white	black
Segregation (instrumented)	-0.108	-0.244	-572	-597	-12.350	-4.875	-0.134	-0.204
	(0.044)	(0.068)	(168)	(133)	(2.377)	(3.490)	(0.030)	(0.044)
Track length per square kilometer	-0.591	0.274	23436	17337	455.253	143.540	4.023	7.432
	(1.922)	(2.538)	(7252)	(6043)	(166.493)	(212.102)	(2.122)	(3.632)

Table 5. Specification checks

	1910 city characteristics				1920 city characteristics					
	Ethnic segregation	Physical area	Population	Percent black	Percent black	Percent literate	Labor force participation	Share of employment in trade	Share of employment in manufacturing	Share of employment in railroads
RDI	-0.080	23290	510357	-0.013	-0.005	0.119	-0.018	-0.028	0.265	-0.061
	(0.130)	(17447)	(398246)	(0.024)	(0.027)	(0.062)	(0.041)	(0.146)	(0.222)	(0.059)
Proximity to the South	0.000	-48.406	-744.810	1.770E-08	-6.800E-06	-1.102E-04	7.620E-05	-8.230E-05	-1.201E-04	-2.060E-05
	(0.000)	(18.298)	(392.108)	(2.32E-05)	(2.75E-05)	(6.28E-05)	(5.58E-05)	(1.30E-04)	(3.42E-04)	(3.57E-05)
RDI*proximity	0.000	35.197	916.524	3.220E-05	5.040E-05	1.316E-04	-1.028E-04	1.533E-04	3.991E-04	3.520E-05
	(0.000)	(31.735)	(631.729)	(3.39E-05)	(3.99E-05)	(7.83E-05)	(7.58E-05)	(1.78E-04)	(4.63E-04)	(5.16E-05)
Track length per square kilometer	-9.144	-38668	4238265	13.905	13.76362	0.6103479	-3.432072	-0.8333482	13.78445	1.395946

Table 5 cont'd. Specification checks
Effect of RDI on outcomes among cities above and below median proximity to South

Outcome:	among:	<400 miles	>400 miles
Poverty rate	whites	-0.127	-0.024
		(0.047)	(0.030)
	blacks	0.175	-0.046
		(0.087)	(0.078)
Percent of adults who are high school dropouts	whites	-0.093	0.021
		(0.062)	(0.073)
	blacks	0.031	-0.119
		(0.084)	(0.111)
Unemployment rate	whites	-0.054	-0.009
		(0.017)	(0.014)
	blacks	0.003	-0.051
		(0.036)	(0.054)
Percent of adults who are college graduates	whites	-0.121	-0.081
		(0.087)	(0.129)
	blacks	-0.127	-0.014
		(0.063)	(0.075)
Percent of households with more than $150,000 in income	whites	-0.020	-0.012
		(0.036)	(0.040)
	blacks	-0.009	0.002
		(0.012)	(0.016)

Table 6. Comparison of OLS and 2SLS estimates of effect of segregation on outcomes

	OLS		2SLS	
	white	black	white	black
Poverty rate	-0.048	0.074	-0.118	0.228
	(0.014)	(0.035)	(0.036)	(0.077)
Percent of adults who are high school dropouts	0.004	0.154	-0.013	0.205
	(0.027)	(0.033)	(0.058)	(0.091)
Unemployment rate	-0.008	0.033	-0.067	0.016
	(0.007)	(0.018)	(0.018)	(0.042)
Percent of adults who are college graduates	-0.040	-0.184	-0.180	-0.254
	(0.041)	(0.033)	(0.104)	(0.070)
Percent of households with more than $150,000 in income	0.005	-0.013	-0.062	-0.037
	(0.016)	(0.006)	(0.034)	(0.012)

Table 7. Reduced form estimates of effect of segregation instruments on individual outcomes of 22- to 30-year-olds

	High school dropout	In poverty	College graduate	Household income>$150k	Idle	Never-married mom
RDI	-0.068	-0.056	-0.093	-0.036	-0.098	-0.038
	(0.097)	(0.112)	(0.144)	(0.037)	(0.072)	(0.017)
RDI*black	0.046	0.246	-0.158	-0.010	0.189	0.218
	(0.033)	(0.042)	(0.035)	(0.007)	(0.027)	(0.020)
Proximity to the South	1.782E-04	7.620E-05	-1.059E-04	1.400E-05	1.351E-04	5.170E-05
	(1.43E-04)	(9.31E-05)	(1.30E-04)	(3.03E-05)	(6.62E-05)	(1.80E-05)
Proximity to the South*black	-8.280E-05	-1.919E-04	2.756E-04	2.190E-05	-1.830E-04	-1.184E-04
	(1.23E-04)	(9.47E-05)	(6.24E-05)	(7.71E-06)	(6.88E-05)	(3.07E-05)
RDI*proximity	-3.801E-04	-1.391E-04	1.985E-04	-2.240E-05	-2.096E-04	-8.160E-05
	(2.38E-04)	(1.20E-04)	(1.74E-04)	(3.72E-05)	(9.40E-05)	(2.75E-05)
RDI*proximity*black	3.360E-04	4.306E-04	-4.403E-04	-2.970E-05	3.117E-04	2.534E-04
	(2.26E-04)	(1.81E-04)	(1.06E-04)	(1.61E-05)	(1.03E-04)	(5.31E-05)
Track length per square kilometer	-13.529	-11.342	12.017	1.682	4.304	0.784
	(11.923)	(8.601)	(12.646)	(2.500)	(7.268)	(1.363)
Track length per square kilometer*black	32.118	18.354	-5.818	0.340	18.041	6.313
	(14.547)	(13.288)	(9.809)	(1.810)	(11.544)	(6.011)
p-value of f-test for joint significance of:						
RDI and proximity	0.272	0.302	0.033	0.514	0.081	0.015
RDI, RDI*black, RDI*proximity, and RDI*proximity*black	0.247	0.000	0.000	0.128	0.000	0.000
RDI*black and RDI*proximity*black	0.154	0.000	0.000	0.185	0.000	0.000