Segregation and Inequality in Public Goods

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Many United States cities function without regular problems. They have well-kept roads, sewers that never overflow, and public parks with swing sets and restrooms. Others struggle to maintain balanced budgets, fail to adequately equip or staff their police forces, and offer little assistance to residents of limited means. What explains these differences? I argue that segregation along racial lines contributes to public goods inequalities. Racially segregated cities are also politically polarized cities, making collective investment more challenging and public goods expenditures lower. I provide evidence for this argument using election data from 25 large cities and demographic data matched to city finances in more than 2,600 places. To handle the problem of endogeneity I instrument for segregation using the number of waterways in a city. I find that segregated municipalities are more politically polarized and spend less on a wide range of public goods.

Replication Materials: The data, code, and any additional materials required to replicate all analyses in this article are available on the American Journal of Political Science Dataverse within the Harvard Dataverse Network, at: http://dx.doi.org/10.7910/DVN/4LZXTY

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Many United States cities function without regular problems. They have well-kept roads, sewers that never overflow, and public parks with swing sets and restrooms. Others struggle to maintain balanced budgets, fail to adequately equip or staff their police forces, and offer little assistance to residents of limited means. What explains these differences? At a very basic level, the generation of public goods requires cooperation. So, why do some cities find it more difficult to cooperate than others? Scholars have identified racial/ethnic diversity and changes in diversity as prime suspects in determining under-provision of public goods (e.g. Alesina et al 1999, Hopkin 2009). In this paper, I argue that it is not diversity, but segregation along racial lines, that contributes to public goods inequalities across cities. Segregated cities are also politically polarized cities. The gulf between whites and racial and ethnic minorities in segregated places makes it less likely that will find common ground in support of a bundle of taxation and expenditures, driving down collective investment.

I provide evidence for this argument using election data from 25 large cities between 1990 and 2010 and demographic data matched to city finance data from 1982 to 2007 in more than 2,600 cities. To handle the problem of endogeneity in the finance analysis I instrument for segregation using the number of waterways in a city. I find that segregated municipalities spend less on a wide range of public goods. Because racial and ethnic minorities are more likely than whites to live in communities that are residentially segregated, access to public goods is segregated along racial lines as well.

Literature and Hypotheses

Local politics, more so than national or state politics, concerns battles over space. This is because local governments control the location of negative and positive externalities (like

pollution producing factories or public parks); and also because many of the functions that local governments provide are allocational in nature (e.g. where police officers will be deployed and which roads will be repaved). One of the few powers that is reserved nearly exclusively to local government is that of zoning or planning. As a result, geographic areas within cities (e.g. neighborhoods) are frequently important actors in municipal politics.

At the same time, neighborhoods remain highly segregated along racial lines (Fischer et al 2004, Oliver 2010). Although neighborhood racial segregation has lessened in recent decades, today the typical white American lives in a neighborhood that is about 75% white, while Black, Latino, and Asian Americans live in substantially more integrated places (Logan and Stults 2011).[1] These patterns have created stark divides between white and non-white communities (Enos 2011). When a city is residentially segregated by race, issues cleave along racial and not just spatial lines (Massey and Denton 1998).

Furthermore, in segregated cities divisions across racial groups are likely to be exacerbated because the political priorities and opinions of racial groups are likely to be more divergent than they are in integrated places. Neighborhood racial isolation is associated with a high degree of racial intolerance, resentment, and competition among all racial groups (Oliver 2010). This correlation is due to both self-selection and interpersonal interactions (Rodden 2010). When deciding where to live, people with racially intolerant attitudes often seek same race neighbors (Charles 2003, Boustan 2011) either because they want to minimize contact with other race individuals (Massey and Denton 1998) or because they associate other race neighborhoods with poor neighborhood quality on dimensions such as schools, crime, and

[1] African Americans, Latinos, and Asians live in a neighborhood that are comprised of 22%-46% of their own group.

property values (Helper 1969, Ellen 2000, Bayer et al 2007, Krysan et al 2008). But living in different types of neighborhoods may also change individuals' perspectives. In integrated neighborhoods, regular, casual interaction may work to counteract dominant, negative stereotypes (Allport 1954, Oliver and Wong 2003). The result of both population sorting and/or neighbors' influence is that individuals who live in homogeneous neighborhoods are more likely to harbor negative stereotypes about other groups (Oliver 2010, Oliver and Wong 2003).

Yet, at higher levels of geography (e.g. in cities, counties, and metropolitan areas) it is integration or diversity that correlates with intolerance, prejudicial attitudes, increased racial tension, less cooperative behavior, and lower spending on public goods (Key 1949, Glaser 1994, Branton and Jones 2005, Taylor 1998, Campbell et al 2006, Alesina et al 1999, Vigdor 2004, Hopkins 2009, Poterba 1997). As a result, racial competition, racial resentment, and racial conservatism are positively correlated with homogeneity at the neighborhood level, but negatively correlated with homogeneity at the city level (see Oliver 2010 for a detailed account of these conflicting patterns). [2] A severely segregated city is one that is diverse overall and has many homogeneous neighborhoods – both characteristics which point toward a high degree of racial conflict.

This higher degree of racial conflict in segregated cities has obvious political implications. Levine (2014) has found that racial segregation is strongly predictive of partisan political divisions in metropolitan areas and that these political divides result in an

[2] There are a few exceptions to this pattern. A handful of scholars have *not* found that diversity increases tolerance at the neighborhood level. Gay (2006) and Oliver and Mendelberg (2000) find no relationship between neighborhood racial context and racial attitudes. Enos (2015) shows that that homogeneity decreases voter turnout among whites and also decreases support for conservative candidates. Cho, Gimpel and Dyck 2006 find that homogeneity decreases turnout among Asian Americans in some cases, but increases it (or has no effect) in others. Leighly and Vedlitz (1999) find that homogeneity correlates positively with turnout for whites.

unwillingness to cooperate on metropolitan-wide policy solutions. We can expect a similar pattern at the city level. First, in segregated cities racial groups should be more divided with respect to political priorities. Second, diverse but divided cities may be less able to come to a consensus about the production of basic government services, and so be less supportive of public goods provision. This second hypothesis speaks directly to the claim that diversity drives down collective investment (Alesina et al 1999). As Benoy Jacob (2013) has persuasively argued, not all diversity is equivalent. When whites and nonwhites live in the same city, the pattern of residential integration ought to matter for expectations about public goods expenditures. White and non-whites may live as next door neighbors, but they may not. If segregation represents preferences or attitudes that are incompatible with collective investment, then uneven distribution of groups, not diversity per se, ought to correlate with lower public goods spending.

Segregation and Political Polarization

In municipal politics, vote patterns and policy priorities are shaped by racial cleavages more so than *any* other demographic division (Hajnal and Trounstine 2013, Hajnal and Trounstine 2014). While ideology, partisanship, and class all play important roles in determining vote choice and support for municipal administrations, conflicts among racial groups predominate. If segregated cities are more politically polarized, these racial divides should be most pronounced in places with a high degree of residential segregation. To determine whether or not this is the case, I analyze the relationship between residential segregation patterns and racial divisions in mayoral elections in the nation's largest cities between 1990 and 2010.

There are many different ways to measure segregation (e.g. the degree to which groups are disproportionately distributed across geographic space). Indices of segregation are typically correlated with each other, but capture different theoretical dimensions of separation and so, measure different things (Massey and Denton 1988). The two most commonly used measures are the index of dissimilarity and the index of isolation which can be intuitively interpreted respectively as the proportion of a racial group that would need to move neighborhoods in order to generate an even racial distribution given the racial makeup of the larger community, and the racial makeup of the neighborhood in which the typical member of the racial group lives. While these are obviously meaningful dimensions of segregation, neither measure includes the most relevant information from a political perspective. In politics, what matters is not just how individuals from different racial groups are distributed across neighborhoods, but also how large each racial group is relative to others and how big of an impact each neighborhood might have on the vote. That is, we need a measure that weights diversity by group size and weights evenness by population size. The entropy index developed by Theil (1972) meets these criteria.

Theil's *H* Index measures the difference between the diversity of the city and the weighted average diversity of individual neighborhoods. Diversity scores for each neighborhood and the city as a whole are influenced by the relative size of racial groups, while the overall index is influenced by the relative size of each neighborhood, giving more weight to larger than to smaller places. Both types of weighting are key to understanding the political implications of segregation. We should expect the effect of segregation to be most pronounced

when minority groups are unevenly dispersed across geographic units *and* represent a substantial share of the population.

Theil's *H* has a number of other useful qualities. Importantly for understanding modern city politics, Theil's *H* can be calculated for more than two groups at a time (unlike either the dissimilarity or isolation indices). Additionally, it is the only index that obeys the principle of transfers in the multi-group case - the index declines when a minority resident (theoretically) moves to a neighborhood with fewer minority residents (Reardon and Firebaugh 2002).[3]

Theil's *H* Index is built from Theil's entropy score (which is a measure of diversity).

$$E = \sum_{r=1}^{R} (\pi_r) \ln \frac{1}{\pi_r}$$

where π_r represents the proportion of the population in racial group *r*, and where $\pi_r = \frac{1}{R}$ for all rThe higher the entropy score, the more diverse an area is.[4] The score ranges between 0 and the natural log of the total number of groups in the area. It is maximized when individuals are evenly distributed among the different racial groups.[5] Entropy is calculated for each neighborhood individually and for the city as a whole.

The *H* Index measures the degree to which the diversity in each neighborhood differs from the diversity of the city as a whole, expressed as a fraction of the city's total diversity and weighted by the neighborhood's share of the total population.

[3] Although I do not take advantage of this property here, Thiel's *H* can also be decomposed into its constituent parts.

[4] Where any group's share of the population is 0 the natural log is set to zero, as is the convention in the literature (Iceland 2004).

[5] A scatterplot relating a white/non-white calculation of E to percent white is included in the on-line appendix.

$$H = \sum_{n=1}^{N} \frac{P_n}{P_c}\left(\frac{E_c - E_n}{E_c}\right)$$

where *P* represents total population of neighborhood *n* or city *c* and E is the entropy of *n* or *c.* *H* varies between 0, where all neighborhoods have the same composition as the entire city, and 1 where all neighborhoods contain only one group.[6] This *H* Index serves as my primary independent variable throughout the paper.[7]

To estimate the effect of segregation on racial polarization, I use a dataset compiled by Hajnal and Trounstine (2014) that measures support for winning mayoral candidates across different racial groups in primary and general elections in large cities. The data include 91 separate contests from 25 cities. Vote by race data were compiled from a combination of exit polls, pre-election surveys, homogenous precinct analyses, and ecological inference.[8] Summary statistics and a list of cities included in the analysis are provided in Appendix Tables A1 and A2. For each election I calculated the difference in support for the winning candidate between black and white voters, Latino and white voters, and black and Latino voters. The dependent variable in the analysis is the absolute value of the largest difference in support for the winning candidate between any two racial groups. For instance, in Philadelphia in 2003, exit polls reported that 24% of white voters supported the winner, John Street, compared to 88% of black voters, and 47% of Latino voters. In this election the black-white divide was 0.64, the

[6] In all analyses neighborhoods are represented by census tracts; relatively stable, contiguous geographic areas containing approximately 4,000 people. Most studies of segregation (e.g. Massey and Denton 1998) use census tracts as a proxy for neighborhood (although this is not without debate, see for instance Logan et al 2015).
[7]The results are robust to using the index of isolation for white (non-Hispanic) residents as an alternative independent variable. The index of dissimilarity is not an appropriate alternative because it does not account for the size of the minority population or the size of the neighborhood. A city with a small number of minority residents might be very segregated by the index of dissimilarity, but this is not a setting in which we would expect racial political divisions to drive public goods outcomes.
[8] These data are described completely in Hajnal and Trounstine 2014.

Latino-white divide was .23, and the black-Latino divide was .41, and so the dependent variable takes the value of the black-white divide, .64. In 62 of the 91 contests the largest divide was between black and white voters, in 13 contests it was the divide between Latino and white voters, and in 16 contests the largest divide was between black and Latino voters.[9] The distribution of racial divides across cases is listed in Appendix Table A2.

As described above, my primary independent variable is a measure of segregation, Theil's *H* Index. I calculated the *H* Index for all United States cities using census-tract level demographic data from the 1980, 1990, and 2000 Censuses of Population and Housing and from the 2011 American Community Survey.[10] To start, I use four groups in the calculation of entropy: white (non-Hispanic), black (non-Hispanic), other (non-Hispanic), and Hispanic/Latino.[11] I then combine Blacks, Hispanics, and Other races into a single non-white group for comparison. For reference, the mean *H* Indices for each city in the analysis are shown in Appendix Table A2.

I include a number of control variables in addition to the *H* Index. One of the primary arguments in the literature is that racially and ethnically diverse populations will have heterogeneous political preferences which then drives low spending on public goods. If this is the case we should see more racial polarization in the vote as diversity rises. So, I include the

[9] As an alternate measure of division, I took the difference in support between white voters and the average of support among black and Latino voters. The results are extremely similar.
[10] Tract level data for 1980, 1990, and 2000 come from a propriety product developed by GeoLytics called the Neighborhood Change Database which matches and normalizes census tracts over time. The data from the 2011 ACS are available for download through the Census ftp server located at http://www2.census.gov/.
[11] The 1980 tract level data only disaggregate the non-Hispanic population into Whites, Blacks, and Others, so I am unable to include Asians as a separate group.

proportion of *Blacks*, *Latinos*, and *Asian-Americans* in the city and a measure of *Diversity* known as the Herfindahl Index:[12]

$$Diversity = 1 - \sum_{r=1}^{R} \pi_r^2$$

I also include control variables that are shown by Hajnal and Trounstine (2014) to affect racial polarization in voting and which may be correlated with segregation. I account for the *Median Household Income*, proportion of the population *Renting* their homes, proportion of the population with a *College Degree*, the race of the candidates in the election (a dummy variable coded 1 if the election featured *Biracial* candidates), a measure noting whether or not the election was *Non-partisan*, an indicator for *Primary* elections, and the size of the total *Population* (logged). Finally, I include fixed effects for year and region and random effect for cities.

In model 3 I also add a measure of the average *Ideology* among the city's white residents to determine whether or not segregation is merely a proxy for a conservative white population. This measure was constructed using General Social Survey data from 1998, 2000, 2002, 2004, 2006, and 2008. Using restricted access data, I geo-coded each respondent in the GSS to his/her city of residence. I then took the mean ideology score for each city's white respondents for each year (higher values indicate more conservative respondents).[13] I interpolated ideology for odd years and then merged these data to the racial polarization data

[12] This calculation includes five racial groups: white (non-Hispanic), black (non-Hispanic), Asian (non-Hispanic), Hispanic, and other.

[13] I dropped city/years from the GSS with a single respondent.

set. In order to preserve as many observations as possible, I matched GSS data from the most recent year for each election.

The results presented in Table 1 offer strong support for the hypothesis that more segregated cities are also more politically polarized.

[INSERT TABLE 1]

The relationship between segregation and political polarization is powerful. A city in the 10th percentile of the segregation distribution can be expected to see a 35 percentage point divide between different racial groups' support for the winning candidate, while a city in the 90th percentile of segregation has a predicted racial divide of 63 percentage points.[14] These results hold even with the inclusion racial demographics. Segregation, not just diversity matters for polarization. The data also indicate (comparing columns 1 and 2) that there is no significant difference in accounting for segregation among multiple racial groups as opposed to accounting for segregation of whites from non-whites.[15] This makes sense given that whites are much more likely to live in homogenous neighborhoods than are other racial and ethnic groups and given that the most pronounced political division is typically between whites and one or more minority groups, rather than among minority groups. These results suggest that political polarization depends on the degree to which *white* residents live in exclusively white neighborhoods.

[14] Estimates generated from regression presented in column 1 with all other variables held at mean values. Predicted effects generated using "margin" command in Stata 12.

[15] The 95% confidence intervals for these coefficients are nearly completely overlapping. Additionally, adding both coefficients to the same equation and running a post-estimation Wald test of equality indicates no significant difference.

I have argued that segregation generates political divisions because the politics of space become intertwined with race. It is possible though, that segregation is simply correlated with a more ideologically conservative white population which then generates divides in support for candidates. As the third column reveals, the relationship between segregation and polarization appears to be unaffected by the conservatism of the white population. In fact, the relationship between ideology and polarization is such that cities with more conservative white populations have smaller racial divides, underscoring the conclusion that racial polarization is not driven by ideological divisions. In the next section I ask whether or not this polarization extends beyond support for candidates to a lack of consensus over policy. In short, I find that it does.

Diversity and Segregation in the Aggregate

Scholars have provided evidence that racially diverse places and those that are becoming increasingly diverse spend fewer public dollars on productive public goods (Alesina et al 1999, Hopkins 2009). I have argued that segregation, not just diversity, should matter in municipal politics. In the first section I showed that segregation is related to political polarization, even after accounting for racial demographics. If it is the case that segregated populations are less able to come to a consensus over citywide policy decisions, we should also see less support for government spending in segregated cities after accounting for racial demographics.

In order to analyze this hypothesis I draw on Census of Governments city and township expenditure data from 1982, 1987, 1992, 1997, 2002, and 2007.[16] To these data I merged interpolated data from the 1980, 1990, 2000, and 2010 Census of Population and Housing, and

[16] Available at http://www2.census.gov/pub/outgoing/govs/special60/. Filename is "_IndFin_1967-2012.zip"

from the 2007-2011American Community Survey. I have complete data for 2,643 cities which range in size from about 1000 residents to more than 8 million. To capture overall spending on public goods I analyze the effect of segregation on per-capita expenditures on *Direct General Expenditures.*[17] I follow this with analyses of operations expenditures on specific budgetary categories including *Roads and Highways, Police*, *Parks, Sewers*, and a combined category of *Welfare, Health, and Housing and Community Development*.[18] I also analyze per capita *Revenues* coming from the city's own residents (as opposed to intergovernmental revenues) as an indication of the burden of funding the populous is willing to bear.[19] All spending data are in thousands of 2007 dollars. Summary statistics are shown in Appendix Table A3. As above, the primary independent variable is the *H* Index to measure segregation. In the tables and figures below I present results using the two group (white and non-white) index; results from the multi-group index and isolation index are very similar and are shown in the on-line appendix.

To account for the alternative explanation that diversity drives down spending, the analyses include the proportion of the population that is *Black*, *Asian*, and *Latino* and overall *Diversity*. Controlling for demographics also helps account for the fact that white and minority preferences for government spending differ. Racial and ethnic minorities support more government spending than whites on a large number of programs at all levels of government (Hutchings and Valentino 2004). In the aggregate then, we might expect cities with larger

[17] All analyses are restricted to cities with non-zero expenditures in the category in question because the data do not distinguish between zero expenditures and missing data.
[18] Operations expenditure totals were generated by taking the total spending in each category less any capital expenditures in that particular year. The category of welfare, health, and housing/community development represents the primary expenditures by cities used to directly support people in economic need.
[19] In contrast, the categorical expenditure variables include all spending on a certain target regardless of the source of the funds.

populations of racial and ethnic minorities to support more per capita expenditure as Boustan et al 2013 find. But if my theory is right, cities with more segregation and similar shares of minority residents ought to witness smaller budgets and lower spending on public goods compared to cities with less segregation because the likelihood of cooperation ought to be fundamentally different in these types of places.

The analyses also control for the total *Population* (logged), the proportion of the population *Over Age 65*, the proportion with a *College Degree*, the proportion of each 100 residents *Employed as Local Government* workers, the proportion of households that *Rent* their home, and the *Median Household Income*. These controls are meant to capture demographic dimensions that affect both segregation and expenditures (through both preferences and need). For instance, we might expect cities with large populations of government workers to have higher levels of spending, while the reverse might be the case in cities with older populations. An important alternative explanation for a negative relationship between segregation and spending could be city wealth. Segregated cities might be poorer cities for some reason, and so simply have fewer resources to spend on public goods. Controlling for proportion of the city that rents and the median household income are intended to account for this possibility.[20] Finally, I include fixed effects for cities. This allows me to analyze the effect of segregation within the same location over time and controls for the many factors (such as age of the city, differentials in costs for service provision, taxation powers and limits, etc.) that might lead cities to differ in expenditure patterns cross-sectionally. I cluster standard errors by

[20] In alternative analyses I tested the inclusion of proportion of the city in poverty and median home values with no change to the pattern of results.

city. I exclude from the analysis cities with only a single census tract because the measure of evenness is constant (by definition).

I begin, in Table 2, by regressing per capita *Direct General Expenditure* on *Segregation* with the controls described above. Then, in the second column, I replace *Diversity* with *5 Year Changes* in racial group shares (following Hopkins 2009) to determine whether or not changes in diversity could be the driving factor.[21] In the third column, I add the mean *Ideology* of city residents (calculated from the GSS for all city residents as described above) to account for the possibility that segregated cities are more ideologically conservative.

[INSERT TABLE 2]

Table 2 provides strong evidence that segregation and public goods spending are negatively related, even in the presence of changing demographics, diverse populations, and conservative residents. The effects of segregation are substantively meaningful and statistically significant. Increasing the segregation index from the 25th to 75th percentile (from .01 to .10) in the base model lowers per capita direct general expenditure from $1,262 to $1,159. A difference in total spending of about $100 per resident could dramatically affect the quality of public goods that individuals experience given that the average per capita expenditure on police is about $180, and about $61 on parks. In Table 3, I show that the depressive effect of segregation extends to individual categories of public goods spending as well.

[INSERT TABLE 3]

[21] Hopkins uses 10 year changes in racial group shares. I chose 5 years in order to preserve more observations in the time-series. The results are similar with 10 year changes.

Clearly, spending on public goods is lower in cities with greater segregation. Across all 6 categories displayed in Table 3, segregation exerts a significant negative effect. Figure 1 presents these results graphically.

[INSERT FIGURE 1]

While segregation is negatively related to public goods investment, more diverse communities are mostly associated with higher levels of spending as the positive coefficients on diversity and on percent black and Latino indicate. Given that racial and ethnic minorities are more both more supportive of public goods spending and more likely to live in segregated places (which see less support for public goods), it is important to ask what the overall impact of these countervailing effects is. Table 4 shows how segregation affects public goods provision across the range of values of diversity. I divided the sample of cities into quintiles of percent non-white (with 2,749 city-years in each quintile) and then, after estimating the model displayed in column one of Table 2, I predicted direct general expenditure per capita at the minimum and maximum values of segregation for each quintile, holding all other variables at their mean values given the quintile. The table shows the difference in these predicted values for each quintile of percent non-white.

[INSERT TABLE 4]

Table 4 reveals substantial declines in direct general expenditure as segregation increases, regardless of the size of the minority population. Segregation has the largest effect in cities with moderate sized minority populations (where minorities comprise 13-41% of the population), but even in majority-minority cities and those that are overwhelmingly white, increasing segregation decreases investment in public spending. That segregation has the most

pronounced effect in the middle quintiles offers indirect evidence that it is likely white residents responding to significant minority concentrations that drives the negative relationship between segregation and public goods spending.[22]

However, one might worry about the causal relationship between segregation and spending. I have argued that segregation should suppress public goods spending. But it is entirely possible, perhaps quite likely, that some unmeasured set of factors affect both spending and segregation (or that the reverse is true, and spending levels affect segregation patterns). Since we cannot randomly assign segregation to determine the effect on city spending, I use an instrumental variable approach to study the relationships.

A great many factors affect residential location and the distribution of different types of residents across neighborhoods. One set of factors that affects both property values and the ability for communities to maintain a preferred degree of homogeneity are natural and manmade barriers. For instance, freeways and railroad tracks frequently divide more desirable and less desirable parts of town (Ananat 2011). But railways and freeways are often built with the intent to segregate racial communities. Instead, I focus on waterways (including large streams and rivers) which vary in number across cities and are arguably exogenous to segregation and spending. The use of waterways as an instrumental variable was introduced by Hoxby (2000) who used streams to estimate the governmental fragmentation of metropolitan areas. Cutler and Glaeser (1997) rely on Hoxby's waterways data as an instrument for

[22] I investigated the alternative possibility that low turnout among minority residents could be the driver. As it turns out turnout and segregation are positively correlated, perhaps because politics is more contentious in these places. Thus, a lack of participation by residents who support high spending is not likely to be the cause of lower public goods investment.

metropolitan area racial segregation. My instrument differs in two ways. First, and most importantly, my data capture waterway counts and segregation patterns at the *city* level rather than at the metro area level. Secondly, I use a different source file for the waterways data and a different method for determining whether a waterway ought to be counted within the boundaries of a community.[23] In order to use waterways as an instrument for segregation, I gathered the "rivers and streams" geographic information system map file from the National Hydrologic Remote Sensing Center which is part of the National Oceanic and Atmospheric Administration (an agency in the US Department of Commerce).[24] I added Census TIGER Line boundary files for all places in the United States as of 2000.[25] I then generated counts of waterways for each place and added these counts to the finance data described above. Overall the correlation between the number of waterways and the H index is a powerful 0.37, and the F-statistic on the excluded instrument is 3,371, considerably higher than the typical target of 10.[26]

My analyses use the same dependent variables as were presented in Tables 2 and 3 (per capita spending on various public goods). The number of waterways is used as an instrument for the H Index. Waterways are also correlated with other characteristics that are important to

[23] Hoxby uses a hand count of streams that are 3.5 miles in length and "of a certain width" supplemented with data from the Geographic Names Information System which lists the latitude and longitude of smaller streams. Instead, I use geographic information system maps as described in the main text and include all large streams and rivers regardless of length and width. Hoxby attributes a stream to an MSA if it terminates in the MSA (Rothstein 2007) whereas my analysis attributes a waterway to a community if it flows through the community at all (not just at its origin or destination).

[24] The "rivers and streams" shape file is available at: http://www.nohrsc.noaa.gov/gisdatasets/. It was most recently updated in 2008.

[25] Boundary files available for download by state here: http://www2.census.gov/geo/tiger/TIGER2010/PLACE/2000/

[26] This F-statistic is drawn from a simple two-stage regression instrumenting segregation with waterways and including no additional controls.

both segregation and spending patterns. The most important of these characteristics is the size of the population. People have settled near waterways since antiquity and larger cities are also much more likely to be segregated than smaller cities (perhaps because there are more neighborhoods from which to choose). To account for this, I include logged population as an instrument in the first stage.[27] In both the first and second stage regressions I include the same control variables as presented in Table 2, with two changes. Because the number of waterways is constant in my dataset, I do not add fixed effects at the city level.[28] Instead, I include fixed effects for region and year. Secondly, I add a lagged version of the dependent variable to account for the high correlation between observations over time for the same city and the fact that local budgets are typically changed incrementally from prior years. The results from this instrumental variable approach are displayed in Table 5. For presentation purposes the first stage results are relegated to Appendix Table A4.

[INSERT TABLE 5]

Regardless of the statistical approach used, segregation appears to have a powerful, depressive effect on public goods provision in cities. The pattern of results in Table 5 reflects the OLS findings presented in Table 2. After accounting for demographic differences, cities with more segregation tend to have smaller budgets, they tend to extract fewer resources from their residents, and spend less on roads, policing, parks, sewers, and support for the poor. In my dataset, nearly 74% of nonwhite residents live in cities in the top quintile of the segregation distribution, compared to only 48% of whites. What this means is that compared to whites,

[27] In alternative specifications I use the number of waterways per capita as the instrument. The pattern of results is exactly the same.
[28] The omission of fixed effects allows for the inclusion of all cities regardless of the number of census tracts.

nonwhites are much more likely to live in communities that struggle to generate adequate public goods for their residents. Segregation of residential communities contributes to the segregation of public goods as well. [29]

Conclusion

The evidence presented here indicates that racial segregation plays a significant role in access to public goods. Segregated cities are comprised of homogeneous neighborhoods embedded in diverse larger communities. While African Americans, Latinos, and Asians are, today, fairly likely to live as neighbors, whites remain in isolated enclaves. Because local governmental decisions often concern spatial allocation, neighborhoods are important municipal actors in local politics and in more segregated places neighborhood interests become overlaid with racial division. Segregated cities are more racially polarized in elections and may be less likely to generate policy consensus. The result is that cities with more segregation have smaller public good budgets. Segregated cities raise fewer dollars from their residents and spend less money on roads, law enforcement, parks, sewers, welfare, housing, and community development. Modern patterns of residential location reveal that white residents are more likely than people of color to live in cities with low levels of segregation. So, not only are whites segregated from racial and ethnic minorities within cities, they are also segregated from people

[29] Of course, even if one is convinced of the causal effect of segregation, these results do not provide evidence of the mechanism by which segregation works. I have argued that segregation generates racial polarization and so, makes cooperation more difficult. Ideally, I would add measures of polarization directly to the spending analysis, but even after interpolating polarization between election years, I only have complete data for 19 cities (and 43 city years). That said, the addition of this measure to a simple regression of per capita *Direct General Expenditure* on *Segregation* with random effects for cities significantly diminishes the effect of segregation (both in terms of statistical significance and substantive effect). These results are shown in the on-line appendix.

of color across city lines. This fact means that access to public goods is segregated along racial lines as well. As the nation has become more diverse, it has also become more unequal. Segregation and public goods play important roles in linking these phenomena.

[INSERT APPENDIX TABLES HERE]

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Table 1: Racial Polarization in Segregated Cities

	Racial Divide w/ Multi-Group Segregation Index			Racial Divide w/ Two-Group Segregation Index			Racial Divide w/ Ideology control		
	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|
Multi-group H Index	0.932	0.39	0.02						
White/non-white H Index				0.756	0.30	0.01	0.835	0.30	0.01
Diversity	0.385	0.36	0.29	0.518	0.32	0.11	0.584	0.32	0.07
% Asian	-0.115	0.53	0.83	0.120	0.56	0.83	-0.004	0.52	0.99
% Black	-0.432	0.27	0.11	-0.237	0.22	0.27	-0.133	0.21	0.53
% Latino	-0.191	0.26	0.46	-0.059	0.25	0.82	0.095	0.28	0.73
Median HH Income (1000s)	-0.004	0.00	0.52	-0.007	0.00	0.32	-0.002	0.00	0.81
% Renters	-0.580	0.42	0.17	-0.806	0.43	0.06	-0.419	0.45	0.36
% College Educated	0.328	0.71	0.65	0.723	0.73	0.32	0.123	0.87	0.89
Biracial contest	0.210	0.04	0.00	0.208	0.04	0.00	0.192	0.04	0.00
Nonpartisan Election	-0.090	0.07	0.18	-0.089	0.07	0.18	-0.034	0.06	0.60
Primary Election	-0.092	0.03	0.00	-0.09	0.03	0.01	-0.071	0.03	0.02
Population (logged)	0.035	0.06	0.53	0.048	0.05	0.38	-0.011	0.06	0.86
White Ideology							-0.051	0.03	0.11
Constant	-0.242	0.57	0.67	-0.393	0.56	0.49	0.236	0.61	0.70
Wald χ^2	187.12		0.00	189.68		0.00	222.92		0.00
N	91			91			86		

Note: Multi-level mixed-effects linear regressions with fixed effects for region and year, and random effects for cities

Table 2: Effect of Segregation on Overall Per Capita City Expenditures

	Direct General Expenditure Per Capita			Direct General Exp w/ changing demographics			Direct General Exp w/ ideology control		
	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|
Segregation	-1.153	0.22	0.00	-1.011	0.25	0.00	-1.733	0.44	0.00
Diversity	0.106	0.13	0.43				-0.063	0.25	0.80
% Black	0.681	0.17	0.00	0.741	0.16	0.00	0.164	0.52	0.75
% Asian	-0.385	0.30	0.20	-0.852	0.35	0.02	0.197	0.71	0.78
% Latino	1.543	0.19	0.00	1.577	0.20	0.00	1.622	0.39	0.00
5 yr Δ % Black				-1.778	0.64	0.01			
5 yr Δ % Latino				-2.055	0.82	0.01			
5 yr Δ % Asian				-0.800	1.09	0.46			
Median Income (1000s)	0.002	0.00	0.07	0.001	0.00	0.68	0.004	0.00	0.15
% Local Gov. Employees	0.014	0.02	0.39	0.006	0.02	0.76	-0.030	0.05	0.51
% Renters	0.527	0.33	0.11	0.547	0.38	0.16	0.336	0.66	0.61
% Over 65	0.093	0.64	0.89	0.487	0.45	0.28	-0.865	0.82	0.29
% College Grad	5.395	0.40	0.00	6.260	0.42	0.00	6.527	1.03	0.00
Population (logged)	-0.243	0.04	0.00	-0.290	0.07	0.00	-0.447	0.09	0.00
City ideology							-0.012	0.03	0.71
Constant	2.254	0.42	0.00	2.727	0.69	0.00	5.085	1.18	0.00
N	13,742			11,194			2,130		
Number of Cities	2,637			2,637			377		

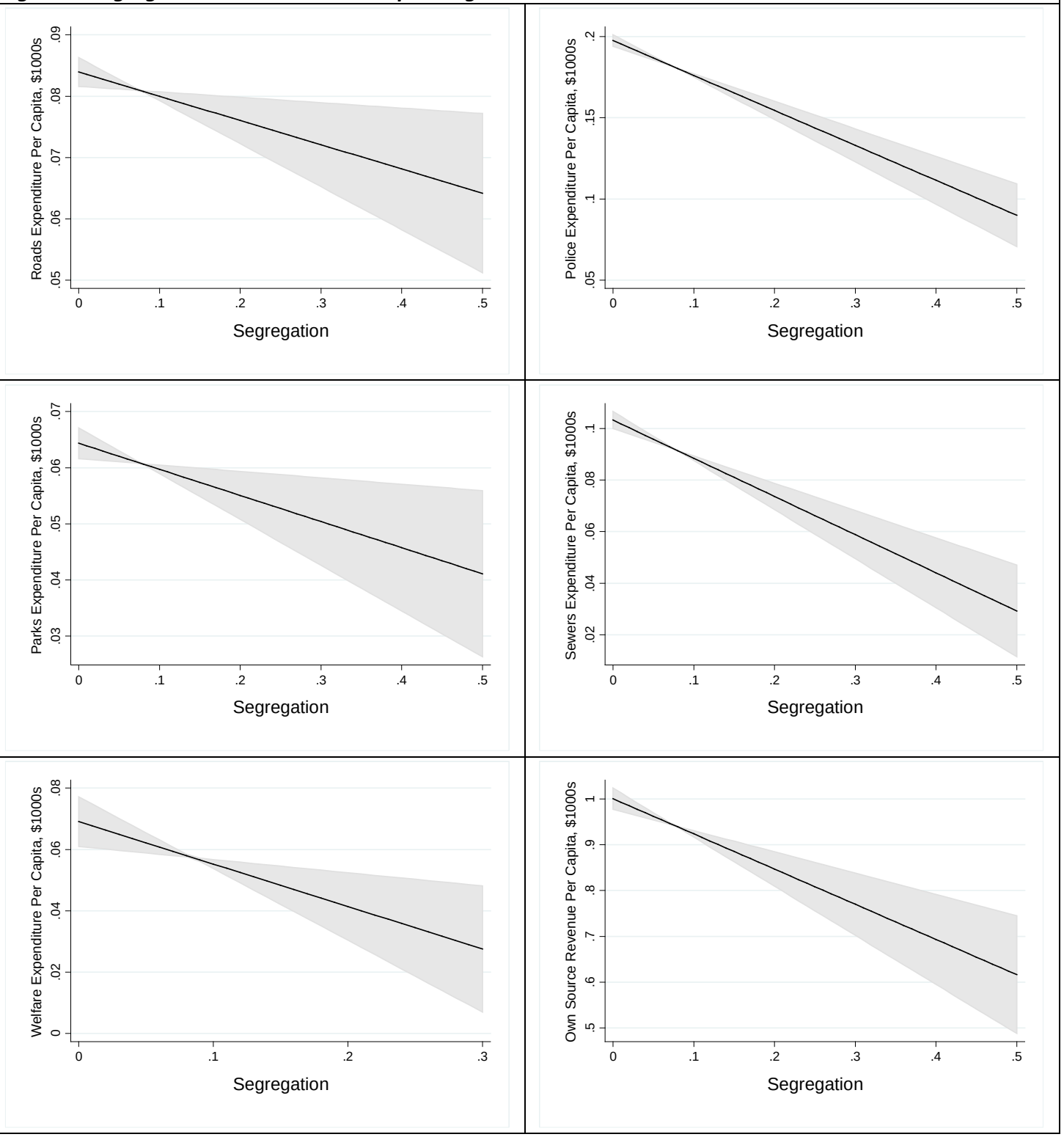
Note: Linear regressions with fixed effects for cities, robust standard errors clustered by city presented

Table 3: Effect of Segregation on Public Goods

	Roads			Law Enforcement			Parks			Sewers			Housing/Welfare			Own Source Rev		
	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|	B	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t||
Segregation	-0.039	0.02	0.01	-0.215	0.02	0.00	-0.046	0.02	0.01	-0.148	0.02	0.00	-0.138	0.05	0.01	-0.768	0.15	0.00
Diversity	0.005	0.01	0.61	0.059	0.01	0.00	0.001	0.01	0.95	0.039	0.01	0.01	-0.033	0.02	0.18	0.091	0.08	0.28
% Black	0.052	0.01	0.00	0.142	0.02	0.00	0.031	0.02	0.09	0.012	0.02	0.50	0.016	0.06	0.78	0.272	0.12	0.02
% Asian	-0.036	0.03	0.17	-0.055	0.04	0.12	-0.067	0.02	0.00	-0.124	0.04	0.01	0.130	0.09	0.15	-0.147	0.23	0.53
% Latino	0.025	0.01	0.07	0.335	0.02	0.00	0.049	0.01	0.00	0.091	0.02	0.00	0.140	0.03	0.00	1.202	0.12	0.00
Median Income (1000s)	0.000	0.00	0.03	0.000	0.00	0.80	0.000	0.00	0.88	0.001	0.00	0.00	0.000	0.00	0.24	0.004	0.00	0.00
% Local Gov. Employees	0.000	0.00	0.80	-0.001	0.00	0.59	0.001	0.00	0.42	-0.004	0.00	0.08	-0.007	0.00	0.01	0.002	0.01	0.86
% Renters	0.011	0.02	0.64	0.075	0.03	0.01	0.018	0.02	0.40	0.174	0.03	0.00	0.079	0.05	0.09	0.569	0.26	0.03
% Over 65	0.140	0.03	0.00	0.147	0.04	0.00	0.127	0.04	0.00	0.104	0.05	0.05	-0.058	0.07	0.41	0.443	0.47	0.35
% College Grad	0.218	0.03	0.00	0.793	0.04	0.00	0.444	0.04	0.00	0.286	0.04	0.00	0.421	0.08	0.00	4.331	0.35	0.00
Population (logged)	-0.015	0.00	0.00	-0.054	0.00	0.00	-0.005	0.00	0.08	-0.023	0.00	0.00	-0.012	0.01	0.08	-0.126	0.03	0.00
Constant	0.160	0.04	0.00	0.513	0.04	0.00	0.010	0.03	0.75	0.169	0.04	0.00	0.135	0.09	0.12	0.943	0.32	0.00
N	13,603			13,626			12,905			11,223			10,871			13,741		
Number of Cities	2,634			2,624			2,573			2,407			2,480			2,637		

Note: Linear regressions with fixed effects for cities, robust standard errors clustered by city presented

Figure 1: Segregation and Public Goods Spending



Note: Figures show predicted relationship between Theil's H segregation index and per capita spending on public goods in constant 2007 dollars. Gray shading represents 95% confidence intervals.

Table 4: Change in Direct General Expenditure Per Capita by % Non-White at Minimum and Maximum Levels of Segregation

Quintile of % Non-White	Average % Non-White	Average Segregation Level	Change in Predicted Direct General Expenditure Per Capita*	95% Confidence Interval
1	4%	0.029	-$447	(-$614, -$279)
2	9%	0.040	-$792	(-$1089, -$495)
3	17%	0.065	-$884	(-$1215, -$552)
4	31%	0.113	-$847	(-$1164, -$529)
5	62%	0.133	-$771	(-$1060, -$482)

*Predicted values generated from regression displayed in Column 1, Table 2. Change is from minimum to maximum level of segregation within quintile of percent non-white

Table 5: Effect of Segregation on City Expenditures, Instrumental Approach												
	Direct General Exp			Roads			Law Enforcement			Parks		
	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|
Segregation instrumented	-2.676	0.93	0.00	-0.363	0.06	0.00	-0.350	0.11	0.00	-0.034	0.02	0.07
Lagged DV	1.472	0.01	0.00	0.477	0.00	0.00	0.955	0.00	0.00	0.869	0.01	0.00
Diversity	0.264	0.36	0.46	-0.032	0.02	0.14	-0.020	0.04	0.63	0.004	0.01	0.55
% Black	0.376	0.32	0.25	0.085	0.02	0.00	0.096	0.04	0.01	0.003	0.01	0.74
% Asian	0.143	0.94	0.88	-0.111	0.06	0.05	-0.064	0.11	0.56	-0.022	0.02	0.24
% Latino	0.087	0.28	0.76	0.088	0.02	0.00	0.088	0.03	0.01	0.007	0.01	0.25
Median Income (1000s)	-0.004	0.00	0.19	0.001	0.00	0.00	0.001	0.00	0.00	0.000	0.00	0.00
% Local Gov. Employees	-0.104	0.03	0.00	0.021	0.00	0.00	0.026	0.00	0.00	0.003	0.00	0.00
% Renters	-0.553	0.35	0.11	0.165	0.02	0.00	0.187	0.04	0.00	0.035	0.01	0.00
% Over 65	0.301	0.73	0.68	0.267	0.04	0.00	0.238	0.09	0.01	0.072	0.02	0.00
% College Grad	0.248	0.57	0.66	-0.044	0.03	0.19	-0.101	0.07	0.13	0.028	0.01	0.02
Constant	0.328	0.28	0.24	-0.125	0.02	0.00	-0.183	0.03	0.00	-0.029	0.01	0.00
N	21,145			20,704			20,627			19,056		
	Sewers			Welfare			Own Source Revenue					
	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|			
Segregation instrumented	-0.363	0.06	0.00	-0.115	0.05	0.04	-1.873	0.79	0.02			
Lagged DV	0.064	0.01	0.00	0.893	0.01	0.00	1.235	0.01	0.00			
Diversity	0.080	0.02	0.00	-0.047	0.02	0.04	0.047	0.30	0.88			
% Black	0.058	0.03	0.02	0.076	0.02	0.00	0.360	0.27	0.19			
% Asian	-0.223	0.07	0.00	0.009	0.05	0.87	-0.029	0.79	0.97			
% Latino	-0.050	0.02	0.01	0.078	0.02	0.00	0.206	0.24	0.39			
Median Income (1000s)	0.000	0.00	0.49	0.001	0.00	0.03	0.000	0.00	0.91			
% Local Gov. Employees	0.001	0.00	0.65	0.016	0.00	0.00	-0.003	0.03	0.91			
% Renters	0.073	0.02	0.00	0.098	0.02	0.00	0.263	0.29	0.37			
% Over 65	0.287	0.05	0.00	0.127	0.05	0.01	0.782	0.62	0.20			
% College Grad	0.029	0.04	0.47	-0.038	0.04	0.31	-0.035	0.48	0.94			
Constant	0.004	0.02	0.84	-0.093	0.02	0.00	-0.174	0.23	0.46			
N	16,616			14,711			21,148					

Note: Two stage least squares regressions with fixed effects for regions and year (not shown); Instrumented: Two-group H Index of segregation; Excluded Instruments: # of Waterways, Population logged

Appendix

Table A1: Summary Statistics Racial Polarization Data

Variable	Obs	Mean	Std. Dev.	Min	Max
Largest Racial Divide	91	0.481	0.213	0.016	0.934
H Index – multi-group	91	0.376	0.119	0.183	0.635
H Index – two-group	91	0.353	0.114	0.156	0.614
Diversity	91	0.623	0.088	0.323	0.736
% Asian	91	0.067	0.074	0.008	0.318
% Black	91	0.275	0.181	0.030	0.815
% Latino	91	0.229	0.155	0.009	0.605
Median HH Income	91	36725	10114	17268	75982
% Renters	91	0.535	0.092	0.368	0.718
% College Ed	91	0.167	0.056	0.049	0.359
Biracial contest	91	0.725	0.449	0	1
Nonpartisan Election	91	0.714	0.454	0	1
Primary Election	91	0.352	0.480	0	1
Population (logged)	91	14.166	0.826	13.065	15.921
White Ideology	86	3.835	0.648	2.667	5.250

Table A2: Cities included in Racial Polarization Data

	Segregation		Largest Racial Divide, Number of Elections		
City Name	Mean H Index Multi-Group	Mean H Index Two-Group	Black/White	Latino/White	Black/Latino
Austin, TX	0.204	0.208	1		
Baltimore, MD	0.510	0.516	3	1	
Charlotte, NC	0.269	0.287	2		
Chicago, IL	0.572	0.460	7		1
Cleveland, OH	0.558	0.531	2		
Columbus, OH	0.316	0.284	3		1
Dallas, TX	0.359	0.339	4		1
Denver, CO	0.289	0.254	1	2	
Detroit, MI	0.398	0.255	1		1
Houston, TX	0.339	0.308	7		2
Indianapolis, IN	0.292	0.293			1
Jacksonville, FL	0.233	0.222	2		
Los Angeles, CA	0.351	0.366	3		5
Memphis, TN	0.470	0.474	2		
Milwaukee, WI	0.423	0.360	3		
New York, NY	0.468	0.474	5	3	1
Oklahoma, OK	0.231	0.165	1		
Philadelphia, PA	0.492	0.487	5		
Phoenix, AZ	0.255	0.270		1	
San Antonio, TX	0.237	0.225		4	
San Diego, CA	0.255	0.266	3		1
San Francisco, CA	0.223	0.161	3		1
San Jose, CA	0.186	0.198		2	1
Tucson, AZ	0.185	0.192	1		
Washington, DC	0.464	0.491	3		

Table A3: Summary Statistics Census of Government Finance and Population

Variable	Obs	Mean	SD	Min	Max
Direct General Expend per cap	13742	1.186	1.220	0.019	70.457
Highways per cap	13603	0.081	0.053	0.000	1.106
Parks per cap	13626	0.181	0.094	0.000	1.546
Police per cap	12905	0.061	0.061	0.000	1.111
Sewers per cap	11223	0.092	0.077	0.000	1.591
Welfare, Health & Housing per cap	10871	0.057	0.131	0.000	4.984
Own Source Revenue per cap	13741	0.942	1.118	0.021	76.123
Two-Group H Index	13742	0.076	0.099	0.000	0.767
Diversity	13742	0.309	0.188	0.007	0.772
% Black	13742	0.097	0.151	0.000	0.980
% Asian	13742	0.032	0.054	0.000	0.674
% Latino	13742	0.104	0.161	0.000	0.987
5 yr Δ % Black	11194	0.007	0.019	-0.101	0.229
5 yr Δ % Latino	11194	0.016	0.020	-0.171	0.207
5 yr Δ % Asian	11194	0.005	0.011	-0.056	0.128
Median income	13742	54520	22081	15643	240938
% Local Gov Employees	13742	3.359	0.951	0.677	8.365
% Renters	13742	0.360	0.140	0.014	0.871
% Over 65	13742	0.125	0.050	0.012	0.771
% College degree	13742	0.160	0.099	0.003	0.587
Population (logged)	13742	10.132	1.016	6.071	15.921
City Ideology	2130	4.023	0.780	1.000	7.000
Population	13742	53723	208144	433	8214426

Table A4: First Stage Regression of Segregation on Waterways and Population												
	Direct General Exp			Roads			Law Enforcement			Parks		
	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|
# Waterways	0.005	0.00	0.00	0.005	0.00	0.00	0.005	0.00	0.00	0.005	0.00	0.00
Population(logged)	0.029	0.00	0.00	0.029	0.00	0.00	0.030	0.00	0.00	0.030	0.00	0.00
Lagged DV	0.001	0.00	0.00	0.003	0.00	0.00	0.002	0.00	0.00	0.017	0.00	0.00
Diversity	0.107	0.00	0.00	0.109	0.00	0.00	0.108	0.00	0.00	0.100	0.00	0.00
% Black	0.138	0.00	0.00	0.141	0.00	0.00	0.140	0.00	0.00	0.177	0.00	0.00
% Asian	-0.251	0.01	0.00	-0.251	0.01	0.00	-0.253	0.01	0.00	-0.240	0.01	0.00
% Latino	-0.008	0.00	0.02	-0.008	0.00	0.03	-0.008	0.00	0.03	-0.003	0.00	0.35
Median Income (1000s)	0.000	0.00	0.11	0.000	0.00	0.13	0.000	0.00	0.20	0.000	0.00	0.81
% Local Gov. Employees	-0.001	0.00	0.00	-0.001	0.00	0.00	-0.001	0.00	0.00	-0.002	0.00	0.00
% Renters	0.000	0.00	0.94	0.000	0.00	0.91	-0.001	0.00	0.89	-0.009	0.00	0.05
% Over 65	0.270	0.01	0.00	0.279	0.01	0.00	0.276	0.01	0.00	0.285	0.01	0.00
% College Grad	0.001	0.01	0.86	0.000	0.01	0.97	0.001	0.01	0.85	0.006	0.01	0.42
Constant	-0.282	0.01	0.00	-0.284	0.01	0.00	-0.288	0.01	0.00	-0.282	0.01	0.00
N	21,145			20,704			20,627			19,056		
	Sewers			Welfare			Own Source Revenue					
	β	SE	P>|t|	β	SE	P>|t|	β	SE	P>|t|			
# Waterways	0.005	0.00	0.00	0.004	0.00	0.00	0.005	0.00	0.00			
Population(logged)	0.030	0.00	0.00	0.032	0.00	0.00	0.029	0.00	0.00			
Lagged DV	0.001	0.00	0.37	0.011	0.00	0.00	0.001	0.00	0.00			
Diversity	0.095	0.00	0.00	0.109	0.00	0.00	0.107	0.00	0.00			
% Black	0.184	0.00	0.00	0.185	0.01	0.00	0.138	0.00	0.00			
% Asian	-0.250	0.01	0.00	-0.242	0.01	0.00	-0.250	0.01	0.00			
% Latino	-0.001	0.00	0.81	-0.002	0.00	0.68	-0.008	0.00	0.03			
Median Income (1000s)	0.000	0.00	0.80	0.000	0.00	0.77	0.000	0.00	0.10			
% Local Gov. Employees	-0.001	0.00	0.04	-0.002	0.00	0.00	-0.001	0.00	0.00			
% Renters	-0.003	0.00	0.52	-0.010	0.01	0.08	0.001	0.00	0.83			
% Over 65	0.273	0.01	0.00	0.346	0.01	0.00	0.270	0.01	0.00			
% College Grad	-0.003	0.01	0.71	0.001	0.01	0.93	0.001	0.01	0.89			
Constant	-0.289	0.01	0.00	-0.311	0.01	0.00	-0.283	0.01	0.00			
N	16,616			14,711			21,148					

Note: First stage of two stage least squares regressions with fixed effects for regions and year (not shown); Instrumented: Two-group H Index of segregation; Excluded Instruments: # of Waterways, Population logged