Racial Segregation and Public School Expenditure*

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Abstract

This paper explores the effect of racial segregation on public school expenditure in US metropolitan areas and school districts. Our starting point is the literature that relates public good provision to the degree of racial fragmentation in the community. We argue that looking at fragmentation alone may be misleading and that the *geographic distribution* of different racial groups needs to be taken into account. Greater segregation is associated with more homogeneity in some subareas and more heterogeneity in others, and this matters if decisions on spending are taken at aggregation levels lower than the MSA. For given fragmentation, the extent of segregation conveys information on households' possibility to sort into relatively more or less homogeneous jurisdictions. We account for the potential endogeneity of racial segregation and find that the latter has a positive impact on average public school expenditure both at the MSA and at the district level. At the same time, increased segregation leads to *more inequality* in spending across districts of the same MSA, thus worsening the relative position of poorer districts.

Keywords: segregation, racial fragmentation, public school expenditure

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1 Introduction

A growing literature in recent years has explored the relationship between ethnic diversity and public good provision, following the seminal contributions by Easterly and Levine (1997) and Alesina, Baqir and Easterly (1999). The implicit contention in this literature is that ethnic divisions harm the possibility to cooperate for the provision of local public goods because the type of goods demanded by different groups are not the same, and/or because there is greater scope for monitoring and enforcement within than between ethnic groups. Empirically, this conjecture has been tested by regressing different indicators of public good provision on the "ethno-linguistic fractionalization" index. This index is built from population shares of the various groups and captures the probability that two individuals drawn at random from the population belong to different groups. What this literature neglects, however, is the role that the *spatial distribution* of races or ethnic groups in the territory may play. Intuitively, two communities with the same composition in terms of racial shares may display very different levels of public good provision depending on whether the various races are uniformly spread over the territory (so that the degree of interaction between races is high) or totally segregated (so that individuals from a given race are most likely to interact with people of their own group). The goal of this paper is to test if, for given level of racial fragmentation, segregation is a significant determinant of spending on public education, which is one of the most important locally financed public goods in the United States.

The existence of sizeable differences among US school districts in public education expenditure is a well known fact. Several studies have shown how spending per pupil can vary by a factor of two or more between contiguous jurisdictions within the same state, and the proportion of such spending funded through local taxes can vary by as much as a factor of four.[1] A variety of demographic and economic characteristics of the jurisdictions have been shown to correlate significantly with spending levels, e.g. average household income, mean property values, racial fragmentation, the fraction of elderly people, to name just a few. Predictions consistent with such findings can be derived from existing multicommunity models that embody proportional income or property taxation, differing qualities of public education, peer effects, and differences in human capital endowments and/or in taste for education among races. Surprisingly, one important feature of US commu-

[1]Evans, Murray and Schwab (1997) report that in 1987 in Kentucky the district of Whitley County was collecting only $247 per student (in 1992 prices) through local taxes, while Walton Verona was collecting as much as $1010.

nities has been overlooked in empirical studies of the determinants of public education expenditure: residential segregation among races. Assessing the impact of segregation on public education expenditure is important for at least two reasons: first, to get a more complete picture of what explains differences in spending levels across jurisdictions; second, to add yet another (possibly undesirable) effect of segregation on individual outcomes, this time measured through a crucial *input* into economic success, that is, access to affordable education.

We can think of two ways in which segregation may affect education expenditure. The first operates through a simple "aggregation" effect. Different degrees of segregation in a community are associated with different levels of *fragmentation* in the sub-areas that compose that community. If we believe that fragmentation affects the willingness or the ability to spend on local public goods (e.g., because of preferences, income differentials or human capital spillovers), then every time we estimate the determinants of expenditure using data which has a higher level of geographical aggregation than the level at which decisions are taken or interaction occurs, we should find that segregation plays a significant role. Notice that according to this explanation the effect of segregation should disappear once we control directly for the composition of the relevant sub-units. The second channel posits that, apart from possible aggregation effects, segregation may have an impact on expenditure due to *externalities* among the sub-areas that compose a community. For example, the extent of competition among school districts within a metropolitan area may depend not only on their number, but also on the characteristics of the available "menu" of districts, e.g. in terms of racial composition. In this sense, the degree of segregation of a metropolitan area (MSA) tells us more than the fragmentation indices of the MSA as a whole or of the single districts, and can be found to have an independent effect even after controlling for the characteristics of each sub-area, precisely because it captures the "interdependency" among them.

We use cross sectional data at the MSA and school district level for the US in 1990 and we take into account the potential endogeneity of racial segregation by looking at the *historical* determinants of segregation. In particular, we instrument MSA-level segregation in 1990 with the share of minority migrants into that MSA in 1940. We find that after controlling for racial fragmentation and for other MSA and district characteristics, racial segregation has a *positive* and significant impact on per pupil expenditure. According to our most conservative estimates, a one standard deviation increase in segregation leads to a 10% increase in average per pupil expenditure at the MSA level. With district level data, ceteris paribus, a one standard deviation increase in the segregation of the MSA where the district is located increases per pupil expenditure in the district by 20-22 percent. At the same time, we find that segregation significantly increases *inequality* in per pupil expenditure among districts in the same MSA, as measured by the Gini coefficient of school spending across districts of the same MSA, by the ratio of spending of the "top" to the "bottom" district, and by the standard deviation of per pupil spending across different districts in the same MSA. For example, a one standard deviation increase in MSA segregation leads to a 1.2 standard deviation increase of inequality in spending among districts of the MSA (that is about half the mean of the Gini coefficient of school spending across districts). To sum up, when we view segregation as a mechanism for sorting into relatively more homogeneous school districts and school attendance areas, we find that average expenditure at the MSA level increases but at the expense of widening disparities among "poor" and "rich" districts.

The remainder of the paper is organized as follows. Section 2 briefly reviews the literature to which this paper is related. Section 3 illustrates our underlying theoretical hypotheses for why segregation can affect expenditure on public education. Section 4 presents our empirical strategy, our measures of segregation and our choice of instruments. Section 5 describes the data and section 6 reports our main econometric results. Finally, Section 7 concludes.

2 Background literature

This paper is related to several strands of the literature. First, it builds on existing work on the empirical determinants of spending on public goods. Particularly related to the approach of our paper is the article by Alesina, Baqir and Easterly (1999), who consider education spending as a form of contribution to a local public good and analyze individuals' willingness to contribute as a function of the racial composition of the community. Using cross sectional data at the county and MSA level, the authors find that increased levels of racial fragmentation are negatively associated with local public goods provision, including public education. In her study of the determinants of per pupil spending across school districts, Hoxby (2000) also finds that racial heterogeneity of the metropolitan area has a negative effect on spending.[2] Banerjee, Iyer and Somanathan (2005) estimate the effects

[2] In a recent study, Rothstein (2007) replicates Hoxby's analysis but does not report results for per pupil expenditure (which is the dependent variable in our empirical analy-

of social divisions on public good provision in India. While we share the analytical framework of these authors, we expand on them by calling attention to the role that residential segregation can play as a means of sorting into relatively more homogeneous school jurisdictions. In this sense, our working hypothesis is corroborated by the recent work of Urquiola (2005), who finds that greater district availability is associated with Tiebout sorting as measured by decreases in districts' racial heterogeneity relative to the MSA where they are located. To our knowledge, ours is the first empirical study on the determinants of school spending to explicitly include segregation among the explanatory variables.[3]

In the background of our work, though not directly related to it, is the empirical literature on the effects of residential segregation on economic outcomes. Among others, Cutler and Glaeser (1997) estimate the effect of residential segregation in metropolitan areas on education, labor market outcomes and single motherhood. They find that increased segregation significantly worsens these outcomes, also when allowing for endogenous residential location. These findings are confirmed in the work of Oltmans (2006), who proposes a new instrument for segregation that is derived from the placement of railroad tracks during the 19th century. Recent studies by Guryan (2004) and by Card and Rothstein (2007) also find negative effects of segregation on education outcomes of African Americans. Our paper takes one step back and considers an *input* which is potentially key to the school performance and to the economic success of the disadvantaged, namely the provision of public education. In addition to the impact related to spatial mismatch or peer group effects, in fact, it is conceivable that segregation may affect the ability or the willingness to provide a local public good such as public education, and if this were the case the effect of public education could reinforce or mitigate the workings of the above channels.

Recent contributions by Clotfelter (2004) and by Lankford and Wyckoff (2006) have called attention on changing patterns in the racial composition of schools. The former author constructs measures of school segregation for the past five decades and finds that, while segregation within districts declined, racial imbalances *between* districts tended to increase. Lankford and Wyckoff (2000), on the other hand, use Census data for eight metropolitan areas in upstate New York and find the racial composition of students is significantly correlated with parents' decisions regarding school choice and

sis), nor on the role played by the racial composition of the community (which is the focus of our paper). Therefore our results will not be comparable with his.

[3] Earlier studies on the determinants of spending on public education include Poterba (1996), Fernandez and Rogerson (2001) and Card and Payne (2002).

residential location. Burgess, Wilson and Lupton (forthcoming) analyze the relationship between school and residential ethnic segregation in England and find that on average school segregation is greater than the segregation of the corresponding group in the neighbourhood. While controlling for racial composition and segregation at smaller geographical levels, our analysis will mainly focus on the effects of *MSA level* segregation, because the latter can be instrumented so as to allow an estimate of the causal link going from segregation to expenditure decisions.

Finally, indirectly related to the present analysis is the literature on endogenous jurisdiction formation, notably the papers by Martinez-Vazquez, Rider and Walker (1997), and by Alesina, Baqir and Hoxby (2004). Both papers allow for the number of jurisdictions to be determined by the taste for association with individuals of a similar race, as well as by other factors. Racial heterogeneity is shown to increase the number of school districts, consistently with the hypotheses of these models. While the present paper will only marginally touch on the issue of endogenous jurisdiction formation, it will explore the role of between and within-jurisdiction heterogeneity by focusing on the geographic distribution of races.

3 Racial fragmentation, segregation and school spending

Racial segregation can influence local spending decisions on public education through several channels. The first is related to *preferences* for intra-racial interactions (see e.g., Alesina, Baqir and Easterly (1999) and Alesina and La Ferrara (2000)). The model of Alesina, Baqir and Easterly predicts that when races differ in their preferred type of local public good, spending on such goods will decline with the degree of racial fragmentation in the relevant area. In this case segregation can give the opportunity to different (homogeneous) groups to provide their preferred public good at a smaller geographic level. Under this view, we can expect segregation to have an impact on spending decisions depending on the level of aggregation of the data. Consider as an example figure 1.

[Insert Figure 1]

Two communities A and B (say, two MSAs) are represented in the figure. Each of them is divided into three smaller units (say, school districts). Different colors in the figure represent different races, with the majority type being represented as white and the minority as black. Communities A and B are assumed to have the same population and the same ratio of black to white population, i.e. the same level of racial fragmentation. However, they differ in the degree of racial segregation, which is maximum in community A and minimum in community B. According to the basic model of Alesina, Baqir and Easterly (1999) the two communities should have the same level of spending on public education because they have the same fragmentation. However, suppose that the relevant geographic unit for decisions regarding some local public goods is smaller than the community as a whole, i.e. that each sub-community can have its own type and level of public good. In the case of education, this amounts to saying that decisions pertain to school districts and not to metropolitan areas.[4] We should then expect A and B to reach different outcomes due to the different levels of within-district fragmentation. In particular sub-communities a1 and a2 in the figure will now spend more than b1 and b2, because they are more homogeneous; a3 will instead spend less than b3, unless the mass of the minority type is large enough to actually decrease racial fragmentation, in which case a3 may also spend more than b3. The aggregate effect of segregation on MSA-level spending is thus ambiguous. It will be positive if homogeneity increases in all sub-communities or if the increased expenditure by the sub-communities that have become more homogeneous (a1 and a2) more than compensates for the decrease in more heterogeneous ones (a3). Notice that the same reasoning can apply at smaller geographic level, e.g. considering A and B as school districts and the sub-units as school attendance areas. In all cases what matters is whether the possibility of sorting into more or less homogeneous sub-units for given level of aggregate fragmentation increases or decreases aggregate spending levels.

A second channel through which segregation may affect spending on public education is through differences in *income*. Starting from the work of Epple, Filimon and Romer (1984) and of Massey and Denton (1993), we can think of a framework in which the minority type is relatively poorer and thus different degrees of racial segregation imply different levels of average income and of inequality within smaller areas. In terms of figure 2, mean income is higher in a1 and a2 than in b1 and b2, and it is lower in a3 than in b3. Considering that education is a normal good, spending levels will be higher in a1 and a2 and lower in a3. The aggregate effect is once again

[4] Of course, the scheme in the figure is oversimplified because in reality school districts can extend beyond the borders of metropolitan areas. We address this issue in the empirical section.

ambiguous and depends among other factors on the income elasticity of the demand for education. One prediction we can derive in this case is that the ratio of spending of top to bottom district in the more segregated community (a1 over a3), will be greater than in the less segregated community (b1 over b3). In other words, according to this channel segregation should lead to increased inequality in expenditure among districts.

A third mechanism linking segregation and local school expenditure builds on "social capital" or *human capital externalities*, along the lines of De Bartolome (1990) and Benabou (1996). In Benabou's model, for example, children's human capital is a function of their parents' human capital, of school spending in their community, and of the quality of local interactions L, which is increasing in the local distribution of human capital. The social capital variable L captures local spillovers related to peer effects, network externalities and the like. In this setting, when the minority type has lower human capital endowment, segregation implies higher social capital in some sub-areas and lower in others. In figure 2, areas a1 and a2 should have more social capital than b1 and b2, while a3 should have less than b3. The aggregate effect will depend on whether the two types are complements or substitutes in the production of social capital and on their degree of complementarity or substitutability.

In reality, we are likely to observe a mixture of all these three channels at work, and they can actually interact in interesting ways.[5] For present purposes, however, all three channels have in common one feature: *segregation can be analyzed as a change in the fragmentation of smaller sub-areas* and, through the impact of fragmentation on spending in each sub-area, segregation will affect aggregate levels of spending in a nontrivial way. The magnitude and direction of the effect depends both on the mechanism of the underlying model and on the level of geographic aggregation chosen.

All the above explanations rely on what we have called "aggregation" effect, in that community-wide segregation only acts through the fact that it maps into different levels of fragmentation in the *sub-areas* that compose that community. A different approach, which we refer to as the "externality" channel, can be formulated by enriching existing models of inter-jurisdictional competition to account for racial composition. While in fact existing models of Tiebout competition posit that the price of educational services should be a negative function of the *number* of available districts,

[5] A recent paper by Sethi and Somanathan (2004), for example, argues that it is important to consider the interplay between preferences on inter-racial interactions and income differentials between races. Their framework is not applied to the provision of public education, but an extension in that direction seems important for future work.

it is conceivable that the degree of competition also depends on the "attractiveness" of such districts, and that the racial mix of the districts is one of the features that determine how attractive each district is. If this is the case, expenditure in a given district will depend not only on its own racial composition but also on the racial composition of *other* districts, and more generally on the geographic distribution of races in the metropolitan area. Consider again figure 1. Compared to situation B where all three districts compete perfectly in the sense that they have the same characteristics, in situation A the two homogeneous white districts face less competition: the number of effectively competing choices for households who would like a "relatively white" school district is now two instead of three. This may lead to lower cost saving incentives, hence higher expenditure. On the other hand, district a3 may face more or less competition compared to b3 depending on whether income effects or preferences for racial homogeneity dominate. If the driving force is the preference for homogeneity, then in situation A district a3 is the only alternative for minority pupils, hence competition decreases with segregation. On the other hand, if the driving force is the desire to mix with high income households either because of their contributing capacity or because of human capital spillovers, and if race is correlated with income, then district a3 may actually face *more* competition from a1 and a2 than b3 does from b1 and b2. Generally speaking, depending on whether greater segregation increases or decreases effective competition among districts, we can expect a decrease or an increase in public school expenditure.[6]

4 Empirical strategy

4.1 Estimating equations

Our basic estimating equation can be specified as follows:

$$Y_{ir} = \beta X_{ir} + \gamma SEG_{ir} + \lambda D_r + \epsilon_{ir} \tag{1}$$

where i represents the MSA/PMSA and r the region. The dependent variable Y_{ir} is the logarithm of per pupil (or per child) current expenditure on public education; X_{ir} is a vector of controls for demographic and economic characteristics of the metropolitan area, including income inequality, racial

[6] Notice that while segregation is endogenous to residential location decisions and is itself a function of inter district competition, in the empirical section we will try to identify the "exogenous" menu of segregation areas by using instruments that transcend individual decisions and capture historical patterns of migration by minorities.

composition and the number of school districts in the MSA/PMSA; D_r is a vector of nine Census region dummies; ϵ_{ir} is the error term, and β, γ, λ are parameter vectors. Equation (1) will be estimated using OLS and 2SLS, given the potential endogeneity of both segregation and the number of school districts. In all cases standard errors are adjusted for clustering at the state level. Notice that among the controls X_{ir} is the index of racial fragmentation of area i, defined as the likelihood that two randomly drawn individuals belong to different races:

$$FRAG_i = 1 - \sum_{m=1}^{M} s_{mi}^2$$

where s_{mi} is the share of group m in the total population of area i and m indicates five possible racial groups: White, African American, Asian/Pacific Islander, American Indian, and Other. We also include an index of *ethnic* fragmentation constructed with the same formula, but grouping people according to their ancestry.[7] Segregation is measured with different indices, which we describe below.

In a second set of regressions, we try to get some insight into the mechanisms underlying the change in public spending by considering as dependent variables in (1) the logarithm of local revenue per pupil and the fraction of pupils enrolled in private schools.

To understand the effects of segregation on the *distribution* of expenditure across districts (as opposed to just average expenditure levels in the MSA), we re-estimate (1) using as dependent variables several indicators of inequality in expenditure across districts in the same MSA/PMSA. Obviously, for these regressions we restrict the sample to metropolitan areas with more than one school district. In particular, we shall report results for:

(i) a Gini coefficient of per pupil expenditure at the MSA/PMSA level, using school districts as sub-units;[8]

(ii) the ratio of per pupil expenditure in the "top" over the "bottom" district in the MSA/PMSA (where top and bottom indicate, respectively, the districts with highest and lowest per pupil expenditure);

(iii) the standard deviation of per pupil expenditure across districts in the same MSA/PMSA.

[7] The 1990 Census originally reports thirty-five categories for ancestry. We aggregate them into ten different groups on the basis of common language, culture and geographic proximity, following Alesina and La Ferrara (2000).

[8] To compute Gini, we restrict the sample to MSA/PMSAs with four or more school districts.

In another set of regressions we employ district level data, and modify our estimating equation as follows:

$$Y_{is}^{d} = X_{is}\beta_0 + FRAG_{is}\gamma_0 + X_{is}^{d}\beta_1 + FRAG_{is}^{d}\gamma_1 + SEG_{is}\delta + D_s\lambda + \epsilon_{is}^{d} \quad (2)$$

where d represents a school district, i a metropolitan area, and s a State. The inclusion of State dummies is particularly relevant as it allows us to account for differences across States in policies regarding public education. Note that the above specification includes a full set of demographic controls both at the MSA and at the district level, but the coefficients on district level variables cannot be given a structural interpretation due to endogenous Tiebout sorting. Following Hoxby (2000), we shall therefore include them to improve the fit of the equation but not discuss them in the results section. In these regressions, our focus is on estimating the impact of segregation *in the metropolitan area* on district level expenditure. Provided that the MSA can be considered as the exogenous educational market that households face in their decisions, and that we find suitable instruments for segregation at the MSA level, we should obtain an unbiased estimate of the coefficient γ.

Finally, even within the same district a given level of MSA segregation and district fragmentation does not mean that households do not have the possibility to send their children to more or less homogeneous schools. The last part of our district level results augments the specification of (2) with the number of schools in the district and with indicators of school composition within the district. Again, while we shall not interpret the coefficients on these variables in a causal way, their inclusion will shed some light on the role played by MSA level segregation in education spending decisions.

4.2 Measures of racial segregation

In our baseline specification we measure segregation using the multigroup version of the dissimilarity index, as proposed by Reardon and Firebaugh (2002):

$$SEG = \sum_{m=1}^{M} \sum_{i=1}^{n} \frac{P_i}{2PI} \left| s_{im} - s_m \right| \quad (3)$$

where m is the index for race, i indicates the census tract, P_i is the number of individuals in census tract i, P is the total population of the metropolitan area, s_{im} is the share of race m in census tract i, and s_m is the share of race

m in the total population. The index I in the denominator is the Simpson Interaction Index, a measure of diversity given by the formula:[9]

$$I = \sum_{m=1}^{M} s_m \left(1 - s_m\right). \tag{4}$$

Intuitively, the multigroup dissimilarity index (3) is a measure of disproportionality of races across the census tracts, and captures the share of all individuals that should transfer among census tracts in order to equalize the proportion of races across tracts, divided by the proportion that would have to change census tract if the metropolitan area were perfectly segregated.[10] The index varies between 0 and 1, where zero corresponds to perfect integration and 1 to perfect segregation.

We prefer to rely on a multigroup index to account for the complex racial heterogeneity patterns of US metropolitan areas. In fact, one drawback of dichotomous indices is that they cannot account for complex segregation patterns among all racial groups, since they measure the residential separation of a minority group with respect to the rest of the population. For example, a dichotomous index measuring the residential segregation of blacks with respect to nonblacks, considers whites, Hispanics and Asians together as an homogenous group. Nonetheless, we also test for robustness of our findings by employing the standard dichotomic version of the dissimilarity index, i.e. with $M = 2$, which is the same proposed by Cutler and Glaeser (1997):

$$SEG_2 = \frac{1}{2} \sum_i \left| \frac{B_i}{B} - \frac{NB_i}{NB} \right| \tag{5}$$

where i indicates census tracts within a metropolitan area, B is the total number of Blacks in that area, B_i is the number of Blacks in census tract i, and NB stands for the remaining racial groups. Expression (5) can be interpreted as the fraction of the black population that should move from one census tract to another in order to achieve an even distribution of races

[9] Note that expression (4) is nothing but the racial fragmentation of the metropolitan area: $I = \sum_{m=1}^{M} s_m \left(1 - s_m\right) = 1 - \sum_{m=1}^{M} s_m^2$.

[10] Rearranging the terms of the multigroup dissimilarity we get $SEG = \frac{1}{2I} \sum_{m=1}^{M} s_m \sum_{i=1}^{n} \frac{P_i}{P} \left| \frac{s_{im}}{s_m} - 1 \right|$. In essence when the metropolitan area is perfectly integrated, every census tract contains the same proportion of each race as in the metrpopolitan area as a whole, i.e. $s_{im} = s_m$ for all i and all m. The case of perfect integration implies an index of zero, since the term in absolute value is always zero. Whenever $s_{im} \neq s_m$ for some i and m, the term in absolute value becomes positive. So we can interpret this index as the average disproportionality across census tracts, weighted by the race proportions and the population shares.

in the area, as a ratio to the proportion of black population that should move in a situation of maximum segregation.

In our sensitivity analysis we also employ the Isolation index, which measures the extent to which people belonging to a racial group are likely to interact with others from the same racial group. For the multigroup version, we rely on the Normalized Exposure index reported in Reardon and Firebaugh (2002):[11]

$$ISO = \sum_{m=1}^{M} \sum_{i=1}^{n} \frac{P_i}{P} \frac{(s_{im} - s_m)^2}{1 - s_m}. \tag{6}$$

This index can be interpreted as the probability that a randomly drawn individual shares the census tract with an individual of the same race, weighted by the race shares. So it is a measure of the degree of individual exposure to people belonging to the same racial group, varying from a value of 0 in case of perfect integration to a value of 1 in case of perfect segregation.

For the dichotomic version, we follow Cutler and Glaeser (1997):

$$ISO_2 = \frac{\left(\sum_{i=1}^{n} \left(\frac{B_i}{B}\right)\left(\frac{B_i}{P_i}\right) - \frac{B}{P}\right)}{\min\left(\frac{B}{P_i}, 1\right) - \frac{B}{P}}, \tag{7}$$

where $\min\left(\frac{B}{P_i}, 1\right)$ is used to adjust the index in order to have a measure going from 0 (perfect integration) to 1. This index can be interpreted as the probability that an African-American would share the census tract with another African American.

4.3 Instruments

An obvious problem with OLS estimates of (1) and (2) is that both segregation and the number of school districts within a metropolitan area are likely to be endogenous. In fact, differing levels of education expenditure affect the incentives of households to relocate across districts within the metropolitan area, and this will affect the degree of segregation. Similarly,

[11]The index is based on Bell's isolation measure $\Omega = \sum_{i=1}^{n} \frac{B_i}{B} \frac{B_i}{P_i}$, where B_i is the number of blacks in census tract i, B is the total black population in the city and P_i is the tract population. The index is the average minority proportion in each census tract, weighted by the minority proportion in the population. Suppose we randomly chose an individual from the population: Ω is the probability that this individual will share a census tract with another individual of the same racial group. The expressions for ISO and ISO_2 are normalizations of this index.

district breakup or consolidation may occur in response to differences in school spending. While we want to allow for endogeneity of both segregation and the number of school districts ($NDIST$), the focus of our analysis is on the role played by *segregation* as a determinant of expenditure. For this reason, we report results both for the case in which segregation is instrumented and $NDIST$ is taken to be exogenous, and for the case in which both are taken to be endogenous. When instrumenting $NDIST$, we simply follow Hoxby (2000) and Rothstein (2005) and employ the count of large and small streams going through an MSA.[12]

In considering potential instruments for current levels of segregation, we decided not to rely on variables related to contemporary barriers in the housing market (e.g., data on real estate agents' activity or on discrimination in mortgage lending by banks) because they may be correlated with unobserved determinants of preferences at the city level that may directly affect the demand for education spending. We thus resorted to the *historical* determinants of segregation patterns across US metropolitan areas and focused on the Great Migration that occurred between the two World Wars.[13] Our basic hindsight is that, as massive waves of migrants moved into urban areas, the composition of the neighborhoods where they settled depended to a significant extent on how homogeneous the mass of the newly arrived was, that is, on what share of the new migrants belonged to minorities.

Our point is easily illustrated through an example. Consider a city inhabited by two racial groups, whites and blacks, and formed by two neighborhoods (census tracts): tract 1 may be termed the "inner city" neighborhood and tract 2 covers the rest of the city. To see what happens to segregation when a flow of new migrants arrives, consider figure 2. In this figure, white areas represent parts of the city initially occupied by the white population, and black areas parts of the city initially occupied by blacks.

[Insert Figure 2]

Panel A of figure 2 shows the change in neighborhood racial composition when new migrants enter the city but relatively few of them are black. Assuming that tract 1 was not fully occupied by minorities to start with and that whites resist to break the color line (a phenomenon that we document

[12] In particular, we use the variable "total streams through MSA" constructed by Rothstein (2005) and available on his website. Our results on the effects of segregation do not change significantly is we employ Hoxby's original variable or other variations available in Rothstein's dataset.

[13] See among others Margo (1988), Collins (1997) and Vigdor (2002).

below), the new black population will be accommodated in tract 1, as shown by the grey area in the right part of Panel A. The effect on the (dichotomic) dissimilarity index is an unambiguous increase. In fact, in our example dissimilarity is equal to $\frac{1}{2}\left(\left|\frac{B_1}{B}-\frac{W_1}{W}\right|+\left|\frac{B_2}{B}-\frac{W_2}{W}\right|\right)=\frac{1}{2}\left(\left|1-\frac{W_1}{W}\right|+\left|0-\frac{W_2}{W}\right|\right)$ which increases after immigration as a greater share of whites now lives in tract 2 compared to the initial situation. Consider now a different initial situation, as depicted in Panel B of figure 2. In this case the size of the black migrant inflow is so large that some of the minority migrants start occupying tract 2. The dissimilarity index thus changes from $\frac{1}{2}\left(\left|1-\frac{W_1}{W}\right|+\left|0-\frac{W_2}{W}\right|\right)$ to $\frac{1}{2}\left(\left|\frac{B_1}{B}-0\right|+\left|\frac{B_2}{B}-1\right|\right)$, which means that if $\frac{W_1}{W}$ was sufficiently small to start with or $\frac{B_2}{B}$ is sufficiently large after migration, dissimilarity may actually decrease. Our conjecture is therefore that inflows of minority migrants should have a positive effect on segregation when their share in the total migrants' inflow is relatively small, but the effect should diminish and possibly become negative as their share becomes very large.

This conjecture is substantiated by historical accounts of the evolution of American ghettos, as described among others by Massey and Denton (1993). The authors document how minority migration into urban areas in the 1930s was accommodated by first increasing population density within inner city neighborhoods:

> "At first, the newcomers took the place of whites departing from racially changing neighborhoods located near the fringe of the ghetto. Once these neighborhoods had become all black, however, further ghetto expansion proved to be difficult because, given the housing shortage, there was nowhere for whites on the other side of the color line to go. As whites in adjacent neighborhoods stood firm and blocked entry, the expansion of the ghetto slowed to a crawl, and new black arrivals were accommodated by subdividing housing within the ghetto's boundaries." (ibidem, p. 43).

As home construction picked up again in the 1940s, after the Great Depression, an increasing number of whites chose to move to the suburbs and the size of the ghetto started increasing through incorporation of adjacent neighborhoods. Massey and Denton summarize this process very clearly:

> "In cities receiving large numbers of black migrants, racial turnover was so regular and so pervasive that most neighborhoods could be classified by their stage in the transition process:

all white, invasion, secession, consolidation, or all black." (ibidem, p. 46)

To construct our instrument for segregation, we therefore use individual level data from the Public Use Microdata Sample of the 1940 Census and calculate the share of migrants into a city in that year who belonged to the category "Black" or "Other". We classify as migrants people who in 1940 reported not living in the same statistical metropolitan area in 1935. Formally, our key instrumental variable is defined as

$$MIGSHARE40_i = \frac{NonWhite\ migrants_{i,1940}}{Total\ migrants_{i,1940}} \tag{8}$$

where i denotes the destination MSA and 1940 the Census year to which the migration status refers. When we measure segregation through dichotomic (as opposed to multigroup) indices, our instrument is the share of Black migrants over total migrants. To account for the nonlinear effect of this variable as described above, we shall introduce $MIGSHARE40$ in quadratic form.

5 Data and descriptive statistics

Before turning to a description of our data and sources, a premise is in order. We are interested in understanding the role of segregation in a context where public education is locally financed and differences in the socioeconomic composition of local school districts translate into differences in spending levels. For this purpose, using the most recent data available (i.e., the 2000 Census and the 2002 Census of Governments) does not seem the best option, as a number of school finance equalization programs were implemented in the late 1980s and 1990s that altered the local financing mechanism. Given that the bulk of the reforms occurred in the 1990s after a series of rulings of the State Supreme Courts and a series of appeals, we chose to conduct our analysis on the 1990 Census and the 1992 Census of Governments. This seems the best compromise between using data that is recent enough and being able to capture the workings of a decentralized education finance system.

From the 1992 Census of Governments (COG) we take our district level dependent variable, the expenditure on K-12 education, as well as the number of students in each district. We construct the MSA level dependent variable by adding the expenditures of all the districts belonging to the

MSA. The number of students and the number of districts in the MSA are computed in the same way. The match between districts and MSA's is provided by the School District Data Book (SDDB). Following a large body of literature (e.g., Fernandez and Rogerson (2001), Card and Payne (2002)) we restrict our attention to *current* expenditure, which is best comparable among states. We normalize expenditure by the number of students in the relevant area and take the natural logarithm. As a robustness check, we will also report results for current expenditure per child. Economic and demographic controls and segregation indices at the MSA/PMSA level are constructed from the 1990 Census.

In the district-level regressions, the number of schools in each district and all school level information on demographic characteristics of the pupil population (notably racial composition) are taken from the Common Core of Data (CCD) of the National Center of Education Statistics for the academic year 1992/93. The source of all demographic and economic controls at the district level is the Special Tabulation of the 1990 Census contained in the SDDB.

Turning to our instrumental variables, we constructed shares of minority migrants using data from the Census of Population and Housing, Public Use Microdata Sample 1940 (PUMS 1940).[14] The streams variables are extracted from the dataset used by Rothstein (2007).[15] Summary statistics of all variables employed are contained in Appendix table A1.

5.1 Racial segregation and fragmentation

Table 1 contains descriptive statistics for some variables of interest at the MSA and school district level. In all our empirical analysis we restrict attention to metropolitan areas whose minority population is at least 5 percent of the total. This is because the meaningfulness of the segregation indexes is very limited otherwise. Our working sample consists of 277 MSAs for the OLS regressions and is restricted to 128 MSAs when we instrument segregation with the share of minority migrants in 1940. This reduction in sample size is due to the smaller number of Statistical Metropolitan Areas in 1940. In the district level regressions (for which we only report the restricted sample results), we have a total of 3,194 school districts in the 128 metropolitan

[14]The PUMS 1940 is a 1% stratified sample of households extracted from Census of Population and Housing. We used the data provided by ICPSR, from ICPSR Study No. 8236.

[15]We used the data available online at http://www.princeton.edu/~jrothst/replication/hoxbydocumentation/final_data.

areas.

[Insert Table 1]

Expenditure per student in the average MSA is 4,783 US dollars (in 1990 prices), with a standard deviation of 1,232 dollars; average figures for the restricted sample are virtually identical. The high variability in expenditure per student is more apparent if we look at district level data, where the corresponding figures are, respectively, 5,361 and 2,048 dollars for the full sample and 5,112 and 1,721 dollars for the restricted one. The number of districts also varies a lot across metropolitan areas. The average MSA has .26 districts for every 1,000 students (.23 in the restricted sample), but the range of this variable goes from .003 to 1.11 districts per 1,000 students. Turning to heterogeneity in income, race and ethnic origin, we see that individual districts are less heterogeneous than metropolitan areas: the average Gini coefficient on household income is .41 for the MSA and .37 for the district; racial fragmentation is on average .28 in the MSA and only .17 in the district, and similarly for ethnic fragmentation. As for segregation, in order to achieve an even distribution on the territory in the average MSA, 51% of the population should move from one Census tract to another (56% in the restricted sample). Note that the measures of income inequality, racial and ethnic fragmentation are almost identical across samples (full and restricted).

[Insert Figures 3-5]

Figures 3 to 5 attempt to look more closely at the relationship between segregation in the metropolitan area and racial fragmentation either at the MSA level (figure 3), or in the corresponding districts (figure 4) or in the schools of that MSA (figure 5). The size of the circles in the figures is proportional to the population of the MSA: points identified by larger circles correspond to more populated metropolitan areas.

Figure 3 shows that there is no statistical relationship between the degree of racial fragmentation of a metropolitan area and its level of segregation, as measured by the multigroup dissimilarity index. Indeed, the correlation coefficient between the two variables is .05. On the other hand, a relationship between population size and both segregation and fragmentation emerges, with smaller metropolitan areas being overall less fragmented and less segregated.[16] This suggests that racial composition and the distribution of races over the territory may actually play an independent role in the data.

[16] Notable exceptions are New York and Los Angeles which, despite their size, have segregation levels of "only" .48.

Figure 4 plots average district racial fragmentation against segregation in the corresponding MSA. The pattern shows a negative association, especially for bigger MSA's, suggesting that more segregated metropolitan areas on average have less fragmented school districts, again an indication of racial sorting *between* districts more than within districts.

In figure 5 we consider the relationship between MSA segregation and racial fragmentation of schools in that MSA. Here the pattern is extremely clear. More segregated metropolitan areas have on average more racially homogeneous schools (panel A). Furthermore, the standard deviation in school fragmentation is higher in more segregated MSA's (panel B). This is quite interesting because it suggests that residential sorting on the MSA territory is associated with many homogenous schools but also with a number of very heterogeneous ones. As briefly sketched in the theoretical section, this pattern is likely to generate different desired expenditure levels by households compared to a pattern with the same *average* school heterogeneity but no variation among schools. Notice that the patterns highlighted in figures 4 and 5 are consistent with Urquiola's (2005) findings about Tiebout sorting. We next move to multivariate analysis.

6 Empirical results

6.1 Average school spending, MSA level

[Insert Table 2]

Table 2 presents simple OLS estimates of the relationship between expenditure per pupil and segregation at the MSA level. Results are displayed for the restricted sample (that is, the subset of metropolitan areas for which we have migration data by race in 1940) also in column 1. Appendix table A2 shows the OLS results for the full sample and for specifications that do not include segregation among the controls. Results are presented for four measures of segregation, i.e. the multigroup dissimilarity index (columns 1-2), its dichotomic version (columns 3-4), the multigroup isolation index (columns 5-6) and its dichotomic version (columns 7-8). A first set of specifications (columns 1,3,5,7) includes only the segregation measure and the nine Census region dummies. In a second set of specifications (columns 2,4,6,8) the following controls are added: the number of school districts per 1000 pupils, median household income (in logs), population (in logs), the share of the population aged 65 or more, the share with education level BA or higher, the fraction of homeowners, the share of African American, Asians/Pacific islanders, and other races (the omitted category is white), the Gini coefficient of inequality in household total taxable income, racial fragmentation and ethnic fragmentation.

The coefficient on racial segregation is positive and significant in 7 specifications out of 8, while the school district variable is never significant. Median household income is positively related to expenditure per pupil, as is the share of the population holding a BA. One notable difference with respect to previous studies is that we do not find a negative coefficient on the racial fragmentation variable, possibly due to the exclusion from our sample of MSA's with less than 5% of minority population.

[Insert Table 3]

We next account for the endogeneity of racial segregation in Table 3. The segregation measure employed in this table is the multigroup dissimilarity index for all regressions. We show in table 5 that similar results obtain when the other segregation indices are employed. Column 1 displays our first stage regression, where the excluded instruments are the share of minority migrants in 1940 (as defined in expression (8)) and its square. These variables turn out to be highly significant, and the estimated coefficients suggest an increasing and concave relationship between MIGSHARE40 and segregation over the sample range, consistently with the hypothesis we advanced in section 4.3.

In column 2 of table 3 we report the 2SLS estimates of public education expenditure when segregation is considered endogenous but the number of districts per students is still taken to be exogenous. We include the number of districts variable to make sure that the effect of segregation does not go through jurisdiction formation. The effect of racial segregation on per pupil expenditure is now positive and significant at the 5 percent level. According to these estimates, ceteris paribus going from a totally integrated to a totally segregated metropolitan area should increase expenditure per student by 94%. The effect of a one standard deviation increase in segregation is a 10% increase in per pupil expenditure. These are quite sizeable effects. Comparing the IV coefficient on segregation with the OLS one, we see that the latter was substantially smaller (and not significant). This is consistent both with attenuation bias due to measurement error, and with an omitted variable bias whereby unobserved MSA characteristics (e.g., preferences) that lead to higher public school expenditure are negatively correlated with racial segregation.

In columns 3 and 4 we report the first stage when both segregation and the number of school districts per 1000 pupils are considered endogenous.[17] For this purpose we augment our set of excluded instruments with the number of streams going through the MSA, as explained in section 4.3. Not surprisingly, we find that the streams variable does well in predicting the number of districts, but less well in predicting segregation, once we include our migrant share variables. The IV coefficients for the second stage are reported in column 5. The coefficient on #Districts/1000 pupils is negative but not statistically significant. The coefficient on segregation is slightly smaller than in the previous specification (.86 instead of .94) and is significant at the 10 percent level.

To test the robustness of our results, we repeated the estimation using as a dependent variable expenditure *per child* instead of expenditure per student. The results are actually stronger, and are reported in Appendix Table A3.

The positive sign of the IV estimate for segregation is consistent with two non mutually exclusive explanations. The first stems from the assumption the households are more willing to spend on education the greater the fraction of children of their own race in the neighborhood where they live. In this case, when segregation increases, expenditure will increase in the districts that have become more homogeneous, but decrease in those than have become more heterogeneous, and if the former effect more than dominates the latter we shall find a positive effect. A second interpretation works through competition. As shown by the descriptive statistics, ceteris paribus in more segregated cities there is a larger fraction of relatively racially homogeneous school districts (see figure 4). The presence of few very heterogeneous districts and a number of fairly homogeneous ones may decrease the competitive pressure (though in theory the effect is ambiguous) compared to a situation with the same number of equally heterogeneous ones. If this occurs, cost savings incentives will be lower and average expenditure higher. In our district level regressions we shall try and shed more light on these interpretations.

[Insert Table 4]

[17] With respect to the possibility that the number of districts itself may be influenced by segregation, notice that Brasington (1999) shows that the two variables that most account for the propensity of two neighboring entities to form a consolidated school district are population and property value. According to his results, racial composition has no independent effect once the above factors are controlled for.

Table 4 is a first attempt to verify the consistence of our results with the argument that higher homogeneity may translate into a higher willingness to contribute to local public goods – along the lines of Alesina, Baqir, Easterly (1999) – and decrease the incentives to "opt out", that is, resort to private education. The first column of table 4 reports 2SLS estimates when the dependent variable is the logarithm of local revenue per student, the covariates are the same as in the expenditure regressions, and both segregation and the number of districts per pupils are instrumented as before. The coefficient on segregation is positive and significant at the 5 percent level. Its magnitude implies that a one standard deviation increase in segregation would increase local revenue per student by 37 percent.[18] Interestingly, the racial fragmentation variable here has a negative and significant coefficient, consistently with the literature on ethnic fragmentation and public good provision (e.g., Alesina, Baqir and Easterly (1999)).

When the dependent variable is the fraction of students enrolled in private schools (column 2 of table 4), the coefficient on segregation is negative and again significant at the 5 percent level. The size of this coefficient implies that a one standard deviation increase in segregation would lead to a decrease in private enrollment of 4.6 percentage point (that is about one standard deviation of this variable). When only segregation is instrumented, and the number of districts is taken to be exogenous, the results are virtually unchanged both for local revenue and for private schooling (see Appendix Table A4). Overall, these results suggest that increases in segregation on average lead to higher willingness to contribute to local public education and less reliance on private education.

[Insert Table 5]

In table 5 we explore the robustness of our results to using different measures of segregation. Each cell reports the coefficient on a different measure of segregation and a different specification, where the basic controls of table 2 are always all included. The first row refers to the dichotomic dissimilarity index constructed for blacks versus non-blacks and defined by expression (5). The second row refers to the multigroup isolation index defined in (6), and the third to the dichotomic isolation index defined by (7). In all cases, the effect of segregation is positive, it is always significant at the 1 percent level, and is considerably greater in size than the one estimated

[18] The OLS coefficient on segregation (reported in Appendix table A4) is also significant at the 5 percent level but smaller, suggesting an 8 percent increase in local revenue per student associated to a one standard deviation increase in segregation.

for the multigroup dissimilarity index. Our baseline specification can thus be considered as the most conservative from the point of view of the measure of segregation employed.

6.2 Inequality in spending across school districts

The results obtained so far indicate that higher levels of residential segregation in a metropolitan area are associated with higher *average* spending of its school districts, but say nothing on whether the increase in spending is uniformly distributed across districts or concentrated in a few ones. We try to address this question by constructing several indices of inequality in per pupil expenditure across districts in the same MSA, and taking these indices as our left-hand-side variables in a series of regressions that follow the same approach as above. Table 6 shows the results of this exercise.

[Insert table 6]

While the naive OLS estimates are not significant for the segregation variable, the IV coefficients are positive and significant for all three measures of inequality. According to the estimates in column (2), a one standard deviation increase in segregation would increase the Gini coefficient for school expenditure by .04. Considering that the sample mean of this variable is .08 and its standard deviation .03, this is a sizeable effect. If we take the ratio of per pupil expenditure of the top and the bottom school district (column 4) a one standard deviation increase in segregation leads to an increase of .27 in this ratio, that is about half the standard deviation of this variable. Finally, when the dependent variable is the standard deviation of per pupil expenditure within a MSA, a one standard deviation in segregation increases this variable by .22, which is approximately 2/3 of its own standard deviation.

In all specifications, the coefficients on the number of school districts per 1000 pupils are positive and generally significant, indicating that school choice – as roughly proxied by this variable – leads to more inequality in spending. Overall, these results convey an important message that cannot be disjoint from the previous findings. Whatever the mechanism underlying the finding that residential segregation translates into more resources devoted to public education *in the aggregate*, it does so at the expense of the low spending districts that see a widening gap in per pupil spending compared to the high spending districts.

6.3 Evidence at the district level

In this section we analyze the determinants of expenditure at the district level, including both a district's own characteristics (demographics, income distribution, racial composition) and the characteristics of the MSA where the district is located. Only the coefficients on the MSA variables are interpretable and are therefore reported. The list of district level controls (reported in the tables) is anyway the same as that of city level controls, except for the addition of a dummy for unified school districts, to control for the fact that unified districts have greater outlays. State fixed effects are included to control for differences in school financing policies across States. All observations are weighted so that every MSA has the same probability of being in the sample.

[Insert table 7]

Table 7 reports three sets of estimates: naive OLS, 2SLS with one endogenous variable (segregation), and 2SLS with two endogenous regressors (segregation and $\#Districts$). The pattern on the segregation variable mimics that of the MSA level regressions. Our estimates in columns 2 and 3 suggests that, ceteris paribus, "moving a district" from a totally integrated to a totally segregated MSA would almost double per pupil expenditure in that district. Ceteris paribus, a one standard deviation increase in the segregation of the MSA where the district is located would increase per pupil expenditure in the district by 22 percent (column 2) or 20 percent (column 3). Notice that this holds *after controlling for the racial fragmentation of the district itself.* Given that the 'demand' effect that associates changes in segregation with changes in district level fragmentation should be picked up by the own district fragmentation variable, the positive coefficient on segregation is likely to reflect externalities among districts.

[Insert table 8]

In table 8 we include two variables that are meant to proxy for the menu of choices among schools available to parents. The idea is that, if inter-racial contact *in the school* is what matters, the availability of a large number of schools and the variation in the degree of school heterogeneity may play an important role. The first column of table 8 includes, in addition to the usual controls, the number of schools in the district. This variable is not significant, while segregation retains a positive and significant effect on spending. In the second column we also add the standard deviation of school level racial fragmentation. The latter variable is particularly relevant in that it captures the degree of variation in the heterogeneity of the pupils population. In fact, what matters is not the *mean* level of fragmentation but its *dispersion*, because it accounts for whether a metropolitan area contains schools whose racial composition is broadly similar or very diverse. The coefficient on this variable is positive and significant, and even in this specification the coefficient on segregation remains stable and significant.

7 Conclusions

This paper has addressed the question of whether racial segregation affects spending on public education, and has provided evidence that segregation has a positive impact on *average* per pupil expenditure, both at the metropolitan area and at the district level. Consistently with this finding, ceteris paribus local revenue per student is higher in more segregated metropolitan areas and enrollment in private schools is lower. However, our estimates also show that increased segregation leads to *more inequality* in spending across districts of the same MSA. Although further work is needed to pin down the exact mechanisms through which segregation impacts on public education provision, the results in this paper point to yet one more undesirable economic effect of racial segregation. In addition to directly worsening economic outcomes of minority groups, as known in the literature, increased segregation seems to cause lower investments in public education by poorer school districts relative to richer ones, which further undermines the prospects of upward mobility for disadvantaged people.

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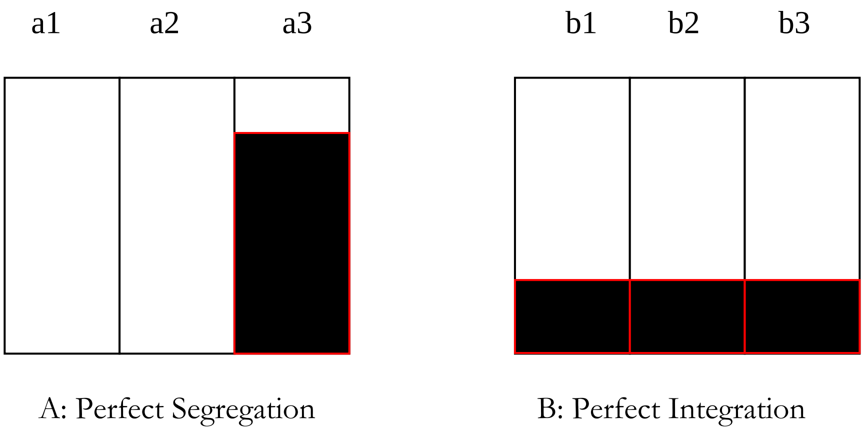
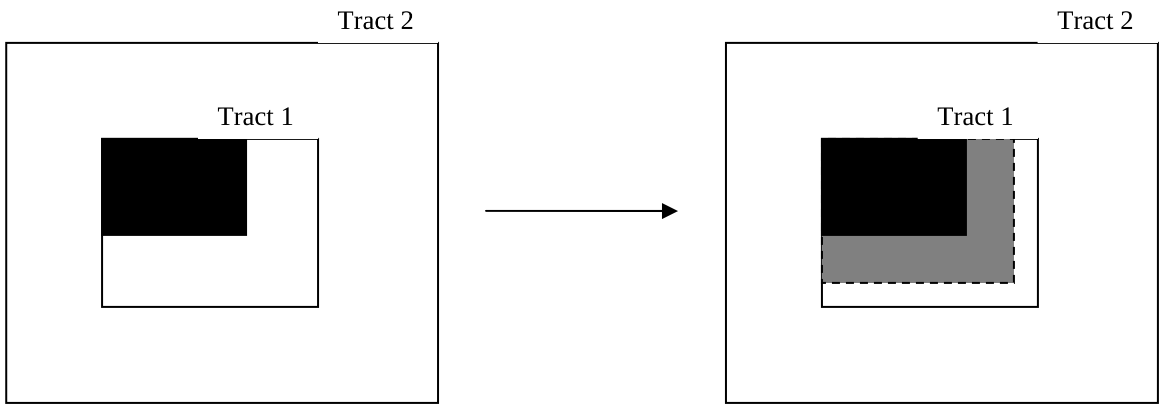
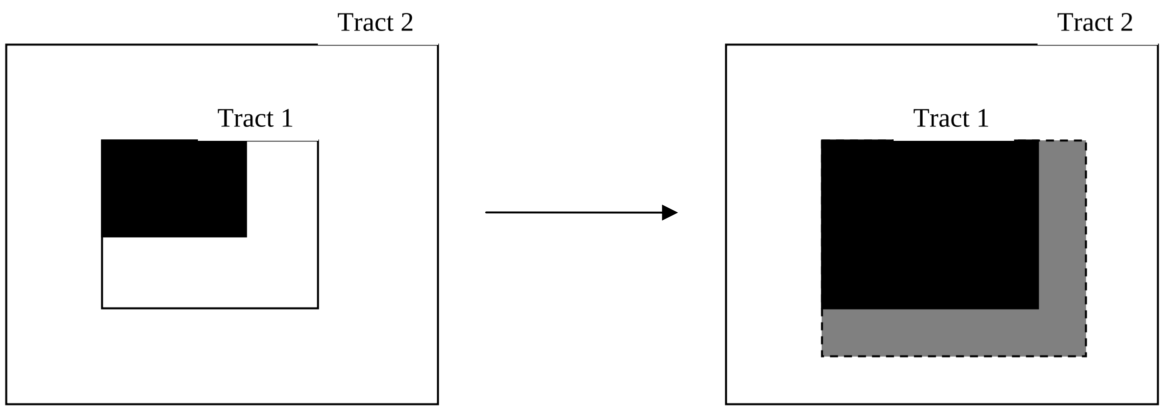


Figure 1: Racial fragmentation vs. segregation



Panel A: Small inflow of minority migrants



Panel B: Large inflow of minority migrants

Figure 2: Migration and changes in segregation

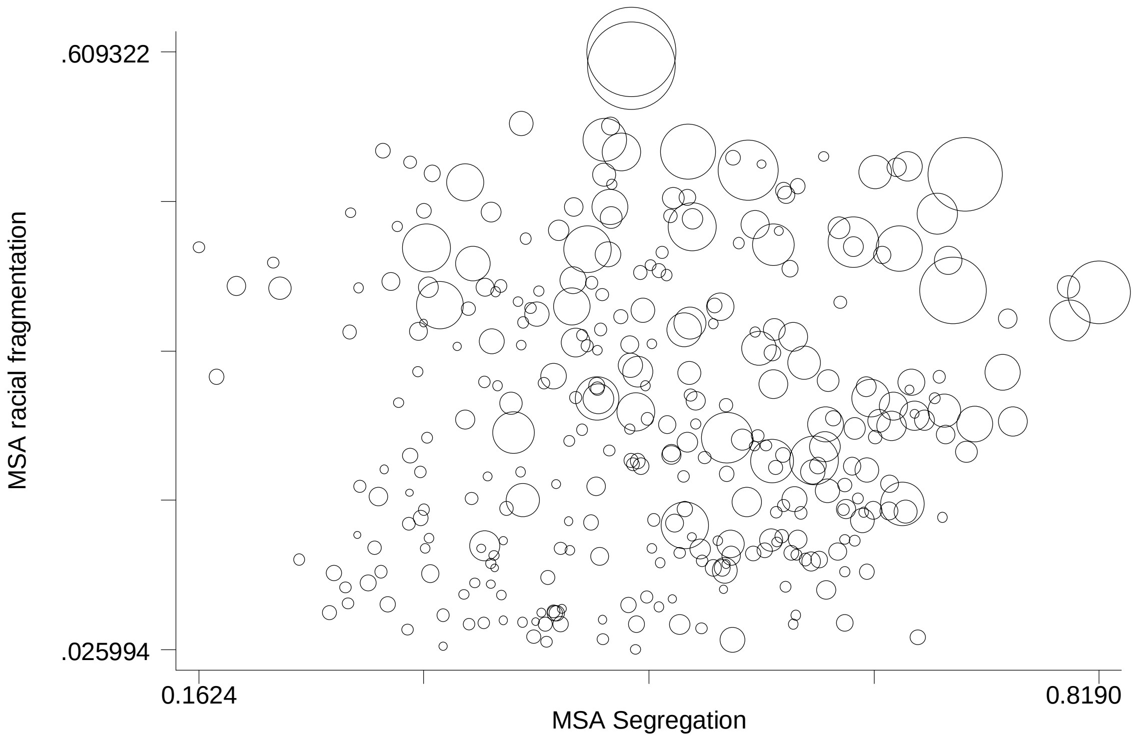


Figure 3: Segregation and MSA racial fragmentation

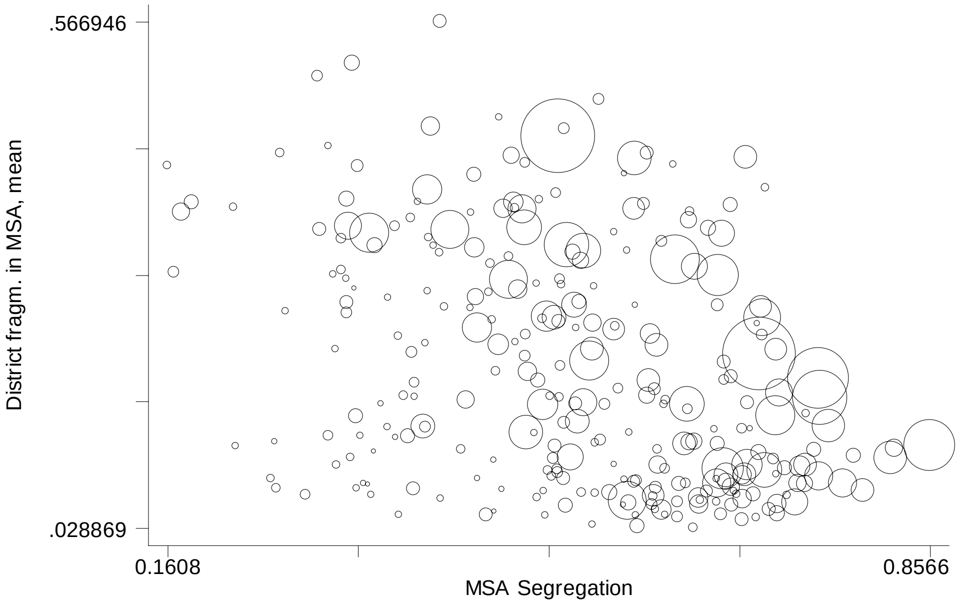
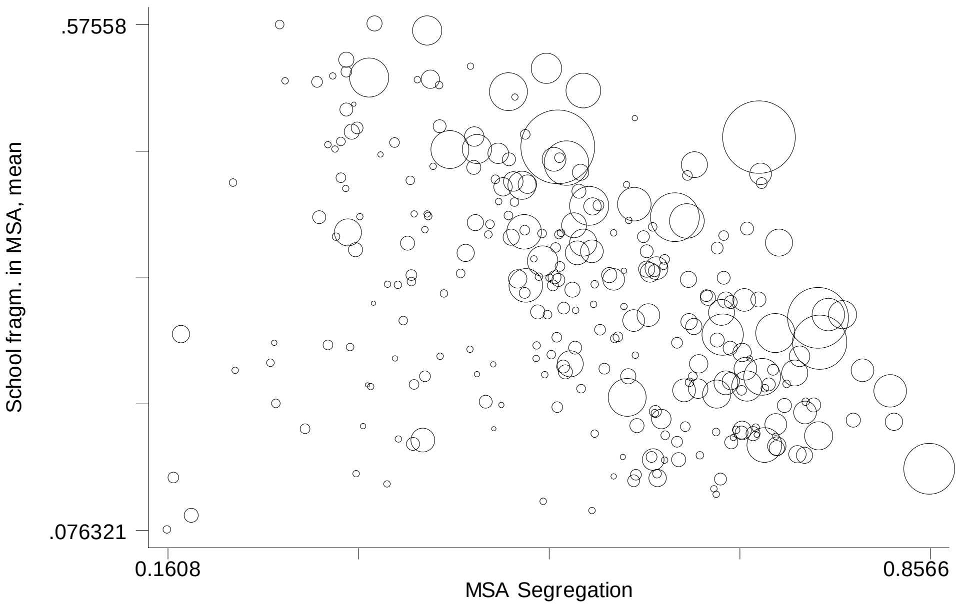
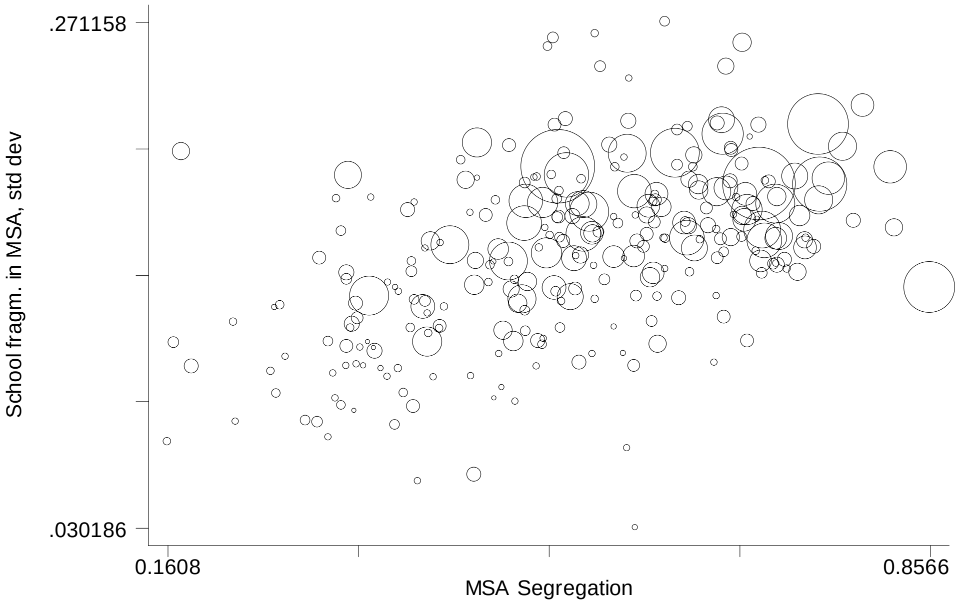


Figure 4: Segregation and average district racial fragmentation



Panel A: Mean



Panel B: Std. Deviation

Figure 5: Segregation and school racial fragmentation

TABLE 1: Summary statistics

	FULL SAMPLE			RESTRICTED SAMPLE[a]		
	Obs	*Mean*	*Std. Dev.*	*Obs*	*Mean*	*Std. Dev.*
MSA level						
Expenditure per pupil	277	4783.1	1231.9	128	4796.1	1079.6
# districts/1000 pupils	277	0.264	0.210	128	0.229	0.164
Segregation	277	0.505	0.131	128	0.560	0.111
Gini	277	0.410	0.024	128	0.410	0.021
Racial fragmentation	277	0.281	0.124	128	0.293	0.128
Ethnic fragmentation	277	0.636	0.087	128	0.633	0.080
DISTRICT level						
Expenditure per pupil	4933	5360.7	2047.9	3194	5112.2	1721.2
Gini	4933	0.373	0.042	3194	0.370	0.040
Racial fragmentation	4933	0.169	0.162	3194	0.158	0.161
Ethnic fragmentation	4933	0.589	0.124	3194	0.576	0.120

Notes:
(a) the restricted sample contains only the MSA's for which the instrument is available

TABLE 2: Expenditure and Segregation at the MSA level, OLS

Dependent variable = expenditure per pupil (ln)

Segregation measured by:	*Dissimilarity multigroup*		*Dissimilarity dichotomic*		*Isolation multigroup*		*Isolation dichotomic*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Segregation	0.432***	0.232	0.496***	0.356***	0.418***	0.349***	0.375***	0.265***
	(0.157)	(0.204)	(0.136)	(0.102)	(0.098)	(0.118)	(0.084)	(0.096)
# districts/1000 pupils		-0.116		-0.115		-0.104		-0.12
		(0.102)		(0.105)		(0.097)		(0.1)
Median hh Income (ln)		0.691***		0.679**		0.67**		0.675**
		(0.247)		(0.255)		(0.252)		(0.252)
Population (ln)		-0.028		-0.037*		-0.036		-0.037
		(0.022)		(0.021)		(0.022)		(0.022)
Over 65		1.596*		1.475*		1.534*		1.571*
		(0.891)		(0.850)		(0.814)		(0.859)
BA		0.541*		0.545*		0.534*		0.474*
		(0.282)		(0.283)		(0.266)		(0.274)
Owner		-0.409		-0.438		-0.528		-0.457
		(0.496)		(0.439)		(0.465)		(0.454)
Black		-0.41		-0.282		-0.178		-0.031
		(0.441)		(0.451)		(0.439)		(0.467)
Asian/ Pac. Isl.		-2.8***		-2.49***		-2.276***		-2.037**
		(0.852)		(0.820)		(0.814)		(0.810)
Other		0.215		0.376		0.689		0.772
		(0.515)		(0.526)		(0.545)		(0.58)
Gini		2.204*		2.049		1.878		1.785
		(1.219)		(1.225)		(1.198)		(1.218)
Racial fragmentation		0.066		-0.035		-0.313		-0.372
		(0.446)		(0.447)		(0.492)		(0.517)
Ethnic fragmentation		0.604**		0.646**		0.604**		0.615**
		(0.274)		(0.274)		(0.283)		(0.277)
Region dummies	YES	YES	YES	YES	YES	YES	YES	YES
Observations	128	128	128	128	128	128	128	128
R-squared	0.692	0.81	0.703	0.817	0.719	0.819	0.728	0.817

Notes:
* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.
Standard errors are corrected for clustering of the residuals at the state level

TABLE 3: Expenditure and Segregation at the MSA level, two-stage least squares

	1^ST STAGE	*2^ND STAGE*	*1^ST STAGE*		*2^ND STAGE*
Dependent variable	Segregation	Expenditure	Segregation	#Districts/ 1000 pupils	Expenditure
	(1)	(2)	(3)	(4)	(5)
Segregation		0.937**			0.861*
		(0.476)			(0.486)
# districts/1000 pupils	-0.044	-0.079			-0.256
	(0.052)	(0.113)			(0.356)
Migr. Share40	0.542**		0.550**	-0.519	
	(0.232)		(0.251)	(0.481)	
Migr. Sharesq	-1.792***		-1.818***	1.491	
	(0.581)		(0.643)	(1.293)	
Streams[(a)]			0.002	0.200**	
			(0.046)	(0.078)	
Median hh Income (ln)	0.074	0.548**	0.071	0.123	0.567**
	(0.170)	(0.265)	(0.174)	(0.207)	(0.257)
Population (ln)	0.029**	-0.049*	0.031**	-0.084***	-0.058*
	(0.013)	(0.026)	(0.013)	(0.013)	(0.032)
Over 65	0.998**	0.810	0.928*	2.019**	1.175
	(0.486)	(0.924)	(0.470)	(0.943)	(0.866)
BA	-0.093	0.728***	-0.093	-0.090	0.718***
	(0.254)	(0.268)	(0.262)	(0.349)	(0.275)
Owner	0.540*	-0.713	0.555*	-0.529	-0.737
	(0.300)	(0.473)	(0.306)	(0.393)	(0.462)
Black	0.585	-0.643	0.658	-1.409	-0.875
	(0.350)	(0.480)	(0.395)	(0.854)	(0.779)
Asian/ Pac. Isl.	0.229	-2.724***	0.313	-1.447	-3.020***
	(0.466)	(0.810)	(0.498)	(0.964)	(0.956)
Other	-0.206	0.545	-0.121	-1.542	0.208
	(0.557)	(0.606)	(0.608)	(1.201)	(0.919)
Gini	0.556	1.507	0.603	-1.315	1.359
	(0.775)	(1.154)	(0.759)	(1.181)	(1.265)
Racial fragmentation	-0.128	0.079	-0.185	1.203	0.291
	(0.366)	(0.436)	(0.408)	(0.771)	(0.709)
Ethnic fragmentation	0.084	0.544*	0.085	-0.024	0.547*
	(0.165)	(0.324)	(0.167)	(0.270)	(0.307)
Region dummies	YES	YES	YES	YES	YES
Observations	128	128	128	128	128
R squared	0.78		0.778	0.651	
Root MSE	0.057	0.099	0.057	0.106	0.099

Notes:
* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.
Standard errors are corrected for clustering of the residuals at the state level
(a) Coefficient and standard error are multiplied by 10^3.

TABLE 4: Local Revenue and Private Schooling, MSA level

Dependent variable:	**Local Revenue**	**Private Schooling**
	2SLS	2SLS
Endogenous variables:	Segregation, # districts	Segregation, # districts
	(1)	(2)
Segregation	3.328**	-0.414**
	(1.349)	(0.205)
# districts/1000 pupils	1.267	-0.286*
	(1.312)	(0.173)
Median hh-income (ln)	1.888***	0.211**
	(0.721)	(0.100)
Population (ln)	-0.016	0.004
	(0.082)	(0.011)
Over 65	-2.648	1.577***
	(3.693)	(0.512)
BA	1.440	-0.172
	(1.112)	(0.153)
Owner	-2.032*	0.016
	(1.056)	(0.151)
Black	3.411	-0.084
	(2.571)	(0.284)
Asian/Pac. Isl.	1.412	-0.275
	(2.832)	(0.450)
Other	6.960**	-0.750*
	(3.216)	(0.442)
Gini	3.545	0.268
	(3.541)	(0.514)
Racial Fragm.	-5.004**	0.320
	(2.309)	(0.258)
Ethnic Fragm.	0.861	-0.025
	(0.668)	(0.082)
Region dummies	YES	YES
Observations	128	128
Root MSE	0.29	0.04

Notes:
* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.
Standard errors are corrected for clustering of the residuals at the state level

TABLE 5: Different Measures of Segregation, MSA level

Dependent variable = expenditure per pupil (ln)

Endogenous RHS variable:	**2SLS** Segregation (1)	**2SLS** Segregation, # districts (2)
Dissimilarity (black vs non-black)	2.270***	2.279***
	(0.721)	(0.737)
Isolation (multigroup)	1.180***	1.111***
	(0.312)	(0.306)
Isolation (black vs non-black)	1.799***	1.740***
	(0.514)	(0.570)

Notes:
No. of obs= 128.
* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.
Controls included in regressions but not shown are: median hh income, log of population, fraction of population over 65, fraction of population with a BA degree, fraction of owners, fraction of blacks, asian/pacific islanders, other race, Gini coefficient, racial and ethnic fragmentation, number of districts per student, Census region dummies.
Standard errors are corrected for clustering of the residuals at the state level.

TABLE 6: Inequality in Expenditure and Segregation, MSA level

Dependent variable:	Gini coeff. for Expenditure		Top/Bottom Expenditure		Std. Dev. of Expenditure	
	OLS	**2SLS**	**OLS**	**2SLS**	**OLS**	**2SLS**
	(1)	(2)	(3)	(4)	(5)	(6)
Segregation	0.045	0.326***	1.032	2.464*	0.187	1.957**
	(0.042)	(0.123)	(0.667)	(1.326)	(0.372)	(0.938)
# districts/1000 pupils	0.099***	0.243***	2.737***	2.681	1.053***	1.416
	(0.021)	(0.094)	(0.388)	(1.681)	(0.259)	(1.204)
Observations	124	124	127	127	127	127
Root MSE	0.025	0.03	0.426	0.39	0.267	0.26
R squared	0.4027		0.6241		0.5500	

Notes:
* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.
Controls included in regressions but not shown are: median hh income, log of population, fraction of population over 65, fraction of population with a BA degree, fraction of owners, fraction of blacks, asian/pacific islanders, other race, Gini coefficient, racial and ethnic fragmentation, number of districts per student, Census region dummies.
Standard errors are corrected for clustering of the residuals at the state level.

TABLE 7: Expenditure and Segregation, district level

Dependent variable = expenditure per pupil (ln)

	OLS	**2SLS**	**2SLS**
Endogenous variable:	--	Segregation	Segregation, # districts
Segregation	0.139	1.946***	1.816*
	(0.111)	(0.731)	(0.940)
# districts/1000 pupils	-99.340*	-127.661	-106.87
	(51.940)	(95.342)	(506.08)
Median hh Income (ln)	0.392**	-0.006	0.025
	(0.158)	(0.339)	(0.329)
Population (ln)	0.007	-0.055*	-0.050*
	(0.009)	(0.030)	(0.029)
Over 65	0.911*	-1.095	-0.982
	(0.527)	(1.296)	(1.885)
BA	-0.269	0.128	0.096
	(0.239)	(0.472)	(0.450)
Owner	-0.358	-1.147**	-1.081**
	(0.238)	(0.535)	(0.496)
Black	-0.051	0.806	0.751
	(0.551)	(0.954)	(0.977)
Asian/ Pac. Isl.	0.261	3.576*	3.353
	(0.806)	(1.893)	(2.312)
Other	0.759	3.879**	3.669*
	(0.689)	(1.539)	(1.965)
Gini	1.582**	-0.575	-0.399
	(0.697)	(1.402)	(1.320)
Racial fragmentation	-0.243	-1.542*	-1.451
	(0.469)	(0.889)	(0.954)
Ethnic fragmentation	0.311**	0.298	0.298
	(0.156)	(0.257)	(0.248)
District level controls[(a)]	YES	YES	YES
State dummies	YES	YES	YES
Observations	3194	3194	3194
Root MSE	0.138	0.16	0.16
R squared	0.7443		

Notes

* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.

(a) District level variables included in regressions but not shown are: median hh income, log of population, fraction of population over 65, fraction of population with a BA degree, fraction of owners, fraction of blacks, asian/pacific islanders, other race, Gini coefficient, racial and ethnic fragmentation. Regressions are weighted so that each metro area receives equal weight.

Standard errors corrected for clustering of the residuals at the MSA/PMSA level.

TABLE 8: School Characteristics, district level

Dependent variable = expenditure per pupil (ln)

Endogenous variable:	**2SLS** Segregation	**2SLS** Segregation
Segregation	1.632**	1.555**
	(0.654)	(0.741)
# districts/1000 pupils	-129.861	-127.797
	(83.041)	(88.472)
# schools in district[(a)]	0.161	-0.027
	(0.219)	(0.187)
St. dev. School fragm.		0.380***
		(0.116)
MSA level controls[(b)]	YES	YES
District level controls[(c)]	YES	YES
State dummies	YES	YES
Observations	3194	2817
Root MSE	0.15	0.14

Notes

* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.

(a) Coefficient and standard error are multiplied by 10^3.

(b) MSA level variables included in regressions but not shown are: median hh income, log of population, fraction of population over 65, fraction of population with a BA degree, fraction of owners, fraction of blacks, asian/pacific islanders, other race, Gini coefficient, racial and ethnic fragmentation.

(c) District level variables included in regressions but not shown are: median hh income, log of population, fraction of population over 65, fraction of population with a BA degree, fraction of owners, fraction of blacks, asian/pacific islanders, other race, Gini coefficient, racial and ethnic fragmentation. Regressions are weighted so that each metro area receives equal weight.

Standard errors corrected for clustering of the residuals at the MSA/PMSA level.

TABLE A1: Summary Statistics

	No. obs.	Mean	Std. Dev.
MSA level			
Segregation	128	0.560	0.111
Dissimilarity (black vs non black)	128	0.618	0.103
Isolation (multigroup)	128	0.321	0.142
Isolation (black vs non black)	128	0.352	0.168
# districts/1000 pupils	128	0.000	0.000
Migr. Share40	128	0.097	0.103
Migr. Share40sq	128	0.020	0.036
Streams	128	202.157	168.032
Expenditure per pupil (ln)	128	8.453	0.212
Local revenue	128	7.806	0.464
Private schooling	128	0.105	0.044
Gini coeff. for expenditure	124	0.077	0.029
Top/Bottom expenditure	127	1.820	0.634
Std.Dev. expenditure	127	0.714	0.363
Median hh income (ln)	128	10.310	0.150
Population	128	13.366	0.945
Over 65	128	0.120	0.023
BA	128	0.270	0.055
Owner	128	0.643	0.060
Black	128	0.128	0.096
Asian/Pac.Isl.	128	0.020	0.029
Other	128	0.030	0.045
Gini	128	0.410	0.021
Racial fragmentation	128	0.293	0.128
Ethnic fragmentation	128	0.633	0.080
Mount	128	0.039	0.195
west_nc	128	0.063	0.243
east_nc	128	0.242	0.430
mid_atl	128	0.117	0.323
n_eng	128	0.063	0.243
s_atl	128	0.164	0.372
east_sc	128	0.070	0.257
west_sc	128	0.148	0.357
DISTRICT level			
Expenditure per pupil (ln)	3194	8.491	0.303
Median hh income (ln)	3194	10.440	0.317
Population	3194	9.606	1.349
Over 65	3194	0.120	0.045
BA	3194	0.256	0.131
Owner	3194	0.731	0.127
Black	3194	0.055	0.110
Asian/Pac.Isl.	3194	0.018	0.037
Other	3194	0.025	0.064
Gini	3194	0.370	0.040
Racial fragmentation	3194	0.158	0.161
Ethnic fragmentation	3194	0.576	0.120
Unified	3194	0.777	0.416
# schools in district	3194	10.477	30.505
St. Dev. School fragmentation	2817	0.049	0.045

TABLE A2: OLS estimates, MSA level

Dependent variable = expenditure per pupil (ln)

	(1) *Full sample*	**(2)** *Full Sample*	**(3)** *Restricted Sample*
Segregation	0.040		
	(0.133)		
# districts/1000 pupils	-0.002	-0.004	-0.128
	(0.052)	(0.052)	(0.101)
Median hh-income (ln)	0.511***	0.516***	0.738***
	(0.133)	(0.133)	(0.257)
Population (ln)	-0.008	-0.006	-0.021
	(0.013)	(0.012)	(0.018)
Over 65	0.949***	0.995***	1.854*
	(0.339)	(0.321)	(0.933)
BA	0.149	0.140	0.480
	(0.186)	(0.192)	(0.293)
Owner	-0.233	-0.226	-0.309
	(0.229)	(0.221)	(0.453)
Black	-0.473	-0.454	-0.333
	(0.356)	(0.366)	(0.457)
Asian/Pac. Isl.	-1.684***	-1.701***	-2.825***
	(0.578)	(0.577)	(0.866)
Other	-0.351	-0.358	0.107
	(0.447)	(0.443)	(0.519)
Gini	1.390**	1.420**	2.434*
	(0.570)	(0.531)	(1.234)
Racial Fragm.	0.412	0.407	0.061
	(0.374)	(0.377)	(0.470)
Ethnic Fragm.	0.051	0.057	0.624**
	(0.240)	(0.240)	(0.265)
Regional Dummies	YES	YES	YES
No. Obs.	277	277	128
Root MSE	.112	.112	.101

Notes:
* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.
Standard errors are corrected for clustering of the residuals at the state level

TABLE A3: Expenditure per child, MSA level

Dependent variable:	*Expenditure per child (ln)*		
	OLS	2SLS	2SLS
Endogenous variables:	--	Segregation	Segregation, #districts
	(1)	(2)	(3)
Segregation	0.092	1.551***	1.488**
	(0.207)	(0.598)	(0.603)
# districts/1000 pupils	-0.111	-0.034	-0.182
	(0.152)	(0.183)	(0.454)
Median hh-income (ln)	0.608**	0.312	0.329
	(0.259)	(0.328)	(0.308)
Population (ln)	-0.059***	-0.103***	-0.11***
	(0.015)	(0.029)	(0.039)
Over 65	0.981	-0.645	-0.341
	(1.274)	(1.354)	(1.305)
BA	1.001**	1.388***	1.379***
	(0.382)	(0.503)	(0.488)
Owner	-0.197	-0.827*	-0.847*
	(0.405)	(0.494)	(0.464)
Black	-1.107**	-1.589**	-1.782*
	(0.481)	(0.618)	(1.064)
Asian/Pac. Isl.	-3.975***	-3.817***	-4.063***
	(0.687)	(0.845)	(1.248)
Other	-0.238	0.445	0.164
	(0.649)	(0.781)	(1.305)
Gini	2.678**	1.234	1.112
	(1.302)	(1.518)	(1.587)
Racial Fragm.	0.611	0.639	0.815
	(0.483)	(0.549)	(0.965)
Ethnic Fragm.	0.553*	0.43	0.432
	(0.277)	(0.406)	(0.39)
Observations	128	128	128
Root MSE	.121	.14	.13

Notes:
* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.
Standard errors are corrected for clustering of the residuals at the state level

TABLE A4: Local Revenue and Private Schooling, MSA level

Dependent variable:	*Local Revenue*		*Private schooling*	
	OLS	2SLS	OLS	2SLS
Endogenous variable:	--	Segregation	--	Segregation
	(1)	(2)	(3)	(4)
Segregation	.734**	2.950**	.012	-0.322*
	(.318)	(1.236)	(.046)	(0.179)
# districts/1000 pupils	.230	0.348	-.044**	-0.062**
	(.307)	(0.311)	(.019)	(0.028)
Median hh-income (ln)	2.435***	1.986***	.119*	0.187**
	(.514)	(0.647)	(.065))	(0.074)
Population (ln)	.004	-0.063	.005	0.015**
	(.043)	(0.058)	(.004)	(0.006)
Over 65	1.70	-0.772	.748**	1.120***
	(2.25)	(2.726)	(.300)	(0.389)
BA	.803	1.391	-.071	-0.160
	(.860)	(1.072)	(.099)	(0.112)
Owner	-1.208	-2.165**	-.096	0.048
	(.933)	(0.990)	(.078)	(0.105)
Black	2.93	2.198	.100	0.210
	(1.893)	(1.777)	(.187)	(0.220)
Asian/Pac. Isl.	-.363	-0.122	.134	0.098
	(2.66)	(2.350)	(.291)	(0.316)
Other	4.181*	5.218***	-.170	-0.326
	(2.199)	(1.855)	(.186)	(0.271)
Gini	4.957	2.764	.127	0.457
	(2.954)	(3.321)	(.490)	(0.494)
Racial Fragm.	-3.95**	-3.907**	.060	0.053
	(1.872)	(1.571)	(.184)	(0.215)
Ethnic Fragm.	1.062*	0.875	-.056	-0.028
	(.531)	(0.545)	(.056)	(0.065)
Observations	128	128	128	128
Root MSE	0.26	0.27	0.04	0.04

Notes:
* denotes significance at 10 per cent level, ** at the 5 per cent level, *** at the 1 per cent level.
Standard errors are corrected for clustering of the residuals at the state level