Inequality in Children's Contexts: Trends and Correlates of Economic Segregation between School Districts, 1990 to 2010

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Abstract

Rising economic segregation of neighborhoods suggests growing inequalities in social contexts that shape children's opportunities. School districts are a particularly important social context for children, as they determine the availability and distribution of resources to schools, but little is known about how segregated school districts are by income and whether this has changed over time. This article examines how segregated school districts in the 100 largest metropolitan areas were by income from 1990 to the late 2000s and the possible causes of economic segregation between districts. Since 1990, the segregation by income of all households and childless households between school districts has not changed much. However, families with children, for whom school districts may be a more salient factor in residential choice and for whom the consequences of school district segregation are greater, have become more segregated by income during this time. Segregation for families with children, particularly public school families, increased primarily in the top two-thirds of the income distribution. School district fragmentation, private school options, income inequality, and neighborhood segregation by income all contribute to how families with children in public school are sorted across school districts.

Keywords: school segregation, school districts, economic segregation, social stratification, children

High-income families have become less likely to live in the same neighborhood with middle- or low-income families since 1970 (Reardon & Bischoff 2011a, 2011b; Watson 2009). Rising economic segregation of neighborhoods suggests growing inequalities in social contexts that shape children's opportunities. Schools are a particularly important social context for children's well-being and life chances, but little is known about whether schools and school districts are highly segregated by income or whether this has changed over time. Two studies provide some evidence on segregation between schools by income. Rusk (2002) and Owens, Reardon, and Jencks (2012) find that poor and non-poor students became more segregated from one another during the 1990s and 2000s. Available data limit these studies to describing segregation between students who are or are not eligible to receive free/reduced price lunch, obscuring segregation elsewhere in the income distribution.

While school-level segregation is important, school *districts* determine the availability and distribution of resources to schools within districts. As Logan, Oakley, and Stowell (2008) argue, examining only segregation between schools in the same district obscures higher-level residential and mobility patterns, such as white or high-income flight out of a district. Segregation between school districts can be measured in several ways. One can examine the characteristics of households that live within district boundaries or the characteristics of families with children enrolled in public schools in the district. Segregation of both populations contributes to inequalities. School districts serve an institutional purpose as the primary funding and administrative unit for schools, and the income of all residents as well as their votes in local elections influence the taxes that make up a substantial portion of school funding in most states. Following the neighborhood effects literature, school districts may serve as a social context within which children may be influenced by neighbors and institutions, and increasing economic

segregation of all residents between districts affects these contextual characteristics. The characteristics of public school families in a district limit how integrated schools can be. In fact, recent work demonstrates that racial segregation of students is higher between districts than within districts, between schools (Fiel 2013; Stroub & Richards 2013). The segregation of public school families leads to differences in student body composition, which shapes available parent, teacher, and peer resources (Rumberger & Palardy 2005; Schwartz 2010). School districts are thus a key context in which inequalities for children may arise, motivating the documentation of trends and possible causes of economic segregation.

This article examines how segregated school districts in the 100 largest metropolitan areas were by income from 1990 to the late 2000s. Owens et al. (2012) provide the only direct evidence on this topic and report that segregation between school districts by income increased for all residents from 1970 to 2010 and increased for families whose children attended public school from 1990 to 2010. A related study by Corcoran and Evans (2010) finds that income inequality, rather than segregation, increased between districts from 1970 to 2000, suggesting that sorting by income between districts increased. I build on past work in two ways. First, I examine trends across populations, focusing in particular on differences by family composition—whether households have children or not. Isolating the trend for families with children enrolled in public school provides the best evidence about whether inequality is growing for the population whose lives are most affected by school districts—children. Second, I explore possible explanations for these trends, identifying associations of metro-level demographic, institutional, and economic characteristics with economic segregation between school districts.

School District Segregation and Household Composition

School district boundaries may shape residential choices, and thus segregation, differently for households with or without children and for families that do or do not send their children to public school. Tiebout's (1956) seminal theory of residential sorting posits that residential decisions are driven by a household's desire to live in a municipality (in this case, a school district) with the set of public goods and services that best matches a household's preferences within its price range. Past research demonstrates that households pay more to live in particular school attendance zones (Bogart & Cromwell 1997; Li & Brown 1980). Several studies use boundary designs, comparing households on either side of school attendance boundaries, to demonstrate that there is an independent effect of schools on housing costs when other neighborhood amenities are very similar (Bayer et al. 2007; Black 1999). The effect size is modest—a one-standard deviation difference in test scores between attendance zones corresponds to a two percent difference in housing costs. However, families with children are willing to pay even more (an additional ~1%) in housing costs than all households for higher quality schools (Bayer et al. 2007; Bayer et al. 2004). Families with children likely pay more to live in certain school districts as well as attendance zones, so higher-income families may become segregated from lower-income families across district lines.

Households *without* children may also be sorted by income across school district boundaries, as school districts often match boundaries of municipalities with varied demographic and economic composition and levels of public resources. If factors other than schools that influence residential decisions, such as racial composition, safety, parks, public services, and other amenities, are bundled at the school district level, economic segregation between districts may be similar for households with and without children attending public schools. For example, past research shows that households pay more for aesthetically attractive neighborhoods, better

air quality, low noise pollution, low crime, and proximity to amenities like public transportation, topographical features, and the central business district, all of which may be associated with school desirability (Bayer et al. 2004; Li & Brown 1980). Examining differences in economic segregation between school districts according to household composition tests whether schooling-related factors drive economic segregation and reveals whether children are more segregated in their social contexts than adults.

In addition to the level of segregation, *trends* in economic segregation may also vary by household composition. If high-income families with children have become more likely to pay a premium to live in a particular district for reasons that do not affect childless families, economic segregation may have increased more among families with children. Over the past twenty years, information about schools has become more available to parents via school and district websites and local newspapers, particularly since the passage in 2001 of No Child Left Behind required increased reporting of test scores and school status (Bast & Walberg 2004). Increased availability of signals of school quality may mean that those with the resources to choose the highest ranked district are now more likely to do so, increasing economic segregation.

High-income and more highly educated parents have also increased investments in their children's education compared to low-socioeconomic status (SES) parents over the past few decades. The class gap has grown in parental time spent in child care, including "managing" the academic and social activities of school-aged children (Bianchi 2000; Kalil et al. 2012; Ramey & Ramey 2010), money spent on children (Bianchi et al. 2004; Kornrich & Furstenberg 2013), and enrollment in preschool (Bainbridge et al. 2005). Underlying this growing class gap is the argument that high-income parents are increasingly concerned about their child getting ahead (Lareau 2003) or getting into a good college (what Ramey and Ramey (2010) call "the rug rat

race"). If increasing concern about children's futures also translates into increased willingness to live in an expensive school district, economic segregation likely increased. These concerns are less important to childless families, so economic segregation may have increased more for families with children than without.

Causes and Correlates of School District Economic Segregation

Households choose to live in a particular school district for many reasons, some related to schools and some not. I identify six potential correlates of between-district economic segregation: school district fragmentation, school options, income inequality, school district resources, racial segregation between school districts, and economic segregation between neighborhoods. As I describe below, school district fragmentation, school options, and income inequality are the most likely causal factors, while the other factors are more likely to be correlational. In general, the factors related to school likely shape the economic segregation of families with children more than for households without children. Table 1 summarizes the causes and correlates I describe below, the hypothesized direction of their association with economic segregation between school districts, and what they predict about the national trend in economic segregation of school districts.

[Table 1 about here]

School District Fragmentation

One feature that may shape between-district economic segregation is school district fragmentation. Some metro areas are comprised of many municipalities, each with its own school district. Others are comprised of just a few school districts, which serve multiple municipalities. Past research finds some evidence that *racial* segregation between school districts

is higher in metro areas where there are more school districts and more fragmentation (Bischoff 2008; Clotfelter 1999, 2004; Urquiola 2005). Bischoff (2008) identifies demand- and supply-side processes through which fragmentation may cause increased residential racial segregation. On the demand side, families match their preferences and ability to pay with characteristics of the school district, as the Tiebout model suggests. A greater number of districts creates more choices and makes it easier for parents to find a district that matches their mix of preferences closely. Districts may become more homogenous as families are more precisely matched to different bundles of public goods at different prices. On the supply side, political boundaries give local government authority over housing, tax, and resource regulations, including school board decisions. A greater number of municipalities creates more competition among municipalities for high-income residents, as municipalities focus on generating tax revenue and minimizing the need for public services. A "politics of exclusion" may result, as families with varying preferences and resources are matched with the municipalities that best serve them.

While past research focuses on links to racial segregation, the mechanisms described above are related to families' resources, so I expect between-district economic segregation to be higher in metro areas with greater school district fragmentation. Families whose children attend public school have stronger preferences about school characteristics than childless families, and thus district fragmentation may be more closely associated with economic segregation of families with children. However, if district boundaries coincide with the boundaries of municipalities through which other public goods are delivered or through which information about racial/ethnic and class composition is interpreted, district fragmentation may also predict segregation of childless households. As Table 1 shows, the fragmentation measure I use increased from 1990 to 2010, so I hypothesize that economic segregation also increased.

School Options

The set of school options available to parents may also affect where they decide to live. In particular, the availability of private schools may reduce economic segregation between districts. High-income families that send their children to private school may have less incentive to pay higher housing costs or taxes to live in a high-quality district. Nechyba (2003) shows in simulations that the existence of a private school market reduces residential segregation of families with children by income between school districts. Further, the availability of private schools may serve as an option for families particularly sensitive to school composition, so removing these families from the public school population results in lower segregation among public school families than would be the case if private schools were not available (Logan et al. 2008). The proportion of students attending private school declined from 12% in 1990 to 10% in 2009 (NCES 2012), suggesting a slightly shrinking private sector, so between-district economic segregation may have risen in response.

Income Inequality

The substantial rise in income inequality over the past several decades has been well documented (Autor et al. 2008; Piketty & Saez 2003, 2013; Saez 2013). Scholars have shown that income inequality has grown since 1990 particularly in the top half of the income distribution: the 90/50 wage gap has grown smoothly since 1990(Autor et al. 2008; Goldin & Katz 2007) and the income share of the top decile also grew disproportionately from 1990 to 2011, particularly among the top 1% of earners (Saez 2013). Reardon and Bischoff (2011a) show that rising income inequality led to rising income segregation across neighborhoods from 1970 to 2000 as higher-income families had a growing resource advantage over lower-income families in purchasing housing. They also find that income inequality affected segregation primarily at a

large spatial scale rather than by increasing sorting of families between blocks. This macro-scale segregation may suggest that sorting between school districts is affected by income inequality. Corcoran and Evans (2010) show that income inequality grew both within- and between-districts from 1970 to 2000, particularly at the top end of the income distribution. While around 90% of income inequality occurs within districts, the share of income inequality between districts grew during this time, suggesting increasing sorting by income between districts. I hypothesize that segregation by income between districts increased more in metro areas where income inequality increased more.

Income inequality is higher among all households and those without children than among households with children (U.S. Census Bureau, 2012). Therefore, high-income households have comparatively more income to achieve their residential preferences than low-income households among childless households than among those with children, suggesting that economic segregation might be higher among childless households than those with children. However, income inequality has risen more for families with children than those without (Western et al. 2008), so between-district segregation may have increased more among families with children than those without.

School District Resources

School districts vary in their financial resources. If parents perceive that some districts offer their child better opportunities than others, they will choose the best district they can afford. If the district's resources are low or falling, parents who can afford higher resource districts may move out. Therefore, I hypothesize that income segregation between districts economic segregation will be positively related to inequality in resources between districts. The causal arrow may run both ways—household income is associated with local spending (Corcoran et al.

2003), though property valuation has become more strongly associated than income with per-pupil spending since 1970 (Hoxby 1998). While school finance reforms reduced the role of property tax valuation in calculating per-pupil spending, households in districts with higher-property values may be willing to spend more on education and vote for higher property taxes (Hoxby 1998).

School finance reform reduced the resource disparity between poor and rich districts during the 1980s and 1990s in many states (Card & Payne 2002; Corcoran et al. 2003; Murray et al. 1998). If resource disparities have declined since 1990, segregation between districts by income for public school families may also have declined, as Nechyba (2003)'s simulation suggests. Public school district resources are most relevant to public school families, so I hypothesize that economic segregation will be higher among this population in metro areas where district resource disparities remain higher.

Racial Segregation between School Districts

Past research shows racial segregation is higher between than within school districts, particularly in the Northeast and Midwest (Clotfelter 1999; Fiel 2013; Rivkin 1994; Stroub & Richards 2013). It also shows that racial segregation between districts grew between 1970 and 2000(Logan et al. 2008; Reardon et al. 2000; Rivkin 1994), though it has declined since 2000 to lower levels than in 1993(Stroub & Richards 2013). To the degree income is correlated with race, between-district segregation may follow a similar pattern and have increased from 1990 to 2000 but declined since 2000.

Residential Segregation by Income

Segregation by family income between neighborhoods increased in the 1990s and 2000s (Reardon & Bischoff 2011b). Two kinds of residential segregation by income have been of

particular interest: the segregation of the affluent from everyone else and the segregation of the poor from everyone else. Segregation of families in the top 10% of the income distribution has increased since 1990, and affluent families have become even more spatially segregated than poor families. Reardon and Bischoff (2011a)show the affluent live in increasingly large spatial enclaves. If these enclaves align with school district boundaries, income segregation between districts will have increased for all households, particularly at the top of the income distribution.

Segregation of poor families from all others has also risen since 1990 (Reardon & Bischoff 2011a, 2011b). In particular, research suggests a growing "suburbanization of poverty" since 1990 (Kneebone & Berube 2013), which is likely to bring more poor children into suburban school districts. More poor households lived in suburbs than central cities by 2008, with a 25% increase in number since 2000 (Kneebone & Garr 2010). This is particularly the case in the Midwest and in inner-ring suburbs (Cooke 2010; Kneebone & Garr 2010).[1] Suburban school districts are higher-income, on average, than urban districts, so if poor residents become more prevalent in suburban districts among higher-income families, segregation may decline.

Neighborhood and district segregation measure the same phenomenon at different geographic levels, so neighborhood segregation may "cause" district segregation in a purely mechanical way. Rather than considering neighborhood economic segregation in a causal framework, I examine whether segregation patterns are similar for the two geographic units. Residential decisions occur at multiple geographic levels, so segregation patterns may not be the same for neighborhoods and districts. Past work has shown that the public school population does not always reflect the population residing in the neighborhood (Saporito & Sohoni 2007). If

[1] Cooke (2010) shows that much of the rise in poverty in inner-ring suburbs is due to residents' transition into poverty rather than the migration of the poor from cities to suburbs. My measure of segregation captures changes in segregation regardless of whether the increase is due to mobility or income changes, if more poor residents are living in suburbs than cities, this could lead to a reduction in between-district economic segregation.

the rise in neighborhood segregation has primarily occurred within school districts, between-district economic segregation may not have risen.

As shown in Table 1, more factors predict an increase than a decline in economic segregation, so I hypothesize that it has increased over time. Given that families with children may be more sensitive to district fragmentation, school options, and racial segregation, and that income inequality has increased more for them than for all households, I hypothesize that economic segregation between districts increased more for households with children than for those without. Below, I describe how I measure economic segregation between school districts as well as each of the factors described here. Then I provide evidence as to how between-district segregation has changed. Finally, I estimate how each of the factors is associated with segregation between districts.

Estimating Economic Segregation between School Districts

The School District Demographics System (SDDS), produced by the National Center for Educational Statistics (NCES), aggregates Census Bureau data collected since 1990 to the school district level. Drawing on Census data in 1990 and 2000 and the 5-year aggregate American Community Survey (ACS) estimates in 2006/10, the SDDS provides counts of households and families by income category in every public elementary or unified (consolidated) school district in the U.S.[2] The SDDS provides income data for multiple populations, allowing me to calculate income segregation for: (1) all households; (2) households without children; (3) families with

[2] The SDDS also provides counts for secondary school districts that are comprised of multiple elementary districts. I exclude these districts to assess segregation between non-overlapping within metro areas. In 1990, several counties in CA did not participate in the Census Mapping Project which provides school district boundaries. Income data are missing in Tehama, Madera, Humboldt, El Dorado, San Francisco, San Benito, Napa, Monterey, and Del Norte counties. Therefore, CA estimates for 1990 do not include these counties. Estimates excluding CA altogether in all years are substantively identical to estimates reported here, so I retained the rest of CA in my analyses. The 2010 Census did not collect data on family's economic status, so the 5-year aggregate estimates from the ACS in 2006/10 must be used instead.

school-aged children (age 3-19); and (4) families with children (age 3-19) enrolled in public school. I examine segregation for all households and households without children based on household income counts and segregation for families with children based on family income counts. [3]

Children's enrollment in public school is determined from an item on the Census or ACS questionnaire assessing whether each child in the family age 3 to 19 without a high school degree attends a public school, defined as "any school or college controlled and supported by a local, county, State, or Federal Government."[4] Families with children enrolled in public school may also have children enrolled in private school. In 2000, the SDDS provides data on family income tabulated for families who have at least one children enrolled in public school and private school separately, so I can calculate that about 5% of public school families also had children enrolled in private school.[5] Therefore, the "public school families" estimates in all years include all families who send at least one child to public school.

I estimate economic segregation between school districts in the same metro areas using the rank-order information theory index *H*. *H* compares the variation in household or family incomes within school districts to the variation in household or family incomes within the metropolitan area. The rank-order information theory index *H* extends binary *H*, also called the entropy index, by estimating a weighted average of the binary *H* computed at every income threshold (Reardon 2011a). Because the rank-order index relies only on information about

[3] I use the word *households* when describing all households and childless households because this includes 1-person households; the Census definition of *family* is a household comprised of at least two related people. If multiple families live in one household, family income counts only the income of members of the reporting family.
[4] While the item does not ask if the child attends public school in the district in which the family lives, it is likely this is the case as less than 1% of public school students attend school in a different district than their own NCES, 2008).
[5] I can estimate the number of families with children only in private school in 1990, 2000, and 2006/10 by subtracting the number of public school families from all families with school-aged children, and I can then estimate segregation among private school students. I exclude these analyses because the interpretation and implications of how segregated private school students are from one another across school districts are unclear.

individuals' ranks in the income distribution (rather than their actual income), it is insensitive to inflation and changes in the shape of the income distribution and does not confound changes in income inequality with changes in income segregation (Reardon & Bischoff 2011a; Reardon 2011a). Reardon (2011a) shows *H* is not very sensitive to the number or location of thresholds used to define income categories once there are more than a modest number of categories that capture the underlying distribution reasonably well. This feature makes *H* particularly useful for comparing income segregation across time (in the SDDS data, there are 25 income categories in 1990 and 16 in 2000 and 2006/10).

In theory, *H* can range from 0 (no segregation) to 1 (total segregation). In a hypothetical metro area where the family income distributions were identical in all school districts (and therefore identical to the overall metro area distribution), the index would equal 0, indicating no segregation by income. In such a metro area, a family's income could have no correlation with the average income of other families in the district since all districts would have the same average. In contrast, in a metro area where every family in a school district had the same income as every other family in the district, the index would equal 1. I estimate *H* within metropolitan statistical areas (MSAs) or divisions based on the 2003 OMB definitions. I limit my analyses to the 100 largest metro areas (based on population in the 2006/10 ACS) and exclude 5 metro areas because they include only one school district (Honolulu, HI; Las Vegas-Paradise, NV; and the three divisions (each comprised of one county and one school district) comprising the Miami-Fort Lauderdale-Miami Beach MSA). I calculate segregation within metro areas rather than cities or counties as they comprise a fuller set of residential choices available to families with jobs in the metro area.

Trends in Economic Segregation between School Districts, 1990 to 2010

Figure 1 presents estimates of *H* measuring economic segregation between school districts, averaged across the 95 largest U.S. metro areas with more than one school district.

[Figure 1 about here]

Between-district economic segregation varies among populations and over time. First, on average, economic segregation between school districts is higher for families with children than for households without children. This is consistent with the general hypothesis that school district boundaries are more salient for families with children when making residential choices. Second, average segregation between school districts did not significantly change from 1990 to 2010 for all households or for households without children, but the increase was statistically significant among families with children during the 1990s and 2000s, and largest for families with public school children. (For convenience, I use 2010 to refer to results from the 2006/10 ACS.) While segregation between districts by income is increasing, it remains lower than racial segregation of students between school districts. Stroub and Richards (2013)use the same segregation index and estimate that between district segregation among all races was 0.165 in 2009, nearly double economic segregation among public school families. Income segregation may be lower because the measure of income is imprecise, which affects the segregation measure. Further, the measure of racial segregation is at the student level, while I measure income segregation at the family level and cannot adjust for family size.

To further explore how segregation is changing, I created segregation profiles that display levels of segregation at each point in the income distribution, averaged across the largest 95 metro areas with more than one district. The profiles are created by taking the binary *H* estimates at each income category threshold and fitting a 4^{th} order polynomial through each point

to estimate *H* at each percentile in the income distribution (see (Reardon & Bischoff 2011a)for details). The segregation profiles can then be presented graphically, with *H* on the y-axis and the income distribution in percentiles on the x-axis. The income distribution of each population varies (for example, the income distribution of families with children is flatter than the income distribution of all households). I present the segregation profiles graphically using the income distribution for all households for consistent comparisons. That is, the public school families profile presents the level of segregation for families who send at least one child to public school at, for example, the 10^{th} percentile of the overall income distribution rather than the 10^{th} percentile of the public school family distribution. Figures 2 through 5 present the segregation profile for each population.

[Figures 2 and 3 about here]

Figure 2 presents the income segregation profiles for all households and Figure 3 presents them for households without children. The lightest gray curve is 1990, the middle gray is 2000, and the darkest gray is 2010. First, one can see that affluent households, among both all households and childless households, are more segregated from non-affluent households than middle- or lower-income households are from all other households. Strikingly, the segregation profiles for all households change very little from 1990 to 2010. Segregation across school districts has remained fairly constant at all points in the income distribution. For households without children, segregation increased for households in the top ~80% of the income distribution during the 1990s but declined during the 2000s for very little overall change since 1990.

[Figures 4 and 5 about here]

The income segregation profiles for families with children are presented in Figure 4 and for public school families in Figure 5. These figures have a very different shape than the segregation profiles for all households and for households without children. First, families with incomes near the top of the distribution are the most segregated across district lines from all others, as was the case for all households and childless households. But families with incomes at the bottom of the distribution are among the *least* segregated from all others, particularly in 2000 and 2010. Second, as Figure 1 indicated, between-district economic segregation among families with children increased from 1990 to 2010 but only among families in the top ~60% of the income distribution. Low-income families (the bottom ~20% of the distribution) with children are more likely to share districts with higher-income families with children in 2010 than 1990. However, given that the top 2/3 of the income distribution become more segregated from all others during this time, low-income families are not increasingly sharing districts with substantially higher-income families; instead, income integration has likely occurred among those in the bottom third of the income distribution. Trends for public school families are very similar, though the increase in segregation for the top ~60% of the income distribution is larger among public school families than for all families with children. Further, segregation increased more, particularly in the 2000s, for public school families than for all families with children at the top of the income distribution (top ~20%). Therefore, the public school student population is more segregated by income across districts in 2010 than in 1990, and affluent students in particular are less likely to attend school in the same district as lower-income students.

These analyses provide a comprehensive picture of economic segregation between school districts since 1990. First, families with children and public school families are more economically segregated between school districts than all households and childless households,

suggesting that families with children do sort by income across district boundaries more than childless households. Second, economic segregation between districts has risen among all families with children and public school families since 1990, but has not changed much for all households or for childless households. Third, segregation for all families with children and public school families has increased primarily in the top ~2/3 of the income distribution, while declining among families in the bottom third of the income distribution since 1990, suggesting that high-income families have become more isolated in districts over time. The magnitude of these changes is modest. The change in *H* among public school families from 1990 to 2010 is 0.013 points, which is about 1/3 of a standard deviation. Looking at Figure 5, the change in *H* from 1990 to 2010 at around the 60th percentile is larger, about 0.02 points. For comparison, the decline in racial segregation between districts from 1993 to 2010 was very similar, about 0.017 (Stroub & Richards 2013). These opposite trends suggest that progress made in racial segregation is countered by increases in income segregation.

The segregation of all households and childless households may impact the local tax and voter base as well as the composition of districts, which may serve as developmental contexts for child well-being. That segregation did not change much for these populations suggests that districts may not have become more unequal in their resource base or contextual characteristics over time. These trends differ from the trends in neighborhood segregation, which show that segregation increased both at the top and the bottom of the income distribution for all families (Reardon & Bischoff 2011a, 2011b). Therefore, sorting by income across district lines may operate differently than sorting across neighborhoods. Segregation between neighborhoods, perhaps within school districts, increased for all families, so inequities in resources may have grown at a smaller geographic scale. The segregation of public school families by district has

grown since 1990, directly impacting diversity in the student body composition of district schools, which may shape which teachers choose to work there, and how involved parents are in schools and school politics. Growing segregation of public school families, then, may have serious consequences for educational achievement. Overall, households are sorting differently by income across district lines depending on whether they have children or not, with middle- and high-income families with children in public schools becoming increasingly segregated from all others over time. In the next section, I explore possible explanations for these trends.

Correlates of Economic School Segregation between Districts

Having established trends in between-district economic segregation, I explore possible causes and correlates. Below, I describe the measures to test the mechanisms identified earlier. Table 1 presents the measures and data sources used to operationalize each mechanism. Table 2 presents cross-sectional correlations in 1990, 2000, and 2010 between each measure and school district economic segregation for households without children and public school families. I focus on these two groups as they represent the most distinct populations.[6]

[Table 2 about here]

I measure *school district fragmentation* using the Herfindahl index (also called the Simpson index), which estimates the probability that two randomly selected students in a metropolitan area will attend school in different districts (see Bischoff (2008) for the fragmentation equation). As Table 2 shows, fragmentation is positively correlated with school district economic segregation in each year, as hypothesized. School district fragmentation has a slightly higher correlation with the economic segregation of public school families, likely

[6] Results for all households are available upon request. In general, results fall between households without children and public school families. Results for families with children are nearly identical to public school families, as 90% of families with children send at least one child to public school.

because school districts are more meaningful boundaries for these families than for childless households.

I measure inequalities in *school district resources* in two ways. First, I examine inequality in total current spending per pupil on instruction and support services. I estimate the within-metro area Gini coefficient for district-level per pupil spending in 1993 (closest data to 1990), 2000, and 2010. Second, I estimate the average proportion of school funding that comes from local sources in the metro area. Data on per pupil spending and funding source at the district level come from the Census Bureau's Public School Finance Data. Table 2 provides mixed support for the hypothesis of a positive relationship between school district resource gaps and segregation. In 1990, spending inequality and level of local funding sources are positively related to economic segregation between districts, with higher correlations for the segregation of public school children. In 2000 and 2010, spending inequity is not significantly associated with economic segregation. In 2000, local funding is significantly correlated with segregation and of similar magnitude to 1990. In 2010, local funding is only significantly correlated with the segregation of public school families, the population most affected by public school resources, and the magnitude is lower than in 1990 or 2000.

To measure *school options*, I estimate the proportion of students enrolled in private school. Child-level data on private enrollment comes from the SDDS. Contrary to my hypothesis, private school availability is positively associated with segregation among public school and, to a lesser extent, childless households, but only in 1990. If increased availability of private schooling is due to parent demand because of subpar or highly uneven public school quality, segregation of the public school families who cannot afford private school might be

higher where there are more private school options, as the stakes for choosing the best district are higher.

I measure *between-district racial segregation* through black-white dissimilarity indices and multiracial entropy indices. SDDS provides counts of all residents in each district in multiple racial/ethnic categories, and the Common Core of Data (CCD) provides data on counts of public school students by race/ethnicity. The black-white dissimilarity index measures segregation between non-Hispanic whites and non-Hispanic blacks while the multiracial entropy index assesses segregation among non-Hispanic whites, non-Hispanic blacks, non-Hispanic Asians and Hispanics (see Reardon et al. (2000)). I assess the correlation between racial segregation of all residents and economic segregation of childless households. I also assess the correlation between racial segregation of *public school children* and the economic segregation of public school families. As hypothesized, there is a positive and significant correlation between racial segregation and economic segregation between school districts in all years.

I use the Gini index to measure *income inequality* within metro areas. Using 1990 and 2000 Census data and 2006-10 American Community Survey (ACS) data, I calculate the Gini coefficient for household and family income using the procedure outlined in Nielsen and Alderson (1997).[7] I assess the correlation between the Gini for *household* income and economic segregation of all households and childless households, and I assess the correlation between the Gini for *family* income and economic segregation of public school families. Contrary to my hypothesis, there is no significant correlation between income inequality and between-district economic segregation in each year.

I measure *neighborhood residential segregation* using the rank-order information theory index *H* to assess how segregated households or families in multiple income categories were

[7] I use the prln program provided by Nielsen at http://www.unc.edu/~nielsen/data/prln04.exe

between tracts within metro areas. Data from the 1990 and 2000 Census and 2006-10 ACS provide counts of households or families by income in each Census tract. Since *H* can be calculated at any point in the income distribution, I estimate between-tract income segregation at the 10^{th} and 90^{th} percentiles of the income distribution. I use household income to assess the correlation with childless households and family income to assess the correlation with public school families. There is a positive and significant relationship between income segregation of the affluent between neighborhoods and income segregation between districts. The correlation is larger for childless households. However, residential segregation of the poor is more strongly associated with between-district segregation of public school families than childless households. I also examine the suburbanization of poverty by calculating the proportion of poor residents in a metro area living in non-central-city tracts (as defined by the Census), using 1990 and 2000 Census and 2006-10 ACS data. However, suburbanization of poverty is not significantly related to between-district economic segregation in any year.

These correlations identify metro area characteristics associated with economic segregation between school districts. The most robust associations seem to be between economic segregation and fragmentation, racial segregation, and neighborhood economic segregation. To further explore correlates and potential causes of economic segregation between districts, however, multivariate models are needed to better isolate relationships between these factors and segregation.

Multivariate Longitudinal Analyses

I conducted regression analyses predicting economic segregation of households without children and public school families from 1990 to 2010 with metro area fixed effects. These populations may be affected by different factors, with public school families more sensitive to

school-specific factors than households without children. Even though between-district economic segregation did not change much on average for childless households from 1990 to 2010, segregation could have increased or declined in individual metro areas, which these models will capture. The analyses describe the characteristics associated with between-district economic segregation when controlling for other factors. I do not use an identification strategy to isolate one particular covariate as the causal variable of interest, so any causal conclusions must be drawn with caution. Some of these factors may be causal (for example, district fragmentation) while others are likely correlates that may share a cause with between-district economic segregation (for example, between-district racial segregation). The coefficients for these longitudinal analyses can be interpreted as a change in between-district economic segregation associated with a change in a covariate.

[Insert Table 3 about here]

Table 3 presents the results from these analyses. I exclude between-district multi-racial segregation, as it is correlated at over 0.9 with between-district black-white segregation. Several factors predict between-district economic segregation from 1990 to 2010. First, district fragmentation is positively associated with economic segregation for both households without children and public school families. The magnitude is slightly larger for public school families, suggesting that district boundaries are particularly salient for this population. However, the positive relationship for households without children suggests that public goods relevant to those without an interest in the public schools may also be bundled at the district level, leading households with resources to select more expensive districts with the goods and services they desire, even if they do not have children. Past research showing increased racial segregation of

all residents between school districts due to fragmentation may thus reflect choices about other goods bundled at the district level aside from school factors.

Second, the proportion of students in the metro area enrolled in private school negatively and significantly predicts between-district economic segregation only for public school families. This finding follows the hypothesis that availability of private schools might remove families particularly likely to segregate themselves from the public school population, reducing segregation among remaining public school families. Alternatively, this could be a reverse causation story: as economic segregation declines in metro areas, private school becomes more popular among high-income parents who want their child in a higher-income school, and increasing demand results in increasing availability. The results confirm that private school availability has little relevance to households without children.

Third, the Gini index measuring economic inequality within the metro area predicts economic segregation between districts for both populations, but the coefficient is much larger and more robust in predicting segregation among public school families. Income inequality provides comparatively more resources for high-income households regardless of household composition, but given that parents' concerns about education and school quality have grown over the last several decades, high-income parents may be more likely than childless adults to use their rising incomes to live in higher-income districts. Along with past research (Reardon & Bischoff 2011a), these findings show that growing income inequality has led to growing inequality in key contexts and institutions that shape opportunities, like neighborhoods and schools. My results show that the brunt of this growing inequality is borne by children, as income inequality is more highly associated with the segregation of school districts by income for families with than without children.

Fourth, neighborhood income segregation positively predicts economic segregation, but only for public school families and only the segregation of the poorest families from all others. In metro areas where the poor have become more segregated between neighborhoods, segregation by income between districts has risen. If increasing segregation of the poor makes poverty more visible or if the social problems associated with poverty concentration emerge, middle- and high-income families with children may be more willing to pay to live in higher-income districts, increasing segregation between districts. Families may be more sensitive to the social problems of crime and violence presumed to operate in poor neighborhoods than childless families. Further, if the increasing segregation of the poor reflects increasing segregation at the macro scale, in geographic areas that coincide with district boundaries, this could result in increased economic segregation between districts.

Finally, economic segregation of childless households between districts is lowered in metro areas where a growing proportion of poor residents live in the suburbs. This relationship follows the hypothesized negative direction. Perhaps it is the case that families with children are more sensitive to the implications of a growing number of poor residents in the suburbs—if a suburb becomes poorer, families with children could move to a less affected suburban district due to fears of declines in schooling quality. Childless families may be more willing to live in diverse suburbs.

Surprisingly, racial segregation between districts is not significantly associated with economic segregation between districts in these longitudinal models that control for other factors. The correlations shown in Table 2 may be spurious, if district fragmentation or income inequality, for example, cause both racial and economic segregation. Overall, these results show that different factors predict between-district economic segregation for different populations. In

particular, district fragmentation, private school availability, income inequality, and the segregation of the poor should be examined as potential causes of rising income segregation among families with children. The first two factors capture schooling-related concerns and therefore it is not surprising that they are more salient for the district enrollment patterns of families with children. Income inequality may matter more for families as it has risen more quickly than for all households, providing a larger comparative advantage for families, and because higher-income parents seem to be increasing their investments in their children compared to lower-income families in a variety of resources. Willingness to live in a higher-income, costlier district may be an additional resource higher-income parents are willing to spend money on to maximize their children's advantages. The impact of the segregation of the poor requires more investigation to understand if there are concentration effects. Complex demographic, political, and economic changes determine how high- and low-income households are distributed across school districts, particularly those with children, and further research should explore these factors in more depth.

Discussion

Since 1990, the segregation of all households and childless households by income between school districts has not changed much. However, families with children, for whom school districts may be a more salient factor in residential choice and for whom the consequences of school district segregation are greater, have become more segregated by income during this time. Had I only been able to examine data on all households, I would have missed this growing inequality in children's contexts. Segregation for families with children, particularly public school families, increased primarily in the top two-thirds of the income distribution.

Lower-income families with children became slightly more integrated into school districts with other families from 1990 to 2010. However, given that higher-income families became increasingly segregated between districts during this time, the integration of low-income families is likely occurring within the bottom third of the income distribution. Low-income families with children may live in districts and send their children to school with only slightly-higher income families.

The results emphasize the importance of examining segregation according to household characteristics like household composition. Segregation by income between neighborhoods rose for all families during this time (Reardon & Bischoff 2011a, 2011b), while between-district segregation by income did not increase among all households. Perhaps the change in neighborhood segregation for all households occurred within school districts, while one factor underlying the sorting of families with children across neighborhoods was school district boundaries.

This raises the question of whether segregation by income across neighborhoods is different for families with children than for all households. Research on racial segregation shows more racial segregation among households with children than among all households (Iceland et al. 2010; Logan et al. 2001), but we do not know if this is the case for income segregation. On the one hand, the proliferation of school choice plans and alternative school options like charter and magnet schools could mean that neighborhoods are becoming less important than districts in residential choice. Families with children, particularly public school families, may prioritize living in a particular district first, and then living in a school catchment zone or neighborhood second. On the other hand, the limited research on between-school segregation suggests that segregation of poor and non-poor students between schools increased since 1990 (Owens et al.

2012; Rusk 2002), suggesting that families may still be segregated within districts between school catchment areas. More research on the segregation of families with children across schools and neighborhoods is needed, but unfortunately, publicly available Census data and data on students' economic status limits researchers' ability to thoroughly address this question.[8] As a start, data collection efforts in individual cities could be brought to bear on some of these issues to establish an understanding of how segregation at multiple geographic levels operates, at least in one place.

Many political, demographic, and economic factors determine where households live and how they are sorted within metro areas across school district lines according to income. The results here show that school district fragmentation, school options, income inequality, and neighborhood segregation by income are all factors that shape how public school families are sorted across school districts. Past research provides theoretical reasons to suggest that fragmentation, schooling options, and income inequality could be causes, rather than correlates, of the sorting of public school families by income between districts, and future research should develop identification strategies to better test this causal links.

Sorting by income across district lines may have serious consequences for educational inequalities for public school children. Reardon (2011b) finds a growing achievement gap between high- and low-income students, and economic segregation could produce such an inequality through several channels. The district serves as a political boundary that determines educational funding and spending, curricular decisions, preschool options, and school choice

[8] Publicly available Census data does provide data on the poverty status of households by household composition. The categories, however, are limited in number and precision, with the top category (incomes over 1.85 times the poverty line) obscuring considerable income variation in the top of the income distribution. Data on students' economic status at the school level is limited to distinguishing between those eligible and ineligible for free or reduced-price lunch, which provides a coarse distinction between students in the bottom ~third of the income distribution and all others. Given that the results here show rising between-district segregation within the top two-thirds of the income distribution, this coarse distinction could miss a similar between-school trend.

options. Many other public goods relevant to children's lives, such as library resources, daycare options, parks, and public transportation, may also be tied to district boundaries if the district is coterminous with a municipality that provides such resources. The district also serves as a social context for children, determining who public school students will have as classmates and influencing the types of adult supervision and role models children will encounter. If families with children, particularly public school families, have become increasingly sorted by income across districts, these resources may be distributed more inequitably, which may result in unequal outcomes for children.

Further research is necessary to document the trends, complex causes, and consequences of economic segregation between both schools and school districts. Most past research focuses on racial segregation, but my results suggest that income segregation is steadily increasing while racial segregation between districts declined in the 2000s. Understanding the contours of economic segregation will have important consequences for policy, as legislators consider school-choice plans based on various student characteristics, increasingly taking family economic resources, rather than race, into account. The results emphasize the need to consider *intra-* as well as inter-district choice plans in order to reduce educational disparities in resources and outcomes. Overall, my findings suggest that inequality in children's contexts has increased over the past 20 years, and the causes and consequences must be explored.

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Table 1. Correlates of Economic Segregation between School Districts

Factor	**Measure**	**Hypothesized Relationship w/ Segregation**	**Hypothesized National Segregation Trend**	**Data Source**
School District Fragmentation	Herfindahl Index	+	Increase: Fragmentation has increased since 1990	SDDS (NCES)
School District Resources	Per-pupil spending Gini	+	Decline: district disparities and reliance on local spending has declined	Public School Finance Data (Census)
	% funding from local sources			Public School Finance Data (Census)
School Options	% of students enrolled in private schools	-	Increase: % of students enrolled in private school has declined slightly	SDDS (NCES)
Between-District Racial Segregation	Black-white *D*	+	Increase during 1990s; decline since 2000	CCD and SDDS (NCES)
	Multiracial *H*			CCD and SDDS (NCES)
Income Inequality	Gini Index	+	Increase: income inequality increased	Census/ACS
Residential Income Segregation	*H* (overall, 10^{th} percentile, 90^{th} percentile)	+	Increase: residential income segregation increased overall and at 10^{th} and 90^{th} percentile	Census/ACS
	% of poor in suburbs	-	Decline: % of poor living in suburbs has increased	Census/ACS

Table 2. Bivariate Correlations with Between-District Economic Segregation

	Year	Households w/out Children	Public School Families
Fragmentation			
Herfindahl Index	1990	0.563***	0.581***
	2000	0.610***	0.630***
	2010	0.571***	0.621***
School District Resources			
Per Pupil Spending Gini	1990	0.430***	0.463***
	2000	0.158	0.192^
	2010	0.056	0.076
% of Funding from Local Resources	1990	0.414***	0.487***
	2000	0.446***	0.469***
	2010	0.188	0.293***
School Options			
% of students in private school	1990	0.250*	0.438***
	2000	0.012	0.097
	2010	-0.053	0.083
At least one district w/ SBSA plan	2010	-0.235*	-0.138
Between-District Racial Segregation			
Black-white Dissimilarity Index	1990	0.725***	0.766***
	2000	0.751***	0.786***
	2010	0.752***	0.789***
Multiracial Entropy Index	1990	0.707***	0.783***
	2000	0.732***	0.768***
	2010	0.763***	0.787***
Income Inequality			
Gini Index (Family Income)	1990	-0.027	-0.073
	2000	0.053	-0.049
	2010	0.045	-0.091
Residential Income Segregation			
Between-tract H for Affluent (90^{th} p)	1990	0.449***	0.366***
	2000	0.460***	0.301**
	2010	0.361***	0.206*
Between-tract H for Poor (10^{th} p)	1990	0.382***	0.650***
	2000	0.501***	0.701***
	2010	0.548***	0.668***
Suburbanization of Poverty	1990	0.075	-0.083
	2000	0.009	-0.070
	2010	-0.012	-0.064

*p≤0.05; **p≤0.01; ***p≤0.001

Table 3. Multivariate Regressions predicting Economic Segregation between School Districts, 1990 to 2010

	Households w/out Children	Public School Families
Fragmentation	0.033*	0.045*
	(0.0127)	(0.018)
Per-Pupil Spending Gini	-0.004	-0.020
	(0.009)	(0.013)
% of Funding from Local Resources	-0.004	-0.016
	(0.007)	(0.011)
% of Students in Private School	0.002	-0.079*
	(0.026)	(0.039)
Black-White Dissimilarity Index	0.022^	0.015
	(0.012)	(0.010)
Gini Index, Family/Household income	0.093*	0.324***
	(0.040)	(0.061)
H between Tracts, 90th percentile	0.004	0.046
	(0.037)	(0.057)
H between Tracts, 10th percentile	-0.027	0.303***
	(0.045)	(0.052)
% of Poor in Suburbs	-0.046**	-0.033
	(0.016)	(0.023)
N Metro areas	95	95
R^2 Within Metro areas	0.140	0.502
R^2 Between Metro areas	0.199	0.377

Notes: Black-white dissimilarity index is based on all residents when predicting segregation of households without children, and the index is based on public school students when predicting segregation for public school families. The Gini index and between-tract H are based on household income when predicting segregation for households without children, and the indices are based on family income when predicting segregation for public school families.

Figure 1. Average Economic School Segregation between School Districts in the 100 Largest Metro Areas in the U.S., 1990 to 2006/10

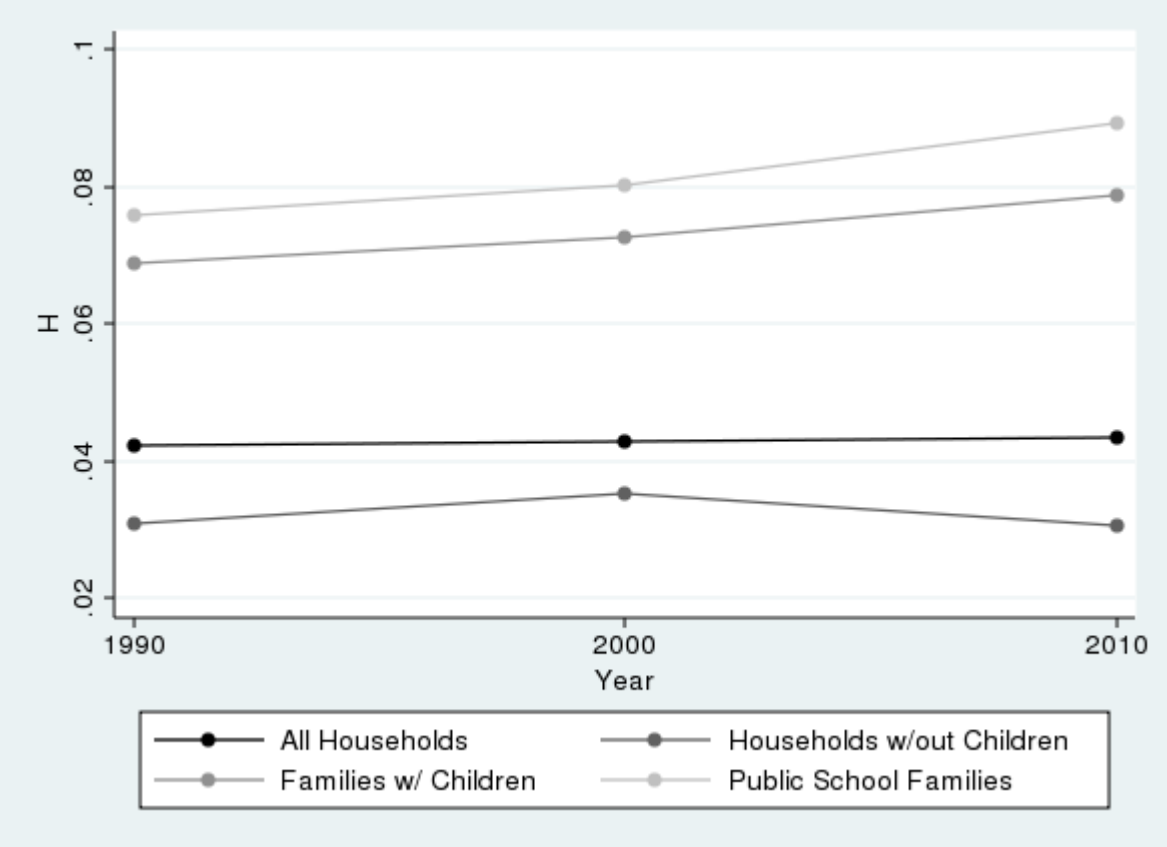

Figure 2. Economic Segregation between School Districts for all Households, 1990 to 2006/10

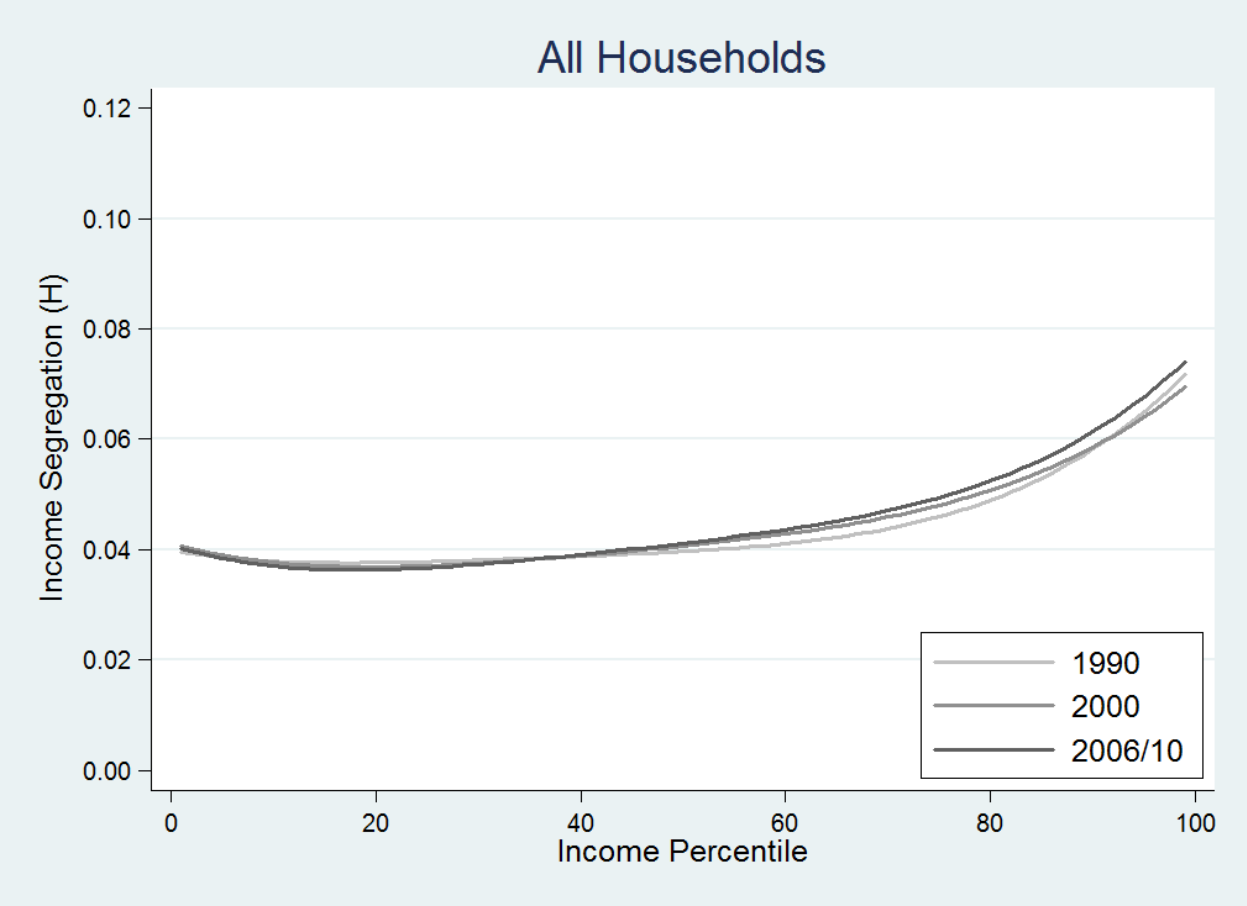

Figure 3. Economic Segregation between School Districts for Households without Children, 1990 to 2006/10

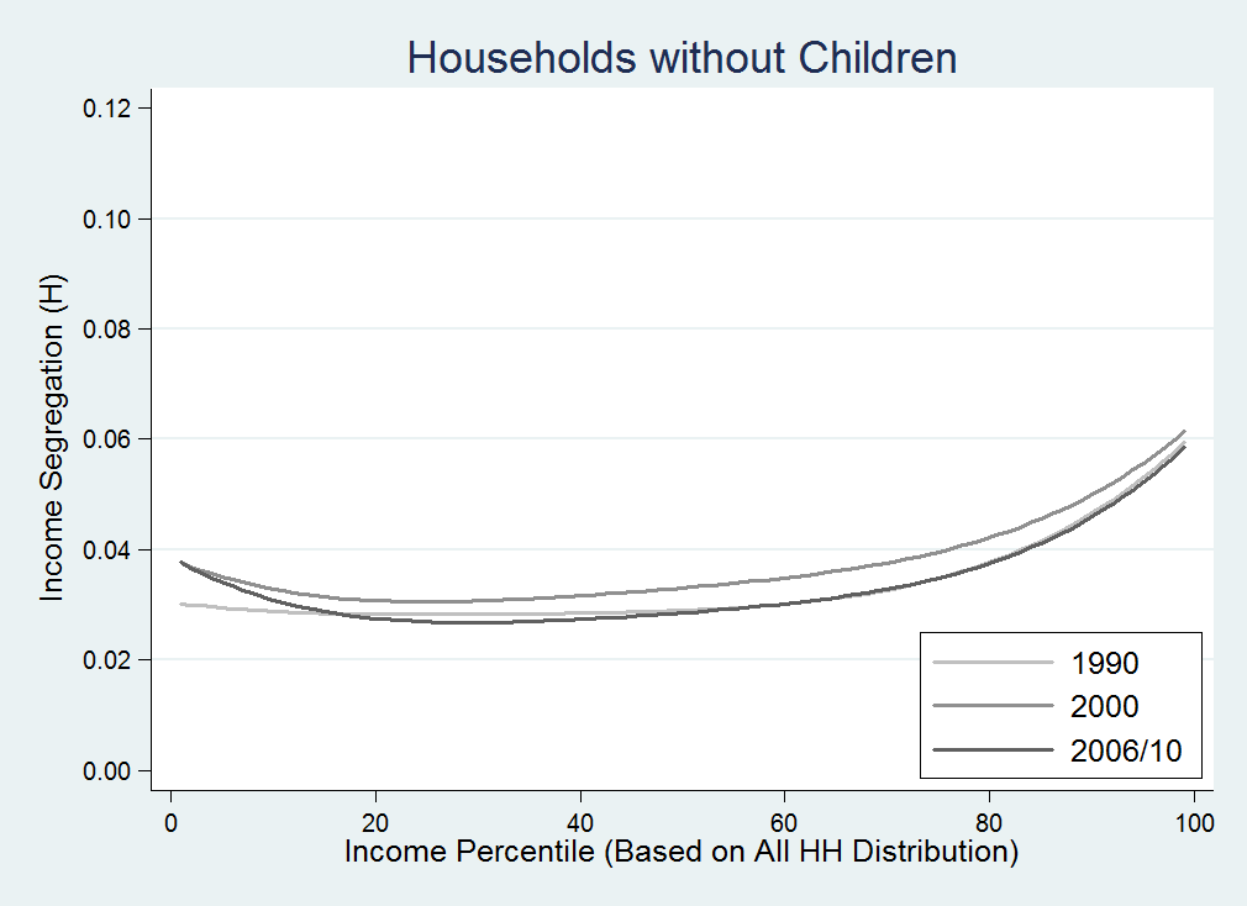

Figure 4. Economic Segregation between School Districts for Families with Children, 1990 to 2006/10

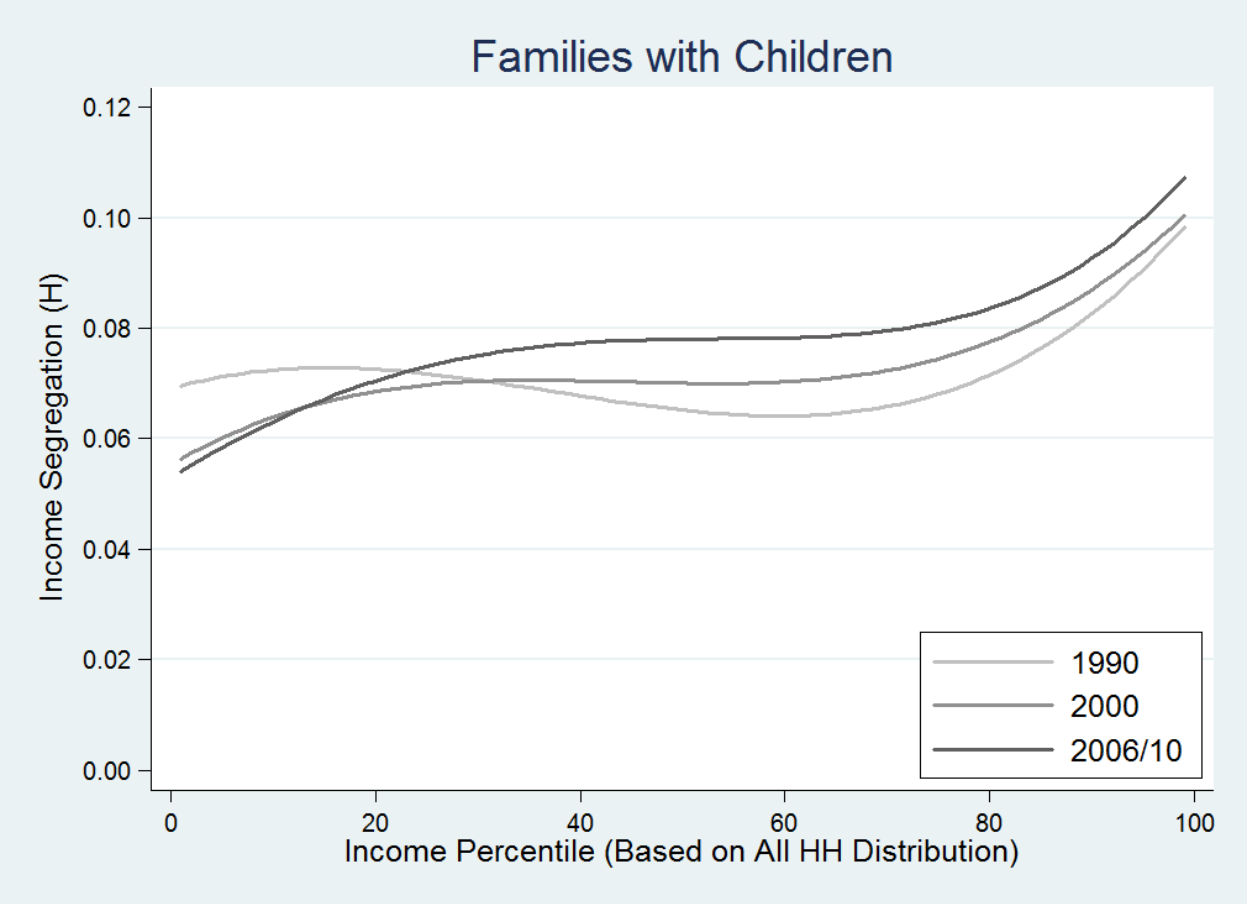

Fig 5. Economic Segregation between School Districts for Public School Families, 1990 to 2006/10