Separate Remains Unequal: Contemporary Segregation and Racial Disparities in School District Revenue

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ABSTRACT

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Separate Remains Unequal: Contemporary Segregation and Racial Disparities in School District

Revenue

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Abstract

Resource exposure is believed to be a key mechanism linking patterns of racial segregation and student outcomes during the Brown v. Board of Education era. Decades later, literature suggests that past progress on school desegregation may have stalled, raising concerns about resource equity and associated student outcomes. Are recent trends in segregation associated with racial disparities in school resources? Drawing on national data from the School Funding Fairness Data System and the Common Core of Data, this study examines the partial association between contemporary patterns of segregation between districts within a state and racial disparities in school district revenue over time. We find that increases in racial segregation, net of racial socioeconomic segregation and other racial differences between districts, are associated with racial disparities in revenue. These findings suggest that purportedly race neutral funding formulas and policies may not be completely race neutral and could be reproducing social inequality.

It has long been theorized that disparities in resource exposure are a key mechanism linking racial segregation to student outcomes. Evidence suggests that the expanded access of Black students to school resources such as smaller class sizes and increased school spending as a result of *Brown v. Board of Education of Topeka* (1954) contributed to improved educational attainment, socioeconomic status, and health outcomes for Black students, with no negative impact on White students (Johnson 2011; Reber 2010). This suggests that desegregation worked in part through redistributing resources important for student performance and outcomes.[i]

Decades later, literature suggests that past progress on school desegregation may have stalled, raising concerns about resource equity and associated student outcomes. Trends in racial unevenness across schools in the past two decades have been stable, while Black-White isolation has increased (Reardon & Owens, 2014). Racial segregation remains closely related to racial disparities in outcomes. The more unevenly Black versus White students are spread across schools in a district, the higher the Black-White achievement gap (Condron et al. 2013), due in part to racial differences in poverty. For example, Reardon (2016) finds that racial differences in exposure to poverty in schools drive the association between racial segregation and achievement disparities. If desegregation was associated with increased school resources for Black students, is contemporary segregation related to racial disparities in school funding?

The current study answers this question by exploring how contemporary patterns of racial and racial socioeconomic segregation are related to the allocation of school funding. More specifically, the current study assesses the contemporaneous relationship between racial and racial socioeconomic segregation between school districts within a state and racial disparities in

school district revenue over time. As racial and racial socioeconomic segregation between school districts increases, what happens to racial disparities in school district revenue?

Policy and practical constraints that exist within school districts more easily impact segregation between schools within districts. This ease of impact and likely variation in segregation between schools makes within district analyses a frequent focus of segregation research (Reardon and Owens 2014). However, school funding policies, decisions, and allocations largely take place at the district level, and districts within the same state are subject to many of the same policies. It is for these reasons that our study deviates from the norm of segregation research by focusing on segregation and school funding patterns between districts within states. This descriptive inquiry is the first to examine how segregation and revenue disparities trend over time. Past studies are generally cross sectional (and thus more subject to confoundedness), over a short period of time, or focused on a single school district. Our national data includes finance and demographic information for nearly every traditional school district in the country over the course of 15 years, allowing a unique opportunity to study both finance disparities and racial and socioeconomic segregation patterns over time. Ultimately, this study explores one mechanism through which contemporary segregation might impact students and advances the empirical knowledge on the potential consequences of resegregation in U.S. public schools.

SCHOOL FINANCE AND STUDENT OUTCOMES

While widely cited research argues that school resource inputs have not led to consistent and discernible improvements in student outcomes (Hanushek 1986, 1997, 2003), a growing body of literature provides an alternative narrative. Several recent studies offer evidence of a

causal relationship between school funding and educational achievement, attainment, and adult outcomes. By exploiting exogenous changes in per-pupil spending, this literature provides a strong basis for arguing that resources matter for student outcomes (Candelaria and Shores 2017; Jackson, Johnson, and Persico 2016; Johnson 2011; Lafortune, Rothstein, and Schanzenbach 2018). Beginning in the 1960s, school finance systems were overturned in various states throughout the country because of large within-state differences in per-pupil spending between poor and affluent school districts. These court-ordered school finance reforms (SFRs) induced increases in district level funding, more progressive funding patterns, and narrower gaps in expenditures between high- and low-income districts (Candelaria and Shores 2017; Card and Payne 2002; Jackson et al. 2016; Lafortune et al. 2018). These changes in funding levels as a result of SFRs were also associated with changes in student performance. Students in low-income districts had higher mean achievement outcomes after the funding reforms, while students in high-income districts experienced no change, effectively narrowing between-district achievement disparities by raising the average scores of students in the low-income districts without harming their high-income counterparts (Lafortune et al. 2018). Similar effects were found using a different metric of achievement. For example, the gap in average SAT scores between students with highly-educated parents and poorly-educated parents narrowed by approximately five percent (Card and Payne 2002).

There is also evidence that changes in district funding levels affected long-run student outcomes. These exogenous funding changes were associated with increased graduation rates (Candelaria and Shores 2017), educational attainment, adult wages, family income, and reduced poverty (Jackson et al. 2016). More specifically, a 10 percent increase in district spending over the course of a child's schooling years resulted in a 0.43 year increase in years of schooling

completed, 9.5 percent increase in adult wages, a 16.4 percent increase in family income, and a 6.8 percent reduction of adult poverty (Jackson et al. 2016). These results were achieved through increases in instructional and support staff expenditures, a decrease in student-teacher ratios, an increase in the length of the school year, and an increase in base salaries of teachers (Jackson et al. 2016).

Other studies have descriptively examined the relationship between state funding for elementary and secondary schools and student outcomes, as well as the level and distribution of staffing across school districts. Higher levels of state investment were associated with increased staffing. Increases in funding progressiveness (i.e., targeting funds to high-poverty school districts) were associated with progressive targeting of staffing. Achievement outcomes for low-income students were highest in states that invested more in education. States with progressive spending also had greater achievement outcomes for low-income students (Baker & Weber, 2016). In sum, recent descriptive and causal research provides evidence that school funding matters for student outcomes.

SCHOOL FINANCE AND RACIAL SEGREGATION

Given the recent literature documenting a causal and positive relationship between school funding and student outcomes, it is perhaps not surprising that school desegregation led to improved outcomes through changes in resource exposure for Black students. Examining districts that underwent court-ordered desegregation, Johnson (2011) found that when desegregation was associated with exposure to higher levels of expenditures, desegregation was related to more positive long-run outcomes for students, including educational attainment and adult well-being, with evidence of dosage effects based on how long a student was exposed to a

desegregated higher resource context (Johnson 2011). Whereas schools that desegregated without these higher levels of expenditures were not associated with the same positive changes in long-term impacts (Johnson 2011), providing evidence that past desegregation improved outcomes through changing the resource context of Black students. Reber (2010) reached similar conclusions in a study of the change in resource levels and peer exposure that occurred as a result of desegregation in Louisiana. Reber (2010) found evidence that exposure to an increased level of resources was associated with larger reductions in student dropout rates than peer exposure. In other words, desegregation improved outcomes by narrowing resource disparities, suggesting that segregation was associated with high resource disparities that in part lead to disparities in outcomes.

Further, studies of Nashville public schools' transition to unitary status and subsequent resegregation suggest that, with deliberate policy action, resegregation need not be accompanied by widening resource disparities. In anticipation of resegregation patterns after being released from their court-ordered desegregation program in 1999, Metropolitan Nashville Public Schools (MNPS) created high resource schools as a compensatory resource allocation strategy (Houck 2010). Where it was truly compensatory resource allocation, there were positive effects on achievement. In particular, schools that were granted reduced class sizes, an extension in the length of the school year, and a mix of additional supports such as before school programming, after-school tutoring, and social and health services saw more achievement gains (Gamoran and An 2016). This suggests a causal pathway between segregation, school resources, and student outcomes, and underscores how intervention in that pathway may mitigate segregation's negative consequences on educational outcomes.

Altogether, recent literature provides evidence that resources are important for student outcomes, both for short-run educational attainment and outcomes and for long-term adult well-being. Past desegregation produced positive outcomes largely through increased resource exposure. Are contemporary patterns of segregation accompanied by racial disparities in school funding? Or has the contemporary funding structure eliminated the relationship between racial segregation and school funding?

OVERVIEW OF SCHOOL DISTRICT FUNDING FORMULAS AND POLICIES

We argue that the mechanisms through which segregation is associated with disparities in school district revenue are directly related to school district funding formulas and policies. Therefore, any discussion of mechanisms first requires a brief overview of school funding processes. In the United States, school districts operate with funding from federal, state, and local sources. While most districts receive the majority of their funding from state and local sources, the actual share from respective municipalities, states, and the federal government, varies between and within states. For example, in fiscal year 2015, school districts in Illinois received eight percent of their revenue from federal sources, 25% from state sources, and 67% from local sources. [ii] Whereas school districts in Vermont received six percent of their revenue from federal sources, 90% from state sources, and only four percent from local sources (McFarland et al. 2018).

Local funding for school districts is largely generated through local tax revenue, most often from property taxes. The reliance on property taxes as the primary source of local education funding has long been a source of contention. Because tax rates and property values vary between districts, there are large disparities in local revenue for school districts in the U.S.

(McGuire, Papke, and Reschovsky 2015; Verstegen and Knoeppel 2012). School districts rely on their respective states to compensate for these shortfalls.

States supply direct aid to elementary and secondary schools to fulfill their constitutional mandate of providing at least a basic education. State aid is largely generated from income and sales tax. States provide revenue to districts to cover costs such as general formula assistance, special education, bilingual education, gifted and talented programs, employee benefits, capital outlay, vocational education programs, and staff improvement programs. Each state uses a formula to distribute state funds to districts. These formulas generally try to account for anticipated differences in the funding capacity between districts. The most common type of funding formula used across states is the foundation program. Foundation formulas set a base funding level that is deemed necessary for a basic or adequate education, determines the required amount of local effort that has to be put towards raising the funds, and uses state funds to cover the shortfall (Verstegen 2011, 2016; Verstegen and Jordan 2009). Foundation programs account for student and district factors such as poverty, disability, English language status, and district size (Verstegen and Knoeppel 2012). Each formula factor is given a funding weight or multiplier (and therefore more dollars).

States also play a role in shaping funding conditions for districts in ways that are indirectly related to the provisioning of financial support. For example, states implement policies that affect local taxes, education spending, and decisions regarding school district funding. In many states across the country, there are limits on government tax revenues and expenditures. These tax and expenditure limits often impact school district budgets and are the most constraining in districts serving economically disadvantaged populations (Mullins 2004). States also make decisions regarding the fiscal independence and dependence of its school districts. In

the majority of states, school districts have the authority to levy their taxes to support school operations, making them fiscally independent. In other states, school districts are fiscally dependent and must present a budget to a municipal, county, or state government which approves or modifies the budget and levies the necessary taxes. The entity that approves tax levies and school district budgets varies across districts and states. In some places, elected officials must grant approval, in other places, local citizens vote on the approval (Center for Public Education 2008; McGuire et al. 2015; Verstegen 2015).

Federal funding for school districts comes from the Department of Education as well as other federal agencies such as the Department of Agriculture. The federal government's role in public education finance is primarily compensatory. The largest shares of federal funding for school districts comes from Title I of the Elementary and Secondary Education Act (ESEA) and the Individuals with Disabilities Education Act (IDEA) (Camera 2016; U.S. Department of Education 2014). The goal of Title I is to increase the resources for school districts with high concentrations of economically disadvantaged students by funding programs that are intended to improve learning for students at risk of educational failure. The federal government provides funding in accordance with IDEA to help ensure that all students with disabilities receive a free and appropriate education. Other major federal programs include, but are not limited to, Improving Teacher Quality, 21st Century Community Learning Centers, Title III Language Instruction for Limited English Proficient and Immigrant Students, and Impact Aid (U.S. Department of Education 2014). The federal government allocates revenue to states (and sometimes districts) based on specific eligibility criteria and/or formulas (Cornman 2015). This generally includes counts of eligible students in states or within districts (National Center for Education Statistics 2016; Sonnenberg 2016). These counts are sometimes multiplied by base

factors (Sonnenberg 2016). States then sub allocate these federal funds to districts based on specific formulas and/or eligibility criteria.

Of the three sources of school district revenue, local funding is the most variable across school districts as it is largely reliant on local wealth. States directly and indirectly shape the funding conditions of their inhabiting school districts through the provisioning of compensatory and general aid, funding policies, and state governance. The federal government determines processes and policies through which states can receive compensatory federal funding to suballocate to school districts. Taking into consideration these structures of school finance, segregation will be differentially associated with federal, state, and local revenue.

WHY AND HOW MIGHT SEGREGATION BE RELATED TO DISPARITIES IN SCHOOL REVENUE?

Racial segregation may be related to racial disparities in district revenue indirectly through its relationship to poverty or directly through the role of race in local political contestation. The exact relationship should differ for federal, state, and local revenue as a result of the variation in the structure of these three sources of school district funding. It is for these reasons, that we focus our attention on not just total revenue, but also federal, state, and local revenue. While there are differences in funding structures across states, federal and state revenue is generally allocated in accordance with specific funding formulas that often give extra weight (and thus more money) to student and district factors such as poverty, disability, and English Language Learner (ELL) enrollments. Because nothing in federal and state funding formulas explicitly allocates funding based on race, there should be no independent association between racial segregation and racial disparities in federal and state revenue, after accounting for poverty

and other formula factors. Given the compensatory role of federal and state funding, particularly as it relates to funding weights for poverty, we suspect that increases in racial socioeconomic segregation will be related to more federal and state revenue for Black and Latinx districts with higher rates of socioeconomic disadvantage.

In contrast to federal and state funding, funding to school districts from local sources generally does not provide compensatory aid and instead is highly dependent on local economic conditions and sociodemographic characteristics (e.g., property tax rates, property values, and poverty rates). The level of local poverty and resources in Black, Latinx, and White neighborhoods should therefore drive local funding disparities. Blacks and Latinos/as experience concentrated neighborhood poverty (Quillian 2012). Poverty and property taxes are negatively correlated (Baker and Corcoran 2012), resulting in a weaker tax base in poorer, less White neighborhoods. Even though low property wealth districts may tax at a higher rate than high property wealth counterparts, the increased effort may be insufficient to make up for lower property values in high poverty districts and result in less local revenue (Baker and Corcoran 2012). Black and Latinx students concentrated in higher poverty districts and neighborhoods will likely have less local revenue as a result. In contrast, White students concentrated in more affluent districts have access to a stronger tax base, allowing them to raise more local dollars with less effort. In addition, wealthier, whiter districts may also have experiences, institutional knowledge, and networks that can be leveraged to secure higher levels of local funding in ways that high minority and high poverty districts may not. For example, relatively affluent districts tend to have more access to other sources of local revenue such as private donations through school-supporting non-profits (Nelson and Gazley 2014). Thus, we would expect racial

socioeconomic segregation would be related to racial disparities in local revenue, but not racial segregation.

In sum, if the relationship between race and poverty is driving the relationship between race and funding disparities, we would expect significant relationships between racial socioeconomic segregation and funding disparities, but no relationships between racial segregation and funding disparities, after accounting for poverty. Specifically, increases in racial socioeconomic segregation would be associated with larger racial disparities in local revenue. However, the compensatory nature of federal and state revenue (e.g., weights for poverty) should make up for local revenue shortfalls. Thus, increases in racial socioeconomic segregation would not be related to racial disparities in total revenue.

A second competing pathway connecting racial segregation to disparities in district revenue may be a more direct link between race and the willingness to fund public education. Evidence from ethnic fragmentation literature suggests that people are less willing to fund public spending when there is a perception that the public goods will be shared with out-group members (Alesina, Baqir, and Easterly 1999). Recent evidence also suggests that Whites are less likely to support increased taxation and progressive taxation when new residents are not White (O'Brien 2017). Under this pathway, we would expect that racial segregation is related to racial disparities in revenue even after accounting for poverty and other formula factors. This relationship should be strongest at the local level, where stakeholders can more easily intervene to change funding systems (e.g., through school board elections or votes on tax levies). Therefore, the more local the funding source, the more we would expect it to decrease for Black and Latinx districts as racial segregation increases. Since federal and state funding formulas target disadvantage and not race per se, they are not designed to compensate for disparities at the local level driven by racial

segregation. Thus, if a direct relationship between race and the willingness to fund public education drives funding disparities, we would expect that increases in racial segregation will not only be related to racial disparities in local revenue, but will also be related to less total revenue for Black and Latinx districts relative to White districts.

METHODOLOGY

Data

For this study, we utilize national, public-use data collected at the district level. The School Funding Fairness Data System's (SFFDS) Local Education Agency (LEA) Fiscal Database (version 1.0) provides longitudinal data on school district finance and demographics. This dataset includes district-level measures from several longstanding federal collections, including the Annual Survey of School System Finances, or F33, collected by the U.S. Census Bureau; the National Center of Education Statistics (NCES) Common Core of Data (CCD) Local Education Agency (School District) Universe Survey Data; Extended Comparable Wage Index (CWI) from The Busch School of Government and Public Service; and Small Area Income and Poverty Estimates (SAIPE) from the U.S. Census Bureau.

We use the SFFDS LEA Fiscal Database to observe several different categories of school district revenue, demographic characteristics of school districts, estimates of child poverty, and geographic cost adjustments. To adjust for geographic differences in the cost of education within states, we link the SFFDS LEA Fiscal Database to state-level cost adjustments from the CWI. To further account for differences in revenue due to geographic concentration beyond the scope of the CWI, we construct a measure of urbanicity using data from the CCD Local Education Universe Survey. For example, average per-pupil revenue may be different in rural school

districts than in urban school districts because of economies of scale. Finally, to address missingness on student demographics in early years of data collection, we linked the SFFDS LEA Fiscal Database to school-level imputations of student demographic data aggregated to the district (including enrollment, racial composition, and Free Lunch (FL) composition) from the CCD.

We restrict our analyses to traditional school districts in states with more than one district. As such, the District of Columbia and Hawaii are excluded since it is not possible to construct between-district measures in states with a single district. We further exclude districts that are non-operational in a given fiscal year, provide only vocational education or special education, serve a juvenile justice population, are charter districts, or do not actually enroll students (i.e., federal, regional, or other education service agencies). [iii] Lastly, district-year observations with outlier values for total per pupil revenue or expenditures, missing revenue or expenditures data, or no 5 to 17-year-olds according to SAIPE estimates are also excluded. See Appendix Table A1 for the number of district-years excluded for each of the aforementioned conditions.

The resulting dataset spans 15 years, including fiscal years 1999 through 2013. The sample includes an average of about 13,417 school districts per year for a total of 201,257 district-year observations. Since we are measuring average revenue disparities between districts within a state, our measures are properties of a given state and year combination. In other words, we have one measure of the between-district disparities for each state and year in our data, for a total of 735 observations (49 states, 15 years). Because there are state-year combinations missing key control variables, we further restrict our analysis to state-years with non-missing data. This

results in an analytical sample of 641 state-year observations. See Appendix Table A2 for more information about missingness.

Measures

Our dependent variables are Black-White and Latinx-White total, federal, state, and local revenue disparities between districts within a state. These racial disparities in revenue are measured in two ways, dollar differences and revenue ratios. For both measures, we first account for geographic differences in labor market costs between districts within a state. Total, federal, state, and local per pupil revenue are cost adjusted by multiplying the base amount by the following,

$$\frac{CWI_{jt}}{CWI_{it}}, \qquad (1)$$

where CWI_{jt} is the comparable wage index for the state in a given year and CWI_{it} is the index for the district (Taylor et al. 2007). Using the cost adjusted per pupil revenue variables, we then create variables for average per pupil revenues in the average Black, Latinx, and White students' districts. To create the average per pupil revenue in the average Black student's district, we compute the weighted average per pupil revenue among districts within a state and year, weighting by the number of Black students in each district. We follow similar steps to compute the average per pupil revenue in the average Latinx student's district and in the average White student's district. We then compute the dollar difference in cost-adjusted per pupil total, federal, state, and local revenue between the average Black/Latinx student's district and the average White student's district. This difference is computed as follows,

$Racial\ Dollar\ Difference\ in\ Revenue_{sy}^{rg} =$

$$\left[\sum_{d=1}^{n_{sy}} \left(\frac{Revenues_{dsy}^{r}}{Enrollment_{dsy}}\right)\left(\frac{Enrollment_{dsy}^{g}}{Enrollment_{sy}^{g}}\right)\right] - \left[\sum_{d=1}^{n_{sy}} \left(\frac{Revenues_{dsy}^{s}}{Enrollment_{dsy}}\right)\left(\frac{Enrollment_{dsy}^{white}}{Enrollment_{sy}^{white}}\right)\right], \quad (2)$$

where d indexes the district, s indexes the state, y indexes the year, g indexes the racial subgroup (Black or Latinx), and r indexes the revenue subcategory of interest (i.e., total, federal, state and local).

A difference of one dollar will be more substantial in a state with larger educational costs (e.g., New York, which received \$23,282.87 in per pupil revenue in fiscal year 2013) than it will in a state with lower educational costs (e.g., North Carolina which received \$8,926.30 in per pupil in the same year). To address this, we standardize district racial dollar differences in per pupil revenue by dividing each difference by average total revenue in a state in fiscal year 2006 (our sample's median year) and multiplying that standardized difference by \$10,000. The resulting value can be interpreted as the racial disparity in per pupil revenue for every \$10,000 of average revenue for a state. For example, a value of \$500 would reflect five percent of a state's average per pupil revenue in 2006. Positive values indicate that the average Black or Latinx student's district receives more revenue than the average White student's district. A value of zero indicates parity. Negative values indicate that the average White student's district has more revenue per pupil.

Next, we construct revenue ratios of cost adjusted per pupil total, federal, state, and local revenue between the average Black/Latinx student's district and the average White student's district. This ratio is computed as follows,

$$Racial\ RevenueRatio_{sy}^{rg} =$$

$$\left[\sum_{d=1}^{n_{sy}} \left(\frac{Revenues_{dsy}^{r}}{Enrollment_{dsy}}\right)\left(\frac{Enrollment_{dsy}^{g}}{Enrollment_{sy}^{g}}\right)\right] / \left[\sum_{d=1}^{n_{sy}} \left(\frac{Revenues_{dsy}^{s}}{Enrollment_{dsy}}\right)\left(\frac{Enrollment_{dsy}^{white}}{Enrollment_{sy}^{white}}\right)\right], \quad (3)$$

Values over one indicate that the average Black or Latinx student's district receives more revenue than the average White student's district. A value of one indicates parity. Values less than one indicate that the average White student's district has more revenue. Ratios are useful measures because they account for baseline differences in revenue between racial groups. Furthermore, using revenue ratios gets rid of secular trends by putting each value relative to its own state in the same year.

Ratios also capture a different aspect of inequality than dollar differences. While dollar differences most directly capture inequality in the resources at a district's disposal, revenue ratios capture inequality in terms of how race groups fare relative to each other. Dollar differences can be large and growing even if ratios are close to one and unchanging if initial (i.e., beginning of sample period) per pupil revenues are large and unequal. Furthermore, ratios can grow without any corresponding change in dollar differences if initial per pupil revenues are unequal and growing at unequal rates. Thus, ratios best capture the extent to which race groups are gaining or losing ground relative to each other while dollar differences best capture the changing resource contexts.

The independent variables are measures of segregation. The first measure of segregation captures Black-White and Latinx-White between-district racial segregation. We calculate the difference in proportion Black enrollment in the typical Black student's district relative to the proportion Black enrollment in the typical White student's district within a state and year. We calculate a comparable measure of Latinx-White differences in Latinx enrollment. The following equation details this measure of racial segregation.

$Racial\ Segregation_{sy}^{g} =$

$$\left[\sum_{d=1}^{n_{sy}}\left(\frac{Enrollment_{dsy}^g}{Enrollment_{dsy}}\right)\left(\frac{Enrollment_{dsy}^g}{Enrollment_{sy}^g}\right)\right] - \left[\sum_{d=1}^{n_{sy}}\left(\frac{Enrollment_{dsy}^g}{Enrollment_{dsy}}\right)\left(\frac{Enrollment_{dsy}^{white}}{Enrollment_{sy}^{white}}\right)\right], \qquad (4)$$

Positive values mean that the average Black or Latinx student is in a district with greater Black or Latinx enrollment than the average White student (thus greater racial segregation). A value of zero indicates racial parity in enrollment across districts within a state.

The second measure of segregation captures Black-White and Latinx-White socioeconomic segregation. We measure racial SES segregation in a similar manner to the racial segregation measures, except we compute the difference in child poverty in the typical Black/Latinx student's districts relative to the typical White student's district. Poverty is measured using SAIPE. SAIPE provides annual estimates of income and child poverty for those residing in all school districts, counties, and states in the U.S. These estimates are used for the administration of federal programming and funding to localities (United States Census Bureau n.d.). Since SAIPE is a measure of child poverty for those living in the district boundaries as opposed to the poverty rate for children actually attending schools in the district, it can be considered a measure of neighborhood child poverty context. Positive values mean that the average Black or Latinx student is in a district with a higher rate of neighborhood child poverty than the average White student. A value of zero indicates parity (i.e., the typical Black/Latinx and White student's district has the same rate of neighborhood child poverty), and a negative value indicates that the average White student is in a district with a higher neighborhood child poverty rate.

Our control variables include time-varying observables that may confound the relationship between racial segregation and racial socioeconomic segregation and racial disparities in revenue. The first is other-group racial segregation (i.e., Black-White differences in

Latinx enrollment and Latinx-White differences in Black enrollment). We include other-group racial segregation as a control because Black-White or Latinx-White racial segregation may be changing because of increased or decreased enrollment of other minorities. For example, we want to measure changes in Black-White racial segregation due to changes in Black and White student enrollment, but not the presence of Latinx students. Second, to address differences in operating costs based on district size, we account for racial disparities in the number of schools per every 1,000 students in a district. Districts with more schools per students likely have higher average operation and maintenance costs. Next, we control for racial disparities in English language learner (ELL) enrollment because of federal and state funding formula weights for English language learners. We also control for racial disparities in special education enrollment to account for higher expenses associated with providing services for students with disabilities. To account for differences in revenue due to geographic concentrations, but not addressed with our cost adjustment, we control for racial disparities in urbanicity (see Appendix Table A3 for details on the construction of our measure of urbanicity). Lastly, we control for average racial composition and neighborhood child poverty within states. By including these state level variables as controls, we account for the potential impact of overall changes in student demographics.

Analysis

In this descriptive analysis, we examine the contemporaneous association between segregation and racial disparities in school district revenue (i.e., dollar differences and ratios). We regress racial disparities in total, federal, state, and local revenue on racial segregation, racial SES segregation, and our control variables. A general specification is as follows:

$Racial\ Revenue\ Disparity_{sy}^{rg} =$

$$\beta_0 + \beta_1 Racial\ Segregation_{sy}^g + \beta_2 Racial\ SES\ Segregation_{sy}^g$$
$$+ \beta_3 Other\ Group\ Racial\ Segregation_{sy}^g$$
$$+ \beta_4 Racial\ Diff\ Number\ of\ Schools_{sy}^g + \beta_5 Racial\ Diff\ Special\ Ed_{sy}^g$$
$$+ \beta_6 Racial\ Diff\ ELL_{sy}^g + \beta_7 Racial\ Diff\ Urbanicity_{sy}^g$$
$$+ \beta_8 X_{sy} + \Gamma_s + \Delta_y + \varepsilon_{sy} \qquad (5)$$

Our stylized model represents changes in racial revenue disparities in a state and year

($Racial\ Revenue\ Disparity_{sy}^{rg}$) as a function of racial segregation ($Racial\ Segregation_{sy}^g$),

racial SES segregation ($Racial\ SES\ Segregation_{sy}^g$), other-group racial segregation

($Other\ Group\ Racial\ Segregation_{sy}^g$), racial differences in the number of schools

($Racial\ Diff\ Number\ of\ Schools_{sy}^g$), special education enrollment

($Racial\ Diff\ Special\ Ed_{sy}^g$), ELL enrollment ($Racial\ Diff\ ELL_{sy}^g$), urbanicity

($Racial\ Diff\ Urbanicity_{sy}^g$), demographic characteristics of states (X_{sy}), state fixed effects (Γ_s),

year fixed effects (Δ_y), and a state-by-year specific error term (ε_{sy}).

There is concern that racial revenue disparities may vary across states or time in ways

that are confounded with segregation levels. Adding state fixed effects to our model allows us to

remove stable differences between states that may confound results. Another concern might be

that segregation is changing over time as states are simultaneously adopting more equitable

funding patterns (e.g., court ordered school finance reforms). Adding year fixed effects helps

address this possible source of confoundedness between states. The result is a regression of racial

disparities in revenue on racial segregation and racial socioeconomic segregation which account

for between-state differences as well as secular trends.

We run this model for the total revenue disparity and each revenue subcategory as an

outcome (i.e., federal revenue, state revenue, and local revenue disparities). Running these four

versions of the model allows us to decompose the regressions to determine the relative contribution of each subcategory of revenue as well as allow for the coefficients to have different signs for each revenue subcategory.[iv] The coefficients on the racial segregation variables can be interpreted as the change in the Black-White or Latinx-White revenue disparities associated with increases in racial segregation. The coefficients on the racial socioeconomic segregation variables can be interpreted as the change in the Black-White or Latinx-White revenue disparities associated with increases in racial socioeconomic segregation.

RESULTS

Levels and Trends in Segregation and Revenue Disparities

Figure 1 depicts the change in Black-White and Latinx-White racial segregation levels between the first and last year of our panel. The horizontal axis shows racial segregation levels for each state in the first year it appears in the analytical sample (for most states, this is fiscal year 1999). The vertical axis shows the change in racial segregation by the end of our panel in 2013. Each point on the Black-White segregation graph is weighted by the size of the Black student population in 2013, while each point on the Latinx-White segregation graph is weighted by the size of the Latinx student population in the same year (smaller points correspond to smaller Black or Latinx populations). Several patterns emerge from these figures. First, in most states, Black-White racial segregation was decreased over our sample years. Second, only a small number of states with small Black student populations had increases in Black-White segregation. Third, Latinx-White segregation, in contrast, tends to be smaller in magnitude than Black-White segregation, and increasing slightly in more states during this time. However, the states with the largest Latinx populations (which also tended to have the highest levels of racial

segregation in the first year of the panel) are the states that tended to experience a decline in Latinx-White racial segregation in the sample years. The primary takeaway from this figure is that over the period of our sample, Black-White racial segregation decreased, whereas Latinx-White segregation was mostly stagnant or only changed slightly.

Figure 2 displays trends in Black-White and Latinx-White socioeconomic segregation over our sample period. This figure can be interpretted in the same way as Figure 1. In most states in 1999, Black and Latinx students are concentrated in districts with higher poverty levels than their White peers. This is evident in the scarcity of points that are to the left of the zero for racial socioeconomic segregation in the first year of the panel. In addition, unlike between district racial segregation which has been declining or stagnant for most states during our sample period, there are many states, some with large Black and Latinx student populations, that have experienced small increases in socioeconomic segregation over this time period. Overall, there is no clear trend, and greater variation in the change in racial socieconomic segregation in our sample years.

Figure 3 shows levels of total revenue by revenue source in the typical Black and White students' districts for each state in the 2013 fiscal year. States are sorted by total revenue in the typical White student's districts. From this figure, we see that there is variation in the proportion of state and local revenue across states. We also see that some of the highest spending states, such as Connecticut, New York, and New Jersey have sizeable racial gaps in local revenue. In New York, it appears that state and federal sources do not fully make up for that gap, leaving the typical Black student's district with slightly less total revenue than the typical White student's district. Whereas in New Jersey, federal and state revenue make up for local revenue shortfalls, leaving the average Black student's district with slightly more total revenue than the average

White student's district. Similar patterns are evident for revenue in the typical Latinx and White students' districts (Figure 4).

Across all states and years in the sample, the average Black and Latinx student's district has less local revenue and more state and federal revenue than the average White student's district. These patterns are to be expected if Black and Latinx students tend to be enrolled in districts with higher rates of poverty, lower local capacity for school funding, and greater need for compensatory funding from state and federal funding sources. Furthermore, Black and Latinx students tend to be in districts with greater proportions of free lunch eligible students and higher rates of neighborhood child poverty, and more Black and Latinx students, relative to White students. Table 1 details these unadjusted trends.

To examine typical trends across years within a state, we regress our outcomes and key predictor variables on fiscal year in separate regressions for each state. The slope of the fiscal year variable gives an indication for how each variable has changed across the years in our sample for each state. We then computed the mean of this slope across all states in our sample. Table 2 presents the mean and other descriptive statistics for the trends in outcome variables and key predictors. For example, the mean of the trend in Black-White total revenue dollar differences is $16.16, meaning that, on average, across states, the Black-White difference in total revenue has been growing by $16.16 each year. In contrast, the Black-White difference in local revenue has been getting smaller, on average, shrinking $11.62 each year.

Segregation and Revenue Disparities

Figure 5 shows the bivariate correlation between racial segregation and socioecnomic segregation net of state and year fixed effects. Once accounting for stable differences between

states and years, Black-White racial segregation is positively, but weakly correlated with Black-White socioeconomic segregation. A similar relationship exists between Latinx-White racial segregation and Latinx-White socioeconomic segregation. These findings provide assurance that our coefficients will not be unstable due to collinearity between racial and socioeconomic segregation.

Black-White revenue disparities

Table 3 presents results from our main models regressing racial revenue disparities on racial segregation, racial socioeconomic segregation, and other controls. In Panel 1, the outcome is Black-White dollar differences. In Panel 2, the outcome is Black-White revenue ratios. In both sets of models, we regress our measures of Black-White revenue disparities (dollar differences or revenue ratios) on Black-White racial segregation, Black-White socioeconomic segregation, Black-White other group racial segregation, Black-White differences (i.e., number of schools, special education enrollment, ELL enrollment, and urbanicity), state-level student demographics, state invariant differences, and time-invariant differences. Recall that negative coefficients indicate that revenue is shifting away from the average Black student's district (and thus shifting towards the average White student's district) while positive coefficients mean that revenue is shifting towards the average White student's district (and therefore away from the average Black student's district). If the average Black student's district starts out with more per pupil revenue than the average White student's district and there is a relative shift away from the average Black student's district, this could be seen as a reduction in the Black-White funding disparity that favors the average White student's district. However, if the average Black student's district starts out with less or equal amounts of per pupil revenue as compared to the average White student's district, a relative shift away from the average Black student's district could be seen as an

increase in the Black-White funding disparity that disfavors the average Black student's district. While our analyses cannot distinguish between these nuances, examining whether revenue shifts in any direction in the context of increasing segregation still has important policy implications.

Black-White racial segregation is a significant predictor of Black-White total, federal, and local dollar differences even after controlling for Black-White socioeconomic segregation. As Black-White racial segregation increases, the Black-White total, federal, and local dollar difference decreases in a way that shifts funding away from the average Black student's district relative to the average White student's district. More specifically, a one-unit increase in Black-White racial segregation is associated with a $6,473.03 decrease in total per pupil revenue, a $1,250.27 decrease in federal per pupil revenue, and a $4,983.62 decrease in local per pupil revenue (for every $10,000 of total revenue) in the typical Black student's district relative to the typical White student's district.

Since a one-unit change in segregation, or going from no segregation to complete segregation, is large in magnitude and unlikely in practice, our results can be contextualized by thinking of segregation in smaller units of change. For example, we consider the difference between states with the smallest changes in segregation over time and states with the largest changes in segregation over time. Returning to Table 2, the 25th percentile of state trends in Black-White racial segregation is roughly -0.005 while the 75th percentile is about 0. Thus, moving from the 25th to 75th percentiles in Black-White racial segregation trends would therefore represent an increase in Black-White racial segregation of roughly 0.005 every year, or 0.07 over 14 years, the number of year-to-year changes in our panel. Therefore, the typical Black student's district in a state that shifted from the 25th to 75th percentiles of the trend in Black-White racial segregation would experience a $453.11 relative decrease (i.e., -$6,473.03 X 0.07) in total per

pupil revenue, a $87.52 relative decrease in federal per pupil revenue, and a $348.85 relative decrease in per pupil local revenue for every $10,000 of average total per pupil revenue. The magnitude of these changes represents about four, one, and three percent of a state's average total revenue in 2006, respectively.

Not only did Black-White dollar differences in total and local revenue grow with racial segregation, but Blacks also appear to be losing relative ground for total and local revenue. As with standardized dollar differences, increases in Black-White racial segregation are significantly and negatively associated with Black-White total and local revenue ratios (Panel 2). In contrast, unlike the standardized dollar difference models, Black-White racial segregation is positively associated with the Black-White federal revenue ratio. The typical Black student's district in a state that shifted from the 25th to 75th percentiles of the trend in Black-White racial segregation would experience a 0.13 relative increase (i.e., 1.788 X 0.07) in the Black-White per pupil federal revenue ratio. The magnitude of this change is roughly nine percent of the average Black-White federal revenue ratio (see Table 1). This suggests that while the average Black student's district receives fewer federal dollars relative to the average White student's district in the presence of increasing levels of Black-White racial segregation, federal revenue is directed in a way in which the typical Black students' district is gaining relative ground. This could happen if, for example, Black and White districts started off unequal and experienced declines in funding, but at differing rates.

In contrast to the findings for Black-White racial segregation, Black-White socioeconomic segregation is only a significant predictor of the Black-White federal revenue ratio. More specifically, an increase in Black-White SES segregation is negatively associated with the Black-White federal revenue ratio. A 0.04 unit increase in Black-White SES segregation

(see Table 2 and previous calculations) is associated with a 0.9 decrease in the federal revenue ratio. These findings are contrary to our predictions that Black-White local revenue disparities would decrease (i.e., shift money away from the average Black student's district) and Black-White total, federal, and state revenue disparities would increase (i.e., shift money towards the average Black student's district) as Black-White socioeconomic segregation increased.

Latinx-White revenue disparities

Panels 3 and 4 of Table 3 present results from our models regressing Latinx-White revenue disparities on Latinx-White racial segregation, Latinx-White socioeconomic segregation, Latinx-White other group racial segregation, Latinx-White differences (i.e., number of schools, special education enrollment, ELL enrollment, and urbanicity), state-level student demographics, state invariant differences, and time-invariant differences. In Panel 3, the outcomes are Latinx-White dollar differences in revenue. In Panel 4, the outcomes are Latinx-White revenue ratios.

Contrary to our findings for Black-White revenue disparities, there is no significant relationship between Latinx-White racial segregation and Latinx-White dollar differences. The findings presented in Panel 4 of Table 3 suggest that, despite a lack of significant relationships for dollar differences, there is evidence that Latinx-White racial segregation is related to the type of inequality captured by revenue ratios. An increase in Latinx-White racial segregation is associated with a decrease in the Latinx-White local revenue ratio. Returning to Table 2, the 25th percentile of state trends in Latinx-White racial segregation is roughly zero while the 75th percentile is about 0.003. Thus, moving from the 25th to 75th percentiles in Latinx-White racial segregation trends would therefore represent an increase in Latinx-White racial segregation of roughly 0.003 every year, or 0.04 over 14 years. For a 0.04 unit increase in Latinx-White racial segregation, this would mean a 0.01 decrease (i.e., 0.247 X 0.04) in the Latinx-White local

revenue ratio. The magnitude of this change is approximately one percent of the average Latinx-White local revenue ratio (see Table 1), a small effect.

Similar to Black-White socioeconomic segregation, Latinx-White socioeconomic segregation is not a strong predictor of Latinx-White revenue disparities. Latinx-White socioeconomic segregation is only associated with the Latinx-White local revenue ratio. A 0.05 (see Table 2 and previous calculations) unit increase in Latinx-White SES segregation would be associated with a 0.05 decrease in the local revenue ratio. The magnitude of this change is about five percent of the average Latinx-White local revenue ratio (see Table 1).

There are several marginal associations that are worth noting. Latinx-White racial segregation is marginally and positively related to the Latinx-White state dollar difference and state revenue ratio. There is a marginal and negative association between Latinx-White socioeconomic segregation and the Latinx-White total revenue ratio. While we cannot rule out null effects at conventional levels, these findings are suggestive of a relationship between Latinx-White segregation and Latinx-White revenue disparities.

Alternative Measure of Poverty

While our primary measure of poverty, SAIPE, is used for the allocation of federal, state, and local revenue to school districts, alternative measures of poverty such as free and reduced-price lunch (FRPL) eligibility are also used to target federal and state resources and other interventions to "high need" schools (Domina et al. 2018). Therefore, we run models with racial differences in free lunch (FL) eligibility enrollment as the measure of poverty for our racial socioeconomic segregation variables to see if our findings vary with a different conceptualization of socioeconomic disadvantage.

The results using FL eligibility as the measure of poverty depict a different pattern (see Table 4). In models for which racial socioeconomic segregation is constructed using the enrollment of FL eligible students, racial segregation matters less and racial socioeconomic segregation matters more. Black-White racial segregation is only marginally associated with the Black-White total revenue ratio and total, federal, and local dollar differences (unlike the models using SAIPE as the measure of poverty). While most of the coefficients remain negative, they are smaller in magnitude. Black-White racial segregation continues to be significantly and positively associated with the Black-White federal revenue ratio and negatively associated with the Black-White local revenue ratio. The magnitude of the associations also remains the same. Black-White socioeconomic segregation using FL eligibility as the measure of poverty has more of an association with Black-White revenue disparities than neighborhood child poverty. For example, Black-White socioeconomic segregation is negatively associated with Black-White total and local dollar differences and the Black-White total revenue ratio. The coefficients for these associations are substantially larger in size.

Latinx-White socioeconomic segregation using FL eligibility is also a stronger predictor of Latinx-White revenue disparities than socioeconomic segregation measured using neighborhood child poverty. More specifically, Latinx-White socioeconomic segregation is negatively associated with Latinx-White total and local dollar differences and total and state revenue ratios. The magnitude of these coefficients varies across models with different configurations of poverty. There is a marginal and positive association between Latinx-White socioeconomic segregation and the Latinx-White federal dollar difference and a marginal and negative association between Latinx-White socioeconomic segregation and the Latinx-White local revenue ratio. Latinx-White racial segregation remains negatively associated with the

Latinx-White local revenue ratio and is marginally and positively associated with the Latinx-White state dollar difference and the state revenue ratio.

DISCUSSION

Using longitudinal data for the population of school districts in the United States, we estimate the contemporaneous association between several measures of racial and socioeconomic segregation and multiple forms of racial disparities in school district revenue. We construct standardized dollar differences and revenue ratios that capture the funding disparity in average per pupil total, federal, state, and local revenue between the typical Black/Latinx student's school district and the typical White student's school district.

We expected to find that Black-White and Latinx-White socioeconomic segregation (measured using neighborhood child poverty) would be related to revenue disparities because of federal and state funding allocations that are linked to school district poverty rates and because of the relationship between poverty and local property tax revenue. Yet, there are no significant relationships for Black-White or Latinx-White socioeconomic segregation and standardized dollar differences in revenue of any kind. However, Black/Latinx to White revenue ratios, yields significant findings. Black-White socioeconomic segregation is negatively associated with the Black-White federal revenue ratio and Latinx-White socioeconomic segregation is negatively associated with the Latinx-White local revenue ratio. The significant results for revenue ratios, but not dollar differences suggest that total revenue/local revenue disparities between the typical Black/Latinx student's district and the typical White student's district may have started from a place of inequality, but over our sample period, these districts are likely experiencing similar dollar increases in revenue as segregation changes, thus sustaining baseline inequality.

Furthermore, the negative association between Black-White socioeconomic segregation and the Black-White federal revenue ratio suggests that federal revenue is not compensatory enough for increasingly segregated Black school districts with greater rates of neighborhood child poverty.

We also predicted that Black-White and Latinx-White racial segregation might be related to racial disparities in revenue after controlling for Black-White and Latinx-White socioeconomic segregation because of a link between race and willingness to fund public education. Furthermore, we expected this relationship to be strongest at the local level. This prediction partially held. As Black-White racial segregation increases, total and local revenue decreases in the average Black student's district relative to the average White student's district (i.e., Black-White total and local dollar differences). These findings also persist in models with Black-White revenue ratios as the outcome. The significant and negative association between Black-White racial segregation and Black-White total and local revenue ratios/standardized dollar differences suggests that in the context of increasing Black-White racial segregation, funding inequality between Blacks and Whites is widening. In addition, Black-White racial segregation is positively associated with the Black-White federal revenue ratio, but negatively associated with the federal dollar difference. This suggests that Black and White districts started off unequal and experienced disproportionate changes over time. Latinx-White racial segregation is negatively associated with the Latinx-White local revenue ratio. Again, the significant results for revenue ratios, but not dollar differences suggest that funding disparities between the typical Black/Latinx student's district and the typical White student's district may have started from a place of inequality, but Black/Latinx and White districts likely receive similar dollar increases in revenue as segregation changes over the sample period, thus sustaining baseline disparities.

Taken together, there are several primary conclusions that can be drawn from our findings. First, purportedly race neutral state and federal funding formulas and local funding policies may not be completely race neutral after all and could be reproducing social inequality. At the local level, Black-White racial segregation is related to funding even after accounting for racial disparities in neighborhood child poverty contexts. This pattern might be a result of funding structures such as caps on property tax rates, a reliance on property values, variation in school district fiscal independence between and within states, and private donations to school districts that could be correlated with race in ways above and beyond poverty. For example, while poverty is negatively correlated with property wealth (Baker and Corcoran 2012), for reasons of historical and continuing discrimination, race and property wealth likely remained linked even after accounting for poverty. Historical discrimination in financing and home sales limited Black access to property ownership and higher income neighborhoods (Rothstein 2017). Racial segregation for both Black and Latinx residents is associated with depressed appreciation of home values (Flippen 2004). More recent evidence suggests that racial stereotypes continue to play a role in assessing the value of homes (Korver-Glenn 2018). Therefore, property wealth and, as a result, local capacity for school funding, may be related to race above and beyond a relationship with poverty. The relationship between Black-White segregation and local funding is also consistent with a direct relationship between race and the local willingness to fund public education. As segregation increases, Whites may be less willing to increase local funding or support redistributive funding structures because the perceived beneficiaries are Black students. White families might instead opt for private resources targeted toward their own children to satisfy their taste for education. While we cannot adjudicate between these mechanisms, the

evidence presented here does suggest that the relationship between racial segregation and local

funding cannot be entirely explained by racial disparities in neighborhood child poverty contexts.

Second, federal and state funding formulas that are designed to be compensatory amidst

concentrated poverty, may not be compensatory enough. At the state level, this could result from

the design of funding programs. Features such as hold harmless or minimum aid provisions,

additional aid not adjusted for property tax capacity, discretionary grants, using average daily

attendance for student counts, flat grants, and property tax relief for higher income districts can

all result in regressive, or at least not progressive, funding systems (Baker and Corcoran 2012).

For example, aid outside states' main equalization formulas that does not adjust for variation in

local capacity can end up directing funds towards districts that already have the capacity to raise

enough funds locally (Baker and Corcoran 2012). If the purpose of state aid is to assist districts

struggling to raise money locally and to provide additional funding for the educational services

in disadvantaged contexts, these results suggest that states, on average, are falling short.

Lastly, the results vary based on the measure of poverty used. There are several possible

interpretations of this different pattern of results. It may be the case that FL better captures

school and district disadvantage while SAIPE best captures neighborhood disadvantage. This

suggests that racial differences in neighborhood disadvantage are less related to funding

disparities than racial differences in school district disadvantage. This is somewhat surprising

since property wealth and the taxes derived from it are a characteristic of the neighborhood, not

the students attending schools within the district. On the other hand, funding formulas often

make use of student enrollments and school district demographic characteristics to determine

funding levels. Yet the negative relationships between Black-White and Latinx-White FL

eligibility disparities and local and total funding disparities support the same general relationship

implied by the SAIPE results: federal and state funding appears to not be compensatory enough to make up for local revenue shortfalls.

An alternative interpretation of these differences in results is that FL is a poor measure of family resources. Recent work by Domina and colleagues (2018) examined FRPL designations and annual household income from the IRS as predictors of student test scores. The authors found that FRPL inadequately and inconsistently captured student's socioeconomic status, but was more strongly correlated with student test scores than annual household income. The authors further suggest that FRPL captures "important aspects of educational disadvantage. However, the nature of the disadvantage that FRPL captures is amorphous and may not be a simple function of family resources" (p. 12). The findings in our study call into question the aspects of socioeconomic disadvantage that SAIPE and FL may be capturing and raise concerns about the inconsistency and variation in the measure of poverty used in school funding decisions.

Overall, the findings of our study have important implications for education policy and research. Racial differences in revenue that change with increasing segregation are concerning given evidence of a causal relationship between school funding and academic achievement. Along with evidence that segregation is related to student outcomes, this suggest that school funding policies may be exacerbating racial inequality in education. Our descriptive findings warrant further inspection into school funding formulas and education finance policies, particularly at the local level, to be sure that poverty and not race is a factor in school finance decisions. Furthermore, because we find that increases in Black-White racial segregation (net of Black-White socioeconomic segregation) are negatively associated with the Black-White total revenue dollar difference and ratio, this may have implications for racial inequality in school spending. More specifically, if the average Black student's district receives less total revenue

relative to the average White student's district in the context of increasing segregation, total expenditures in the average Black student's district should also decrease relative to the average White student's district because districts can only expend what they have at their disposal. If the average Black student's district relative to the average White student's district is receiving less total revenue and thus spending less overall, how do districts prioritize what categories of spending to cut and what spending categories to preserve? Therefore, future research should examine the relationship between segregation and racial disparities in subcategories of per pupil expenditures as this could be another source of educational inequality.

NOTES

[i] While Brown v. Board of Education of Topeka (1954) increased access to school resources that ultimately improved educational outcomes for Black students, we would be remiss not to acknowledge the negative consequences of Brown such as the displacement of Black teachers that could arguably be related to educational inequality today.

[ii] Fiscal year is the spring of the school year.

[iii] Roughly 90% of district-year observations for charter districts are missing revenue and expenditure data.

[iv] Note that in a limited number of cases, federal, state, and local revenue do not sum exactly to the total revenue reported, though all values are within 0.1 % of the total revenue reported.

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TABLES AND FIGURES

Table 1. Levels of Outcome Variables, Predictors, and Controls (Unadjusted Trends)

	Levels of Black-White Disparities				Levels of Latinx-White Enrollment			
	mean	sd	min	max	mean	sd	min	max
Total Revenue Dollar Difference	195.905	739.578	-1175.380	2331.271	110.294	537.754	-1636.489	1503.899
Federal Revenue Dollar Difference	274.403	249.150	-89.275	981.435	194.740	203.298	-214.430	696.023
State Revenue Dollar Difference	232.346	896.073	-1049.006	4123.647	205.254	871.220	-920.877	3409.726
Local Revenue Dollar Difference	-310.843	774.599	-2519.674	1245.764	-289.700	831.115	-2688.810	1349.172
Total Revenue Ratio	1.021	0.076	0.892	1.238	1.012	0.055	0.843	1.170
Federal Revenue Ratio	1.467	0.511	0.913	2.925	1.340	0.422	0.834	2.808
State Revenue Ratio	1.081	0.284	0.820	2.513	1.074	0.277	0.763	2.251
Local Revenue Ratio	0.952	0.158	0.619	1.442	0.957	0.161	0.559	1.328
Free Lunch	0.142	0.115	-0.012	0.359	0.112	0.112	-0.059	0.403
SAIPE	0.054	0.049	-0.014	0.163	0.040	0.048	-0.044	0.186
White Enrollment	-0.251	0.169	-0.562	-0.011	-0.196	0.140	-0.530	-0.041
Latinx Enrollment	0.058	0.071	-0.020	0.278	0.121	0.104	0.008	0.364
Black Enrollment	0.185	0.152	0.005	0.540	0.069	0.069	-0.005	0.205
Special Education Enrollment	0.003	0.009	-0.012	0.029	0.000	0.009	-0.021	0.021
Schools Per 1,000 Students	-0.386	0.593	-2.728	0.248	-0.269	0.401	-1.953	0.574
ELL Enrollment	0.033	0.033	-0.014	0.117	0.056	0.039	0.006	0.150
City District	0.307	0.172	-0.138	0.593	0.182	0.166	-0.089	0.527
Suburban District	-0.075	0.125	-0.423	0.294	-0.050	0.129	-0.398	0.205
Rural District	-0.232	0.137	-0.493	0.034	-0.133	0.101	-0.349	0.081

Note: N = 49 states. Means are first calculated within states across all years and then calculated across all states. Revenue dollar differences are standardized by dividing per pupil differences by total revenue in each state in 2006 (the median year of data) and multiplying by 10,000. They can be interpreted as dollar disparities in per pupil revenue per $10,000 of average revenue in the state.

Table 2. Adjusted Trends in Outcome Variables and Predictors

	Trends in Black-White Disparities				Trends in Latinx-White Enrollment			
	mean	sd	p25	p75	mean	sd	p25	p75
Total Revenue Dollar Difference	16.159	53.929	-12.876	34.288	8.304	40.240	-14.677	25.504
Federal Revenue Dollar Difference	17.419	18.151	6.134	24.904	11.655	11.966	3.425	17.718
State Revenue Dollar Difference	10.288	42.416	-11.873	19.466	8.351	34.719	-10.872	23.006
Local Revenue Dollar Difference	-11.547	44.347	-26.779	11.756	-11.702	40.218	-36.840	19.345
Total Revenue Ratio	0.001	0.004	-0.001	0.003	0.000	0.004	-0.002	0.002
Federal Revenue Ratio	-0.003	0.020	-0.009	0.003	-0.004	0.017	-0.011	0.006
State Revenue Ratio	0.002	0.008	-0.001	0.004	0.001	0.007	-0.002	0.005
Local Revenue Ratio	0.001	0.007	-0.003	0.004	0.000	0.007	-0.003	0.004
Free Lunch	-0.001	0.003	-0.002	0.001	0.000	0.003	-0.002	0.002
SAIPE	0.001	0.001	-0.000	0.001	0.000	0.001	-0.000	0.001
White Enrollment	0.001	0.004	-0.001	0.004	0.000	0.004	-0.002	0.003
Latinx Enrollment	0.001	0.002	-0.000	0.002	0.001	0.003	0.000	0.003
Black Enrollment	-0.002	0.004	-0.005	0.000	-0.001	0.003	-0.002	0.001

Note: N = 49 states. Based in regressions of each variable on year in separate regression for each state. Descriptive statistics of these trends are calculated across all states

Table 3. Estimated Partial Associations between Segregation and Revenue Disparities (SAIPE)

	(1) Black-White Dollar Differences		(2) Black-White Revenue Ratios		(3) Latinx-White Dollar Differences		(4) Latinx-White Revenue Ratios	
	Racial Segregation	SES Segregation (SAIPE)	Racial Segregation	SES Segregation (SAIPE)	Racial Segregation	SES Segregation (SAIPE)	Racial Segregation	SES Segregation (SAIPE)
Total Rev.	-6473.032***	-56.471	-0.482***	-0.137	240.269	-2821.643	0.047	-0.331
	[1538.593]	[3121.901]	[0.132]	[0.246]	[668.643]	[1708.594]	[0.064]	[0.178]
Federal Rev.	-1250.269*	1045.41	1.788**	-2.155**	222.351	682.768	0.230	0.311
	[604.234]	[665.309]	[0.539]	[0.627]	[325.214]	[581.389]	[0.536]	[0.846]
State Rev.	-239.148	1294.495	0.147	-0.216	1180.086	7.928	0.320	-0.058
	[1567.598]	[2320.477]	[0.339]	[0.451]	[659.136]	[2139.855]	[0.163]	[0.432]
Local Rev.	-4983.615**	-2396.376	-1.059***	-0.4	-1162.169	-3512.339	-0.247*	-1.005*
	[1450.724]	[1755.106]	[0.268]	[0.291]	[789.133]	[2446.400]	[0.097]	[0.393]
Controls	X	X	X	X	X	X	X	X
State FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
N	641	641	641	641	641	641	641	641

Note. Based on regressions of Black-White total, federal, state, and local revenue dollar differences on Black-White racial segregation and Black-White SES segregation. Standard errors in brackets. Constant not displayed. Controls not displayed include Black-White other group racial segregation, Black-White disparities in district size, special education enrollment, ELL/LEP enrollment, and urbanicity; as well as the state proportions SAIPE, Asian, Black, Latinx, and Native American.
*$p < .05$,** $p < .01$,*** $p < .001$

Table 4. Estimated Partial Associations between Segregation and Revenue Disparities (Free Lunch)

	(1) Black-White Dollar Differences		(2) Black-White Revenue Ratios		(3) Latinx-White Dollar Differences		(4) Latinx-White Revenue Ratios	
	Racial Segregation	SES Segregation (Free Lunch)	Racial Segregation	SES Segregation (Free Lunch)	Racial Segregation	SES Segregation (Free Lunch)	Racial Segregation	SES Segregation (Free Lunch)
Total Rev.	-3894.762	-4403.850*	-0.302	-0.318*	404.338	-2598.402*	0.064	-0.281*
	[1956.888]	[2022.863]	[0.161]	[0.145]	[695.240]	[1173.169]	[0.062]	[0.108]
Federal Rev.	-1060.161	-246.897	1.842*	-0.253	190.249	548.521	0.222	0.189
	[622.415]	[338.367]	[0.861]	[0.998]	[290.433]	[311.219]	[0.572]	[0.693]
State Rev.	151.892	-571.308	0.33	-0.33	1226.066	-483.096	0.367	-0.519*
	[2065.074]	[1682.065]	[0.405]	[0.232]	[684.338]	[1017.242]	[0.190]	[0.237]
Local Rev.	-2986.493	-3585.645**	-0.956**	-0.206	-1011.977	-2663.828*	-0.245*	-0.326
	[1612.994]	[1077.701]	[0.281]	[0.155]	[677.548]	[1143.434]	[0.100]	[0.190]
Controls	X	X	X	X	X	X	X	X
State FE	X	X	X	X	X	X	X	X
Year FE	X	X	X	X	X	X	X	X
N	641	641	641	641	641	641	641	641

Note. Based on regressions of Black-White total, federal, state, and local revenue dollar differences on Black-White racial segregation and Black-White SES segregation. Standard errors in brackets. Constant not displayed. Controls not displayed include Black-White other group racial segregation, Black-White disparities in district size, special education enrollment, ELL/LEP enrollment, and urbanicity; as well as the state proportions SAIPE, Asian, Black, Latinx, and Native American. *p < .05,** p < .01,*** p < .001

Figure 1. Changes in Racial Segregation between First and Last Fiscal Years in Analytical Sample
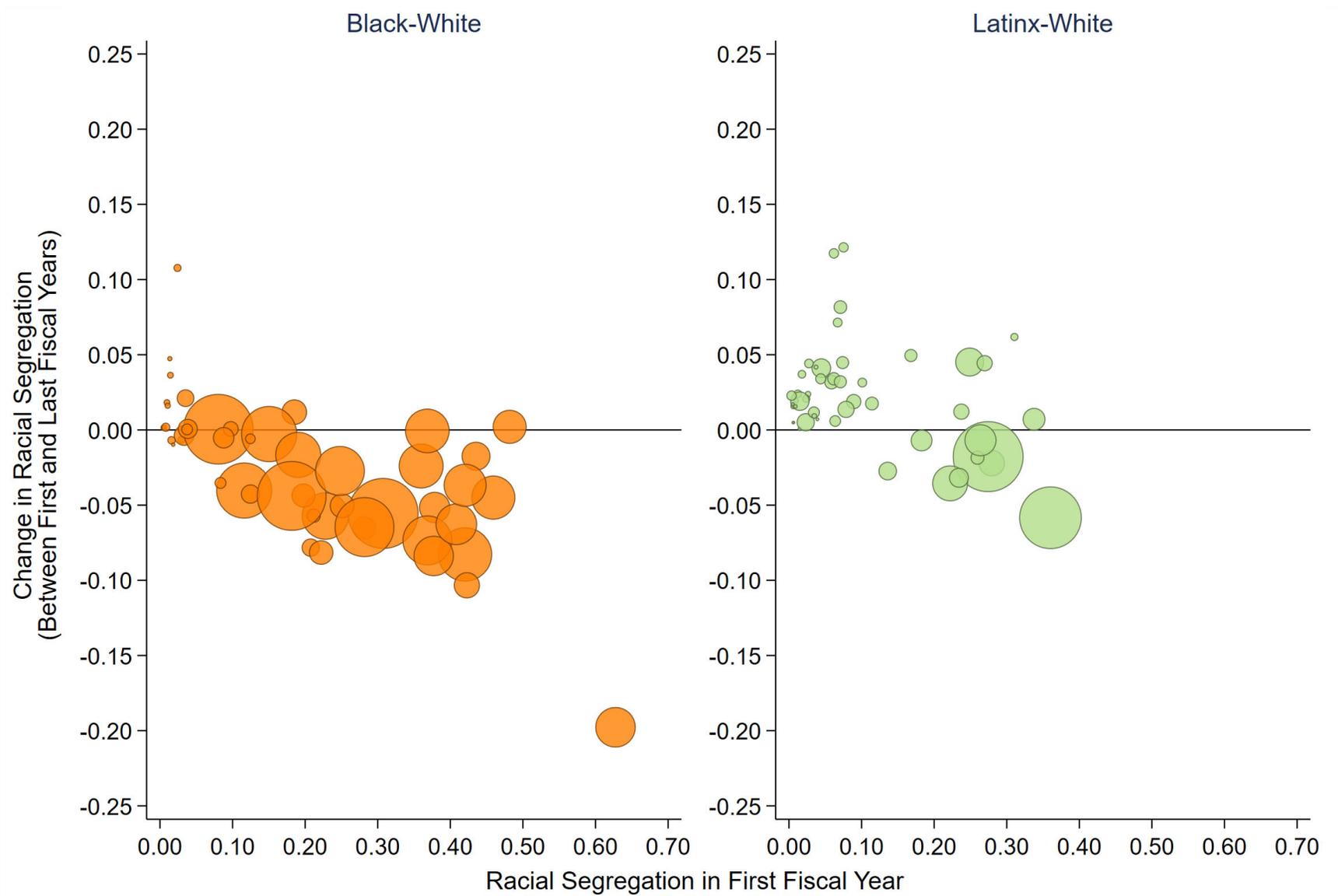
Figure 2. Changes in Racial Socioeconomic Segregation between First and Last Fiscal Years in Analytical Sample
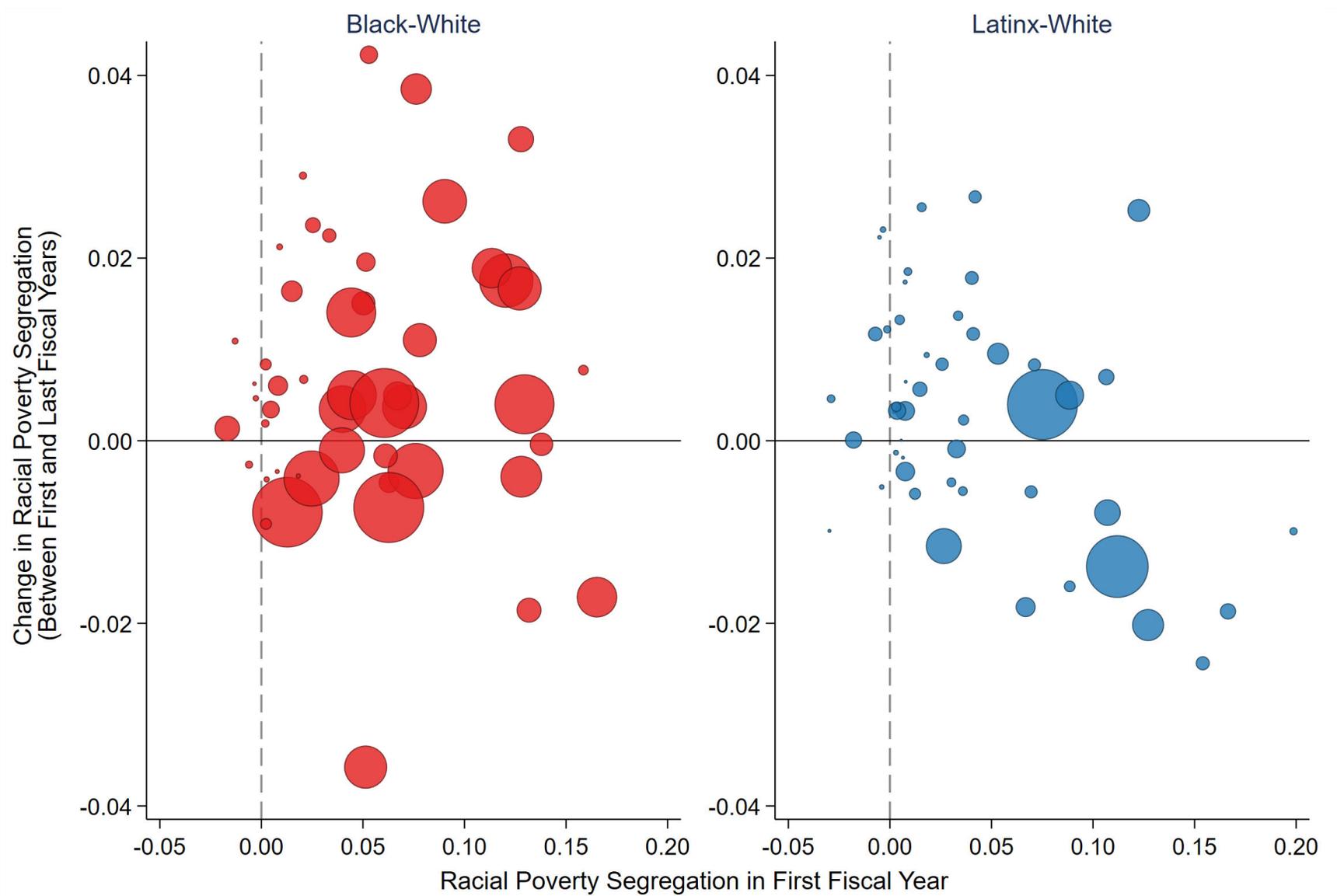
Figure 3. Black and White Levels of Total Revenue, by Revenue Source
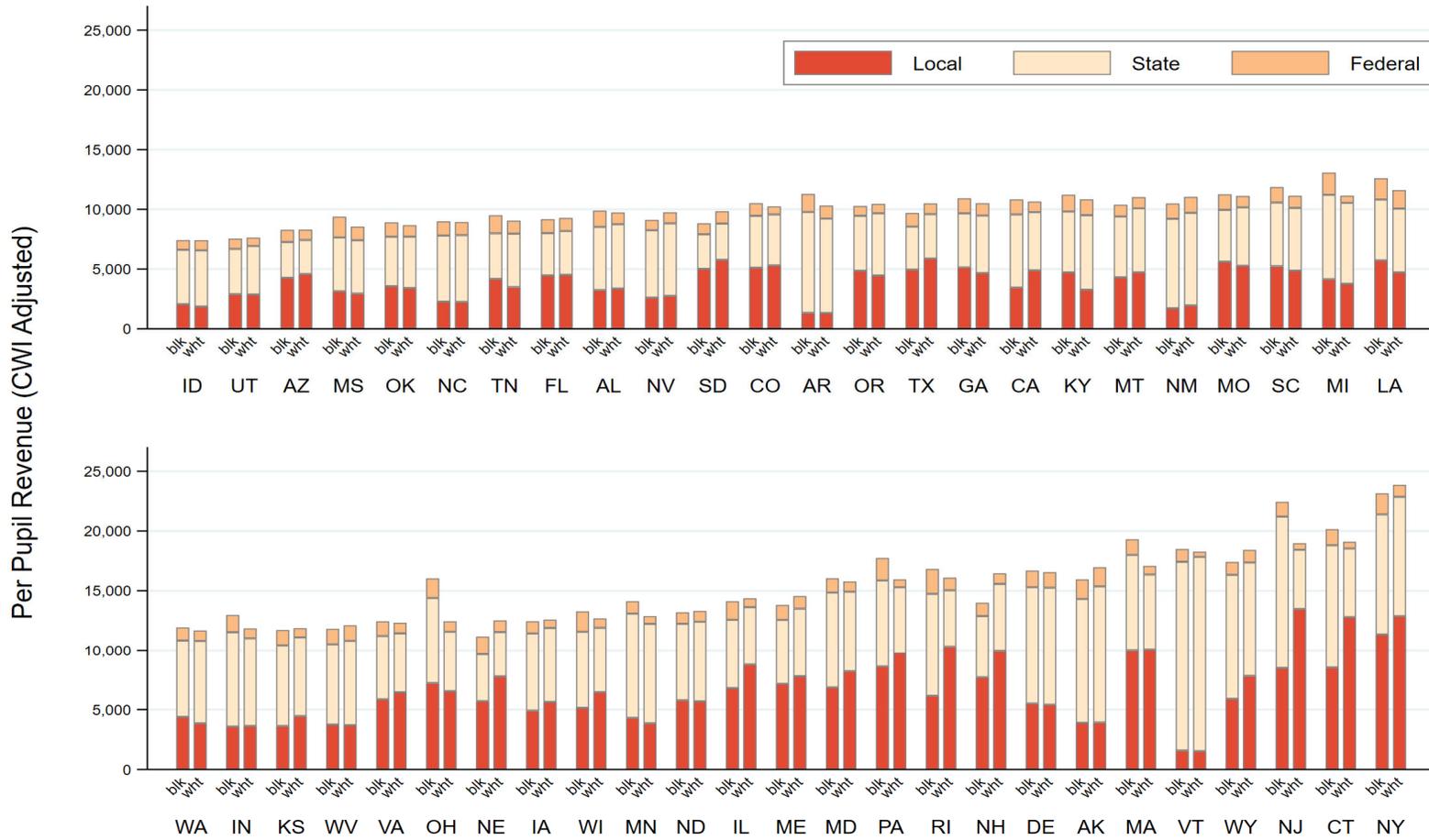
Note: States sorted by total revenue in the typical White student's district in a state in the 2013 fiscal year.

Figure 4. Latinx and White Levels of Total Revenue, by Revenue Source
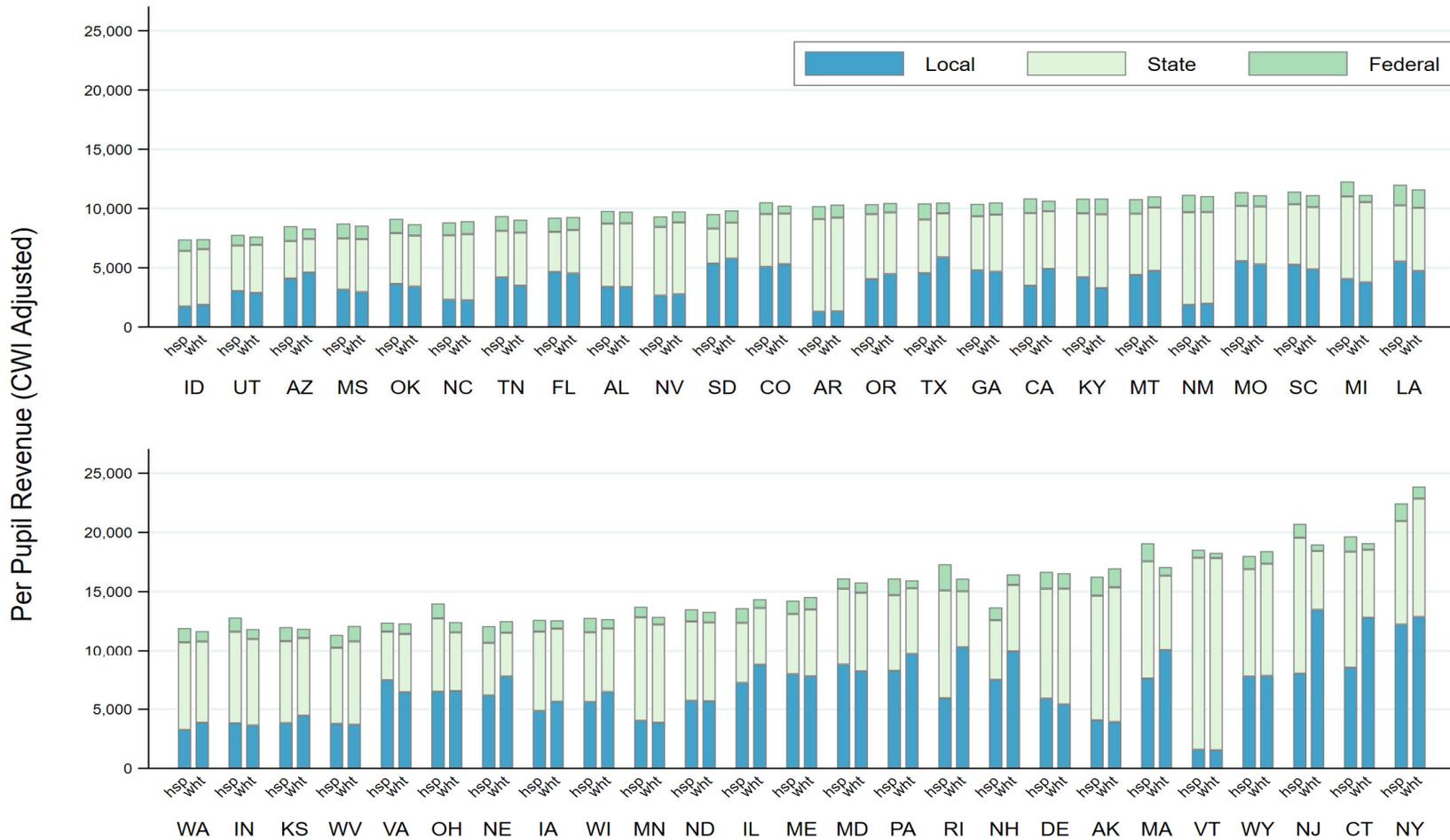
Note: States sorted by total revenue in the typical White student's district in a state in the 2013 fiscal year.

Figure 5. Correlation between Racial and Socioeconomic Segregation, Net of State and Year Fixed Effects
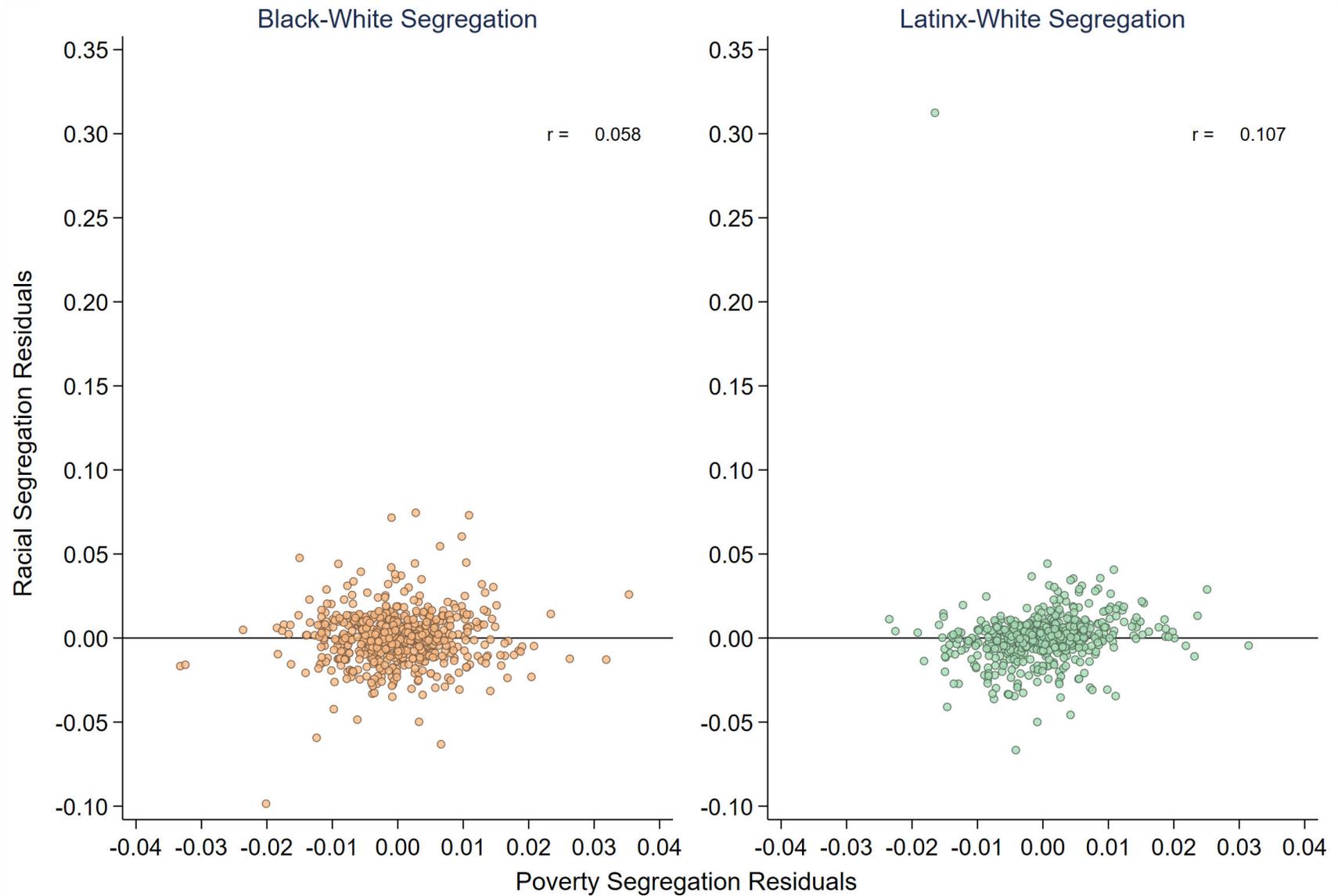
APPENDIX TABLES

Table A1. Districts Dropped in the Analytical Sample Restriction

Total observations between 1999 and 2013	*268,498*
Total BIE, DOD, territories, DC, and Hawaii districts dropped	2,069
Total non-operational districts dropped	3,830
Total vocational/special education districts	7,288
Total federal, regional, or other ESAs dropped	18,772
Total juvenile justice districts dropped	35
Total charter districts dropped	25,661
Total high/low total per pupil expenditures outliers dropped	3,239
Total missing expenditure or per pupil expenditures dropped	6,314
Total with no 5-17 year olds according to SAIPE dropped	33
Total districts dropped	*67,241*
Total districts in analytical sample	*201,257*

*Note.* Indicators for BIE, DOD, territories, DC, Hawaii, non-operational, vocational, special education, ESAs, juvenile justice, and charter districts come from the SFFDS. Additional districts were identified using string searches of district names. String searches included: (1) voc sch, voc sys, voc-tech, voc/tech/ jvsd, vocationa, boces, vocatio for vocational districts; (2) deaf, blind, handicap for special education districts; (3) (non-op) and (non op) for non-operational districts; (4) charter for charter districts; and (5) juvenile and correction for juvenile justice districts. If districts are ever observed as vocational, special education, ESAs, juvenile justices, or not in a state, they are dropped from the analysis in all years. Charter and non-operational districts are dropped in just the year that they are identified as such.

Table A2. State-Year Observations Excluded from the Primary Models Due to Missing Values on Key Controls

State	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Ala.															X	1
Alaska	X	X														2
Ariz.	X															1
Ark.									X							1
Calif.									X	X			X			3
Colo.	X								X	X	X		X			5
Conn.																0
Del.																0
Fla.																0
Ga.																0
Idaho																0
Ill.						X	X	X								3
Ind.		X														1
Iowa																0
Kans.	X															1
Ky.	X	X														2
La.	X															1
Maine	X	X	X								X					4
Md.									X	X	X					3
Mass.																0
Mich.	X	X	X													3
Minn.	X															1
Miss.											X					1
Mo.							X			X	X					3
Mont.	X	X	X													3
Nebr.																0

Table A3. State-Year Observations Excluded from the Primary Models Due to Missing Values on Key Controls, *Continued*

State	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Nev.	X	X	X													3
N.H.	X							X		X						3
N.J.	X	X	X				X		X	X						6
N.M.	X										X					2
N.Y.	X					X	X			X						4
N.C.																0
N.D.	X	X	X	X				X	X							6
Ohio																0
Okla.											X					1
Ore.																0
Penn.	X	X	X	X	X	X	X	X								8
R.I.											X					1
S.C.																0
S.D.									X	X						2
Tenn.	X	X	X	X	X	X	X	X								8
Tex.																0
Utah																0
Vt.	X									X	X					3
Va.																0
Wash.	X	X	X													3
W.Va.	X	X														2
Wis.	X	X						X								3
Wyo.																0
Total	**22**	**14**	**9**	**3**	**2**	**4**	**6**	**6**	**8**	**9**	**8**	**0**	**2**	**0**	**1**	**94**

Table A3. Construction of District-Level Urbanicity Measure

Measure	Definition in FY1999 – FY2000 (based on msc code)	Definition in FY2001 - FY2006 (based on locale code)	Definition in FY2007-FY2013 (based on ulocal code)
City district	Primarily serves a central city of an MSA	Large city or mid-size city	City, large; city, midsize; city, small
Suburban district	Serves an MSA but not primarily its central city	Urban fringe of a large city or urban fringe of a mid-size city	Suburb, large; suburb, midsize; suburb, small
Rural district	Does not serve an MSA	Large town, small town; rural, outside metropolitan statistical area; rural, inside metropolitan statistical area	Town, fringe; town, distant; town, remote; rural, fringe; rural, distant; rural, remote

Note. District-level urbanicity is constructed based on MSC and locale codes reported in the CCD LEA which we merge onto the SFFDS dataset. Definitions come from CCD LEA technical documentation in fiscal years 1999, 2000, and 2007.