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EdWorkingPaper No. 20-338

The Segregation of Students by Income in Public Schools

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VERSION: December 2020

Suggested citation: Dalane, Kari, and Dave E. Marcotte. (2020). The Segregation of Students by Income in Public Schools. (EdWorkingPaper: 20-338). Retrieved from Annenberg Institute at Brown University: https://doi.org/10.26300/kqkr-0c04

The Segregation of Students by Income in Public Schools

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Abstract:

Over the past three decades, children from low-income families and those from more affluent families have increasingly been attending different public schools. While recent work has helped us understand patterns of income segregation between districts and schools within districts, we know very little about segregation of students as they experience school: in the classroom. In this paper, we attempt to advance knowledge of trends in the segregation of students by income at the classroom level. We make use of detailed, student-level administrative data from North Carolina which provides a measure of a student's free/reduced price lunch eligibility, which we refer to as economically disadvantaged (ED) status, along with information on classroom assignments. Since we know the ED status of each student in each classroom, we assess whether ED students are assigned to classes in the same pattern as other students or if are clustered/segregated into different classrooms. We know very little about the magnitude of income-based segregation, and almost nothing about whether this has changed over time, so we provide novel evidence on the question of whether segregation of students by socioeconomic status has increased within schools. We find that within-school segregation has risen by about 10 percent between 2007 and 2014 in elementary and middle schools we study. Further, we find that segregation of ED students within schools is correlated with the level of segregation between schools in districts, and this relationship grew stronger over our panel.

We acknowledge funding from the Smith Richardson Foundation. All interpretations and any errors are our own.

Over the past three decades, children from low-income families have increasingly been attending different public schools than children from affluent families. This trend has been documented using a variety of data and measures. Owens, Reardon, and Jencks (2016) use income reported by parents in Census data and find that in large metropolitan areas, the segregation of students by income across different school districts increased by 15 percent between 1990 and 2010. They further estimate using data schools report to the U.S. Department of Education that the concentration of low-income students by schools within school districts increased by 40 percent over the same period. More recent work has confirmed these patterns using different measures and data.

Among the factors thought to be at play here are changes in residential segregation by income in metropolitan areas, along with changes in the school choice landscape. The 21st Century in the U.S. has seen resurgence of city centers, gentrification of urban neighborhoods, and changes in suburbs that have contributed to residential segregation of households by income (Jargowsky, 2015). A recent report using Census data from the 50 largest cities in the U.S. found that about 20 percent of low-income neighborhoods experienced gentrification since 2000, compared to only 9 percent during the 1990s (Governing, 2015). On top of these dynamics, the processes through which students are assigned to traditional public schools are changing. The growth of charter and magnet schools, and within-district choice plans have loosened the link between neighborhood of residence and school of attendance. Two recent studies using the Common Core of Data find that within-district segregation by socioeconomic status grew modestly with charter school enrollment in the district (Marcotte and Dalane, 2019; Monarrez, Kisida and Chingos, 2019).

While recent work has helped us understand segregation by income between districts and schools within districts, we know very little about segregation of students as they experience school: in the classroom. However, it may be that within school patterns are affected by the same factors shaping segregation between schools. As neighborhoods change and school choice options grow, administrators at the district and school levels may seek to attract or retain students by changing what is offered inside the school building. Options available to placate parents who might be most likely to choose among multiple schools include ability tracking or offering specialized school-within-a-school curricula.

In this paper, we attempt to advance knowledge of trends in income segregation of students by examining changes in segregation by socioeconomic status within schools – at the classroom level. Further, we assess whether income segregation of students at the classroom level exacerbates or moderates segregation between schools. The typical American public school has more than 100 students, grouped into 5 or more classes. We know little about whether decisions about how students are assigned to classrooms within schools are related to patterns of segregation between schools.

We make use of detailed, student-level administrative data from North Carolina which provides a measure of a student's free/reduced price lunch eligibility, along with information on classroom assignments.[1] We refer to students who are eligible for free or reduced-price lunch as economically disadvantaged (ED) in accordance with our data-sharing agreement with the North Carolina Education Research Data Center. Since we know the ED status of each student in each classroom – and each student in the relevant district – we can then assess whether ED

[1] We discuss the limitations of ED status as a measure of socioeconomic status, below.

students are assigned to classes in the same pattern as other students, or are clustered/segregated into different classrooms. Because income is an important predictor of school readiness and achievement, it is expected that any ability grouping would result in an uneven distribution of students, by income, to classrooms. Yet, we know very little about the magnitude of income-based segregation, and almost nothing about whether this has changed over time.

In this paper, we provide novel evidence on the question of whether segregation of students by socioeconomic status (SES) has increased within schools. We further consider whether SES segregation within schools is correlated with SES segregation within districts. This second question is vital for understanding whether the growing body of knowledge about segregation of students by income at the school level is being exacerbated or tempered by changes within school buildings.

Background

Segregation in American public schools has been a topic of concern for researchers and policy makers for a very long time. Much of that attention has focused on the segregation of students by race. Though race and socioeconomic status are substantial correlates in the United States, until recently researchers have paid little attention to the distinct question of segregation of students by income. Recently, analysts have employed data from various sources to study the topic. For example, Owens et al. (2016) reported increasing levels of income segregation between districts in large metropolitan areas, and between schools within those districts. They use income data reported in the Census by respondents with school-aged children to estimate that between-district segregation in the 95 largest metropolitan areas, and

find measures of segregation increased 15% between 1990 and 2010. Using ED status data at the school level from the Common Core of Data, they find that between-school segregation in the 100 largest districts increased by over 40% over the same time period. Marcotte and Dalane (2019) use more recent CCD data, and report similar patterns of rising segregation of students by income in large districts, but no substantial increase in small districts.

Rising segregation raises concerns for education policy by shaping the distribution of economic opportunity. Schools with higher proportions of low-income students have fewer educational resources, so the concentration of poor students in poor schools could further exacerbate disparities of opportunity (Betts et al. 2000). Further, states with the highest levels of between-district segregation also have the highest level of variation in achievement between districts (Fahle & Reardon, 2018).

One possible explanation for rising socioeconomic segregation of students in schools is rising income inequality in the nation more broadly. Rising economic inequality within urban areas is associated with gentrification in cities across the country (Jargowsky, 2015). Another possible factor is the declining strength of the link between where a child resides and where she attends school. The growth of public charter and magnet schools have provided opportunities for some parents to sort into schools based on factors other than neighborhood of residence. Indeed, there is evidence that a family's likelihood of using school choice options is related to income and education (Lauen, 2007). Bischoff and Tach (2018) find that in urban areas with more racial diversity, schools are less likely to reflect neighborhood demographics than suburban districts – where schools and neighborhoods are more demographically similar, but also less diverse. Bischoff and Tach (2018) also find that "exit options" from public schools

are associated with differences between the demographics of a neighborhood's residents and its local public schools. There is also evidence that charter school growth modestly increases segregation within school districts by socioeconomic status (Marcotte and Dalane, 2019) and race and ethnicity (Monarrez, Kisida and Chingos, 2019).

While researchers continue to sort out possible drivers of segregation between school districts and between schools within districts, a question that has received almost no attention is whether segregation is changing within schools. This oversight is surprising, since the changing neighborhoods and schooling options that may be driving system wide patterns may also be affecting the organization of schools themselves. For example, if growth of charter schools in an area provides exit options for families, administrators in traditional public schools likely have interest in retaining students who might otherwise leave. To retain students, administrators might offer school-within-a-school or tracking options that aim to more directly serve the students most likely to exercise choice options. If so, the factors shaping socioeconomic segregation between schools could also be having similar effects between classrooms within schools.

Previous work provides evidence that the assignment of students to different classes based on socioeconomic status is driven by parent and teacher preferences (Kalgorides and Loeb, 2013). For example, Lareau (1987; 2000) has documented how parents (and especially mothers) from families with higher incomes and education are more involved in their children's schools, more likely to know the names and reputations of many teachers within those schools, and more often intervene with principals in classroom assignment decisions on behalf of their children. Because wealthier, more educated families can vote with their feet, administrators

can feel pressure to accede to their classroom assignment requests in order to retain them in their schools/districts (Clotfelter, et el. 2005). Principals may get similar pressure from their teachers, who also have substantial interest in classroom assignment decisions, as well as information about student performance. In an effort to retain their best teachers, principals may acquiesce to preferences for assigned students who present with fewer behavioral or academic challenges (Kalgorides and Loeb, 2013).

While we do know that parent SES shapes classroom assignment of children within schools, we know almost nothing about how within school segregation of students by classroom is related to segregation between schools in the broader district. Districts that experience the most change in between school segregation are necessarily undergoing substantial change that could include migration or economic and housing growth. High income parents and experienced teachers have better capacity to change schools in response to these changes. Because of these preferences, we anticipate that school principals in districts experiencing the most profound changes in socioeconomic segregation between schools would have the most pressure to employ within-school student grouping to placate their most important constituencies – active parents and experienced teachers. For this reason, we assess whether within-school segregation of students by SES is higher in districts where between school segregation is high.

Clotfelter et al. (2020) have found that between school segregation of students by race is associated with between classroom level segregation by race within schools. One explanation for rising segregation of students by race or ethnicity has been the growing population of Hispanic students in many large states (including North Carolina). In California,

Gandara et al. (2003) find substantial segregation of Hispanic students into classrooms with inexperienced teachers and underdeveloped curricula. One factor in the segregation of Hispanic students is the limited English-language proficiency of some recent immigrants. But, this is only part of what Gandara (2019) has labeled the Latino education crisis. Among students with proficient English, segregation of students by classroom is primarily driven by grouping students based on proficiency or level of study, or tracking. However, there is an established body of research showing that socioeconomic attributes of students affect classroom assignment, even conditioning on demonstrated ability (e.g. Gamoran, 1992; Grissom and Redding, 2016).

Analytic Plan and Methods

Our objectives are first to document patterns of within-school segregation of students by socioeconomic status; and then to assess whether any such patterns are related to between-school segregation. To study segregation of students by classroom within schools, we use student-level administrative data from the North Carolina Education Research Data Center (NCERDC) beginning in the 2006-2007 school year and ending in the 2013-2014 school year. These data provide information for every public school student in the state, and provide measures of student socioeconomic and demographic characteristics, as well as school and district attributes. Most importantly, the NCERDC data enable us to identify the classrooms to which each student is assigned during the school day, and thereby assess the socioeconomic and demographic attributes of students in each classroom, as well as those of the schools overall.

Because classes are (overwhelmingly) grouped by grade, our unit of analysis is the grade school level, by academic year. We limit our analysis to students in grades 3-8. We are unable to include lower grades because course enrollment data is only reported beginning in grade 3. We exclude high school students from our analysis since high school classes are more likely to include students from multiple grades, which makes determining the appropriate comparison group for each course more difficult. For each school and grade in our panel, we first generate a district dissimilarity index, which measures income segregation between schools for each grade within that district. This measure is generated by comparing the number of ED and non-ED students in each school/grade to the total number of ED and non-ED students in the appropriate grade/district. If all schools serving the same grade in a district had an equal portion of ED students, the district dissimilarity index would be 0, regardless of the mean ED rate. If ED students and non-ED students in a particular grade and district were perfectly segregated into different schools, the dissimilarity index would be 1.

ED status is inherently a limited measure of a student's socioeconomic status. Domina et al. (2018) assessed its validity as a measure of student disadvantage by comparing ED status measures with family income data obtained from Internal Revenue Service (IRS) records in Oregon and a district in California. Domina et al. (2018) found that variation in ED status captures relatively little variation in IRS-reported family income. Importantly, though, they found that ED status is a better predictor of educational disadvantage. Domina et al. explained that a potential reason for "the strong and robust negative association between FRPL enrollment and student test scores is that these measures tap into aspects of educational disadvantage that more precise IRS income data elide" (p. 547). This is perhaps not surprising

since income alone measures only one element of socioeconomic status. Indeed, Domina et al. provided some reassurance for our use of ED status as a measure of socioeconomic status, a construct that includes attributes like education and family background that are associated with student educational outcomes.

We next generate school-level measures of dissimilarity to capture within school segregation. To do this, we first aggregate our student level panel to the course level. Courses are reported in different ways in different schools across the panel. We use a large set of variables to map students to courses, including school code, district code, course code, meeting code, section, cycle, period, teacher identification code, course title, and reported enrollment. It is important to note that courses may appear more than once since some schools report the same course over multiple semesters, terms, or cycles. Rather than attempt to isolate one iteration of each course, we use the full set of unique course observations reported by each school. Once we have mapped students to classes, we then generate counts of the ED and non-ED students in each course. We calculate the total number of ED students in a grade as the sum of all ED students in relevant courses in that grade. We then do the same for non-ED students.

We first generate the dissimilarity indexes for all courses within a grade. This includes all types of courses, including courses such as physical education and even homeroom. We next use the course codes present in the data to isolate those courses identified as math courses and calculate the dissimilarity index within each grade/school/year using just these

courses. We do the same for all ELA courses.[2] When we limit our sample to just math or ELA courses, we still allow students to be enrolled in more than one course of each type. We focus on math and ELA since they are the subjects to which students are nearly universally enrolled each grade. Just as importantly, math and ELA are most frequently tested on high-stakes tests. School administrators may feel more pressure to improve achievement in these subjects and may view tracking as a way to accomplish this goal.

In calculating each of the all-course, math, and reading dissimilarity indexes, we exclude any courses with just one student enrolled and those with more than 50 students enrolled since these are not typical courses. There are some instances in which courses consist of students from more than one grade. In those cases, we use the modal grade of enrolled students to assign courses to grades.

We generate grade-specific dissimilarity indexes for two main reasons. First, the composition of each grade within a school or district may differ. For example, if a school is becoming increasingly poor over time, lower grades in the school may have higher concentrations of ED students than higher grades. Since students typically take courses with students from their own grades, ED and non-ED enrollments in their own grades are the appropriate comparison group to generate dissimilarity indexes. Comparing the enrollment in a grade 3 class to the overall enrollment in the school would capture not just segregation in grade 3, but also the changing composition of the school. We isolate the former by generating

[2] We calculate math and ELA dissimilarity indexes only if 90% or more of the students in a grade/school/year have at least one math or ELA course, respectively. Since some schools report general "elementary" courses rather than subject-specific courses, especially in grades 3-5 early on in the panel, we only calculate a math dissimilarity index for approximately 86% of our grade/school/year observations and an ELA dissimilarity index for approximately 87% of our grade/school/year observations.

indexes separately for each grade. Second, there may be different segregation patterns by grade. This may be especially true when comparing elementary grades to middle grades. Since we know from prior research that within-class ability grouping is more common in elementary grades and academic tracking in separate classrooms is more likely to start in middle grades, we expect there to be higher levels of within school segregation in middle grades.

Our first objective is to assess trends in between and within school segregation over time. We first do this graphically, showing the enrollment weighted average district dissimilarity index over time by grade. We create similar graphs to illustrate how within school segregation is changing over time. We then estimate a series of models of socioeconomic segregation at the grade-school level, over time. We regress D_{sgt}, the segregation index within school (s) for grade (g) in year (t), on basic attributes of the school and district, along with grade-specific fixed effects and grade-specific linear trends:

$$D_{sgt} = \alpha + \beta X_{st} + \sum_{g} (\delta_g + \tau_g(\delta_g * t)) + \theta_{LEA} + \theta_s + \epsilon_{sgt}$$

We estimate this model separately for within-school segregation in math, reading, and all classes. The coefficients of interests are the grade-specific fixed effects (δ_g) and time trends (τ_g). The first measure differences in levels of segregation by grade, and the second measure changes in within-school segregation by grade, net of what might have been expected due to changes in enrollments or other school attributes. In all models, we control for district fixed effects (θ_{LEA}).

We estimate models without and then with school fixed effects (θ_S), to assess whether any overall changes in within-school segregation over the period were due to broader (county-

wide) changes in enrollment, or to growth in local areas within a district.[3] Models without school fixed effects provide a baseline estimate of any changes in socioeconomic segregation that are due to compositional changes in enrollment, and any within-school changes in allocation of students. In the fully specified model, the grade-specific time trends measure changes in average segregation by grade that are entirely within-school. While the difference between the models is relevant for understanding trends in socioeconomic segregation at the classroom level, the grade specific trends from our fully specified models are of special relevance, as direct tests on whether there have been changes in the way schools allocate students into classrooms over the panel.

We also attempt to provide insight into how segregation between schools, within districts relates to segregation between classrooms within schools. To do this, we augment our empirical model of within-school segregation above, by adding in lagged measures of between-school socioeconomic segregation in a school's district. Specifically, we add in grade-specific measures of the segregation of students by income between schools to our school, grade, year panel models.

Results

Table 1 provides descriptive statistics for our sample. Our unit of analysis is the grade/school/year. The average grade within a school in our panel enrolls about 86 students in a typical year, and is 53% White, 27% Black, and 12% Hispanic. Approximately 55% of students in a typical grade are economically disadvantaged. The mean district dissimilarity index is .31

[3] In North Carolina, each county is its own school district.

while the mean school dissimilarity indexes are .23 for all courses, and .25 for both math and ELA courses. About 7% of our grade/year observations are charter schools.

Descriptive Analyses

To begin understanding how socioeconomic segregation is changing over time, in Figure 1 we show trends in the average level of SES segregation between schools within North Carolina's school districts. We show separate trends by grade, and weight by district enrollment. Consistent with prior research in other settings, between school segregation rose substantially between 2007 and 2014 in North Carolina. The mean district dissimilarity index increased by approximately 20% for all grades. Figure 1 also makes clear that elementary school grades have higher levels of between school segregation than middle school grades, with an average 2007 district dissimilarity index of about .3 in elementary grades compared to .24 in middle grades. This is because elementary schools are typically smaller than middle schools and draw students from smaller geographic areas.

We next turn to trends in segregation between classrooms within schools. In Figure 2 we display enrollment-weighted trends in the dissimilarity index calculated across all courses, by grade. Within school segregation grew much more slowly than between school segregation over our panel. Middle school grades have higher levels of within school segregation when compared to elementary grades, the opposite of what we observe in between school segregation. Within school segregation is also significantly lower than between school segregation in elementary schools, with a mean of .23 compared to a mean of .34, while within school segregation is higher in middle schools, with a mean of .27 compared to a between

school segregation mean that is also .27. This is likely due to academic tracking, which typically isn't present in elementary school grades but may be introduced in middle school grades.

Figure 1: Between School Segregation Over Time by Grade

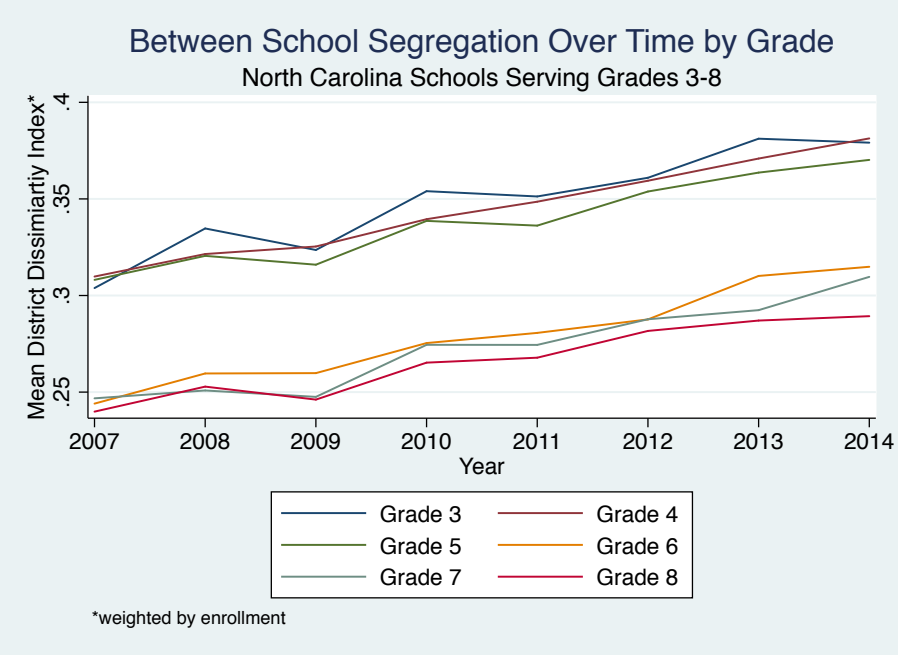


Figure 2: Within School Segregation Over Time by Grade

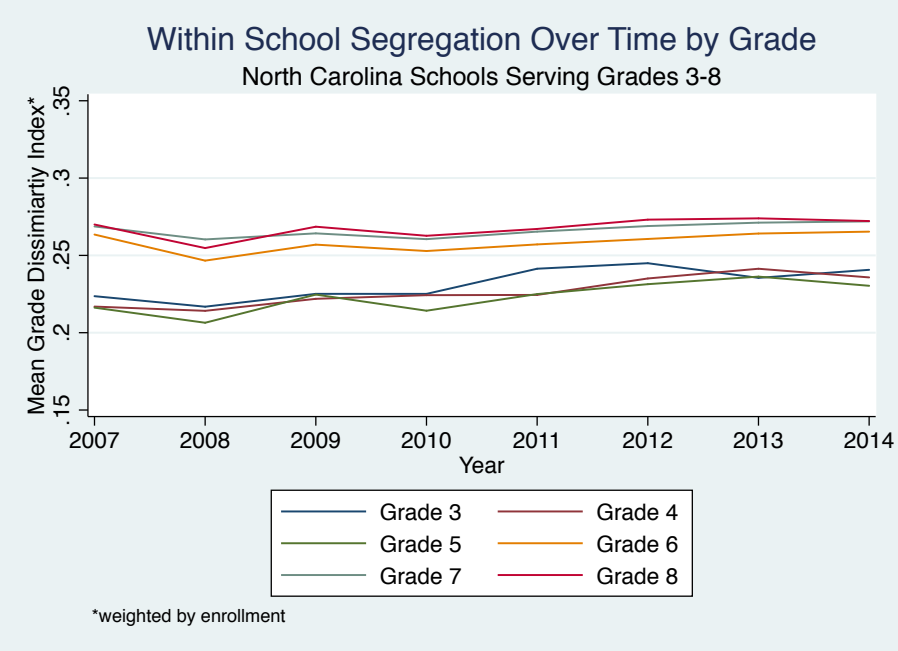
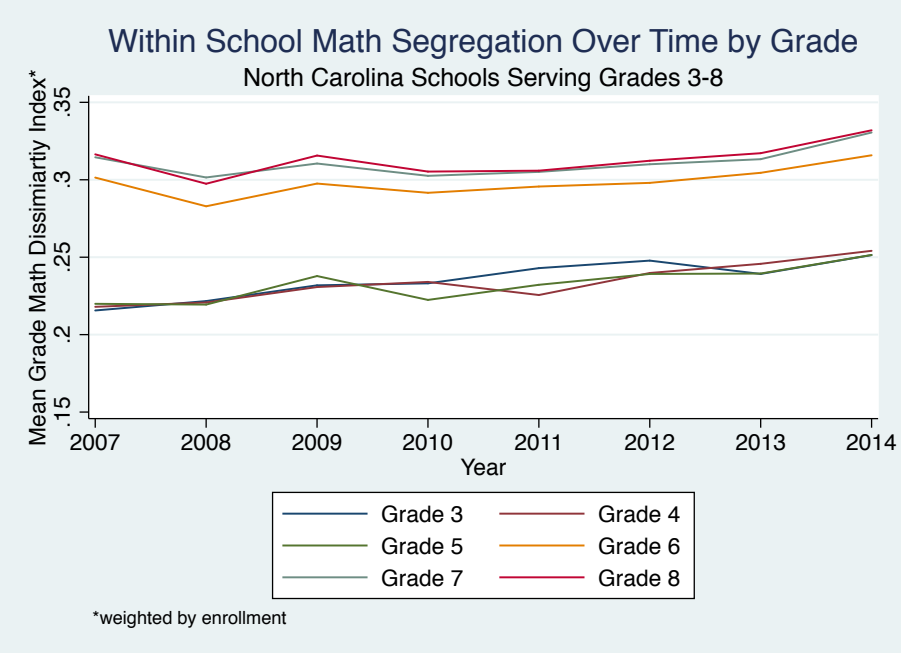


Figure 2 includes all courses offered in a school, including non-academic subjects such as gym and band. Because within school segregation might be higher in academic subjects that are more likely to be tracked, in Figure 3 we plot the mean within school dissimilarity index for only math courses by grade. Figure 3 makes clear that for middle school grades, within school segregation is higher for math classes than overall levels for all courses in general. This is to be expected, since tracking often intensifies in these grades. There also appears to be a somewhat more positive trend in math courses than in all courses overall. We will examine these trends in our regression models, below.

Figure 3: Within School Math Segregation Over Time by Grade



Next, we examine the relationship between within and between school segregation, and how this may have changed over time. In Figure 4, we plot mean within-school segregation in a district by the level of between school segregation in that district from the first year of our

panel. In Figure 5, we plot the same data from the last year of our panel. In both graphs, we present results for math courses in grade 4 with markers weighted by district enrollment in that grade/year, and report slope coefficients from linear fits of the relationship between within-school and between-school segregation.

In 2007 (Figure 4), there is a weak positive relationship between segregation at the district and school level: The dissimilarity index within schools is 0.10 higher for a unit increase in the between school dissimilarity index. Figure 5 provides suggestive evidence that this relationship has increased over time. By 2014, districts with higher levels of between school segregation are also more likely to have higher levels of within school segregation: The dissimilarity index within schools was 0.23 points higher with a unit increase in the between dissimilarity index.

Figure 4: Between and Within School Segregation: Grade 4, 2007

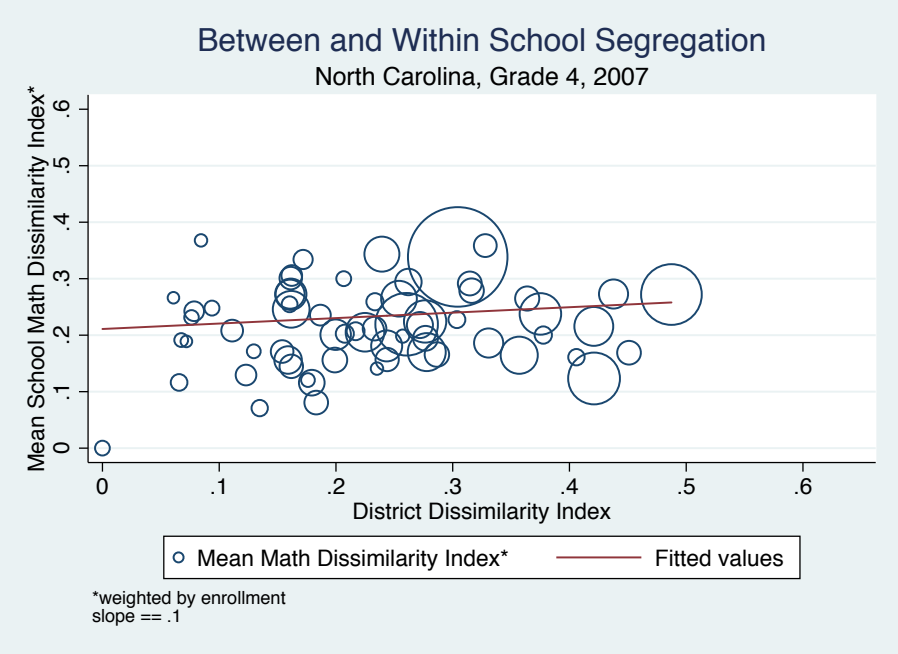
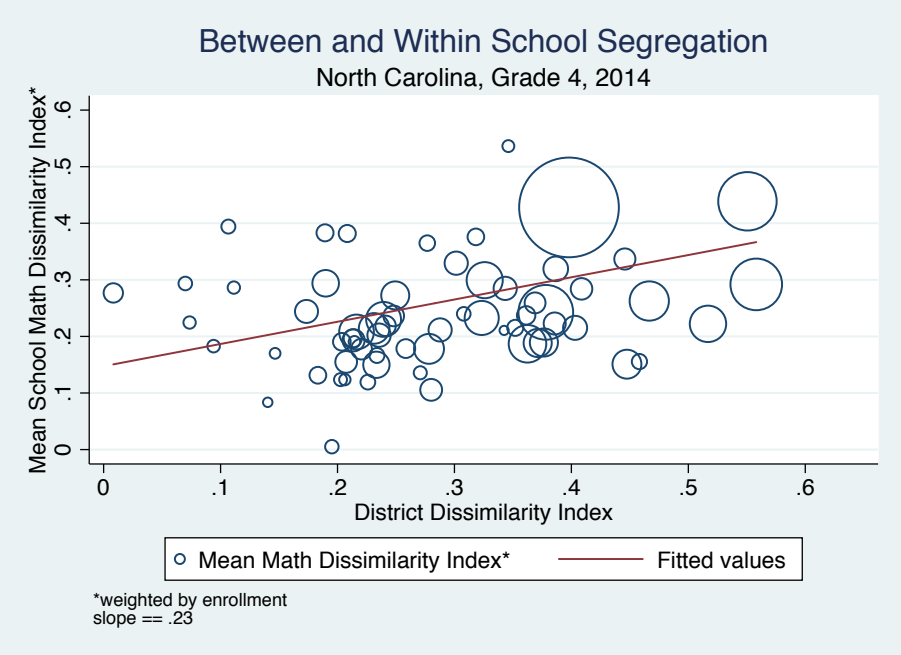


Figure 5: Between and Within School Segregation: Grade 4, 2014



Multivariate Analyses

We next turn to estimating patterns of segregation between schools. Because the descriptive trends above illustrate differences in segregation by grade, we estimate separate trends for each grade. Our unit of analysis in these models is the district/grade, and the results are presented in Table 2. Our first model includes only enrollment, grade fixed effects, and grade-specific linear trends. This model provides a baseline with which we can compare our other models. In all models, between school segregation is higher in larger school districts: The dissimilarity index increases by about 0.005 for every 1000 students enrolled in a district/grade. This is unsurprising, since large districts serve larger and potentially more heterogenous areas. As we saw in the figure above, the grade fixed effects confirm that elementary grades have higher overall levels of between school segregation than middle school grades. We also find that socioeconomic segregation is rising in all grades, though the grade-specific linear trend is

only marginally significant for grade 8. We estimate that the rate of increase in socioeconomic segregation ranges from .007 in grade 3 to .003 in grade 8. This year-over-year change translates into increases in district dissimilarity indexes of between .056 for grade 3 and .024 for grade 8 over the course of our eight-year panel.

In column 2 of Table 2, we introduce controls for the racial composition of districts' students. Socioeconomic segregation is likely correlated with racial segregation, so schools with a high proportion of Black students, may also be more likely to have higher concentrations of low-income students. In column 2, we see the linear trends for every grade reduced in magnitude somewhat compared to the model without racial composition variables controls. This suggests that part of the observed growth in segregation between schools is due to the changing racial and ethnic composition of students in North Carolina schools. However, these shifts explain only a small portion of the changes we observe.

The grade-specific trends estimated in columns 1 and 2 capture changes in each grade's mean dissimilarity index that are due to changes in how students are sorted into schools, as well as compositional shifts in enrollment across districts. In model 3, we include district fixed effects to focus on within-district changes, net of any compositional changes driving state-wide trends. Notably, the estimated linear time trends hardly change: The trends in between school segregation are driven by changes within districts – not by compositional shifts in enrollment toward districts with higher levels of segregation.

We next turn our attention to trends in within-school rather than between-school segregation. In Table 3 our unit of analysis is the grade/school/year and all models include controls for enrollment, racial composition, and grade and district fixed effects. We estimate

trends in socioeconomic segregation across all classes within schools, math classes, and then reading/ELA classes. In each case, we estimate models without and then with school fixed effects. In the first models without school fixed effects, both the reallocation of students into schools with differing baseline dissimilarity indexes and any within school changes in the dissimilarity index contribute to the linear trends for each grade. The models with school fixed effects isolate the changes taking place within schools while excluding any impact that reallocation of students may have on each grade's mean within school dissimilarity indexes.

As in Model 2, enrollment is positively associated with within school segregation, especially for math and ELA courses. Schools with more students may have more flexibility in how they assign students to classes. The grade fixed effects confirm what we saw in our graphs, with higher levels of within school segregation in middle grades than in elementary grades. Unlike our results in Model 2, the racial composition variables are insignificant in all models. The coefficients on the linear time trends are positive and significant in all models for all grades. There are no large differences in the trends between grades, and the addition of school fixed effects changes the trends very little. This suggests that the trends are being driven by changes in how schools assign students to classrooms rather than changes in the allocation of students to schools with different levels of segregation.

In our final model, we estimate the impact of between school segregation on within school segregation. Here, our unit of analysis is the grade/school/year and we use the math dissimilarity index as the outcome. We cluster errors at the district/grade level. We include enrollment, racial composition controls, and grade and district fixed effects in every model. We also include a separate lag of the district dissimilarity index for each grade. The lag of the

district dissimilarity index captures the level of between school income segregation for a district/grade in the prior year. A positive coefficient on this lag would indicate that a growing dissimilarity between schools in a district is associated with higher dissimilarity indexes within school in math the following year. We also include a linear time trend that captures average growth in within school segregation over time. As with the previous table, we provide estimates without, and then with school fixed effects.

We present these results in Table 4. The coefficients on the grade indicators make clear the patterns described above: Within school segregation is higher in middle school grades. The coefficients of interest are those on the grade-specific lags of between school segregation in the district. The estimates in the columns differ in that we include school fixed effects in the second. We find that segregation in the district in 3rd grade is associated with higher levels of within school segregation. To scale the coefficient, a one standard deviation increase in district level segregation (0.13) is associated with an increase in within school segregation of 0.009. This is a bit less than a tenth of a standard deviation. We find weaker evidence that segregation between schools among 4th grade students is also correlated with within school segregation – but no evidence that segregation at higher grades has similar effects.

Discussion

In this paper, we examine the understudied question of whether segregation of students by socioeconomic status has increased within schools. We illustrate that in North Carolina, segregation of students by income at the classroom level has increased in elementary and middle school grades. We confirm prior research on the growth of between school income segregation over the last several decades. Further, we show that higher levels of between

school segregation are correlated with higher levels of within school segregation, and that this association has strengthened over the course of our panel.

Our findings differ in important ways from a recent paper on patterns of racial segregation in North Carolina. Using NCERDC data, Clotfelter, et al. (2020) examine racial segregation of students by classroom within schools, using a similar panel and measures of segregation. The authors examine patterns of racial segregation between and within schools, rather than trends over time. They find that between school and within school segregation by race and ethnicity are negatively correlated: when one is low, the other tends to be high.

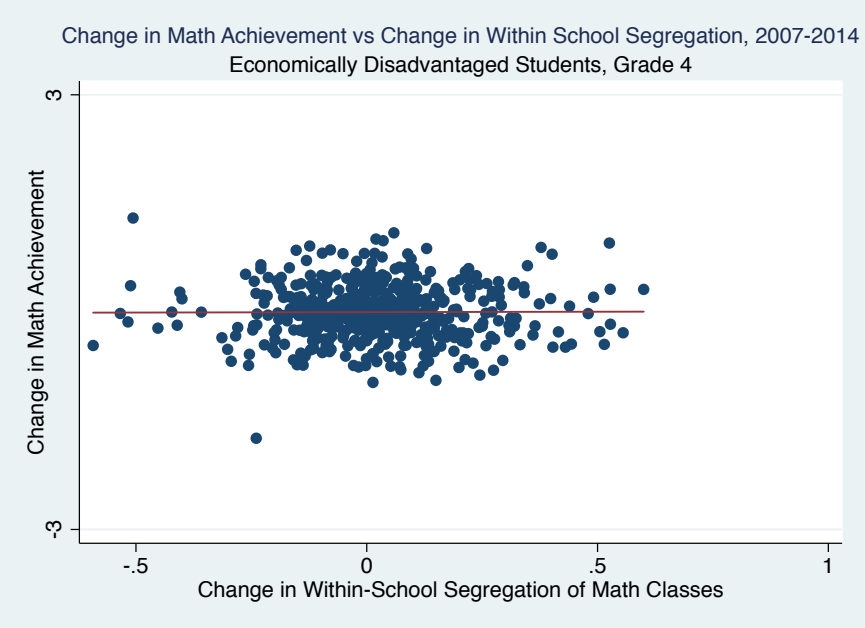
In contrast, we find that within school socioeconomic segregation supplements between school segregation. These differences highlight the point that patterns of socioeconomic segregation are not driven by racial segregation of students. As we describe above, adding in controls of changes in the racial composition of students do not materially change the patterns and trends we see in socioeconomic segregation within schools. And, all of our main models control for the racial and ethnic composition of schools. We also re-estimate all our main models in Tables 2 and 3, replacing the socioeconomic dissimilarity index as dependent variable with the black/white dissimilarity index. To conserve space, we include these as appendix tables. Unlike socioeconomic segregation, we find no evidence of changes in racial segregation between schools (Table A1). Within schools, we find smaller increases in segregation by race, and these are limited to elementary school grades (Table A2). Taken together, we interpret these findings as evidence that even as between and within school racial segregation of students remains endemic, it has been socioeconomic segregation of students that has been on the ascendance.

Our findings help us to better understand the landscape of income segregation. The experience a student has in school is shaped not just by the district and school she attends, but also the classrooms within a school where she receives instruction and interacts with peers. The growing relationship we observe between within and between school segregation suggests that increasing levels of between school segregation are likely to be exacerbated by increasing levels of within school segregation.

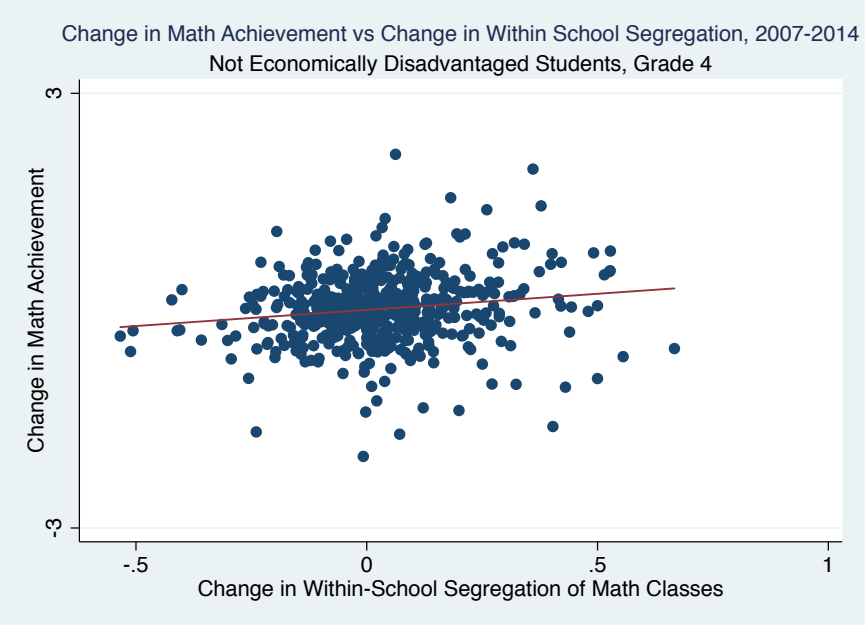
These patterns are concerning in part because they challenge principles of egalitarianism in public education. Of course, if students are grouped based on ability there may be pedagogical or other advantages that benefit all groups of students. If so, our concerns about segregation may be assuaged if SES is a valid proxy for ability. However, there are many reasons to doubt this supposition. Regardless of whether SES is a proxy for demonstrated achievement, we can assess whether and how economically disadvantaged students and their better off peers are affected by segregation. In Figure 6, we plot changes in math achievement between 2007 and 2014, by changes in SES segregation of math classrooms over the same period, separately for low-income (Panel A) and higher income students (Panel B). Each point represents changes over the panel in within a school in math achievement and SES segregation. In Panel A, there is no clear pattern, with math achievement for economically disadvantaged students growing no faster or slower in schools experiencing the most growth in socioeconomic segregation. In Panel B, however, math achievement grew more for higher income students in schools where socioeconomic segregation grew. The different relationships between a school's changing level of socioeconomic segregation and achievement for economically disadvantaged

Figure 6: Within School Segregation and Achievement: By SES Status

Panel A



Panel B



and other students presented in Figure 6 is merely descriptive and suggestive, not conclusive. We present these patterns to illustrate that socioeconomic segregation may affect achievement, and achievement gaps. Assessing the implications of rising segregation at the classroom level is a topic that merits further attention. The patterns illustrated in Figure 6 also raise questions about mechanisms. The literatures on peer-effects and teacher preferences discussed earlier provide candidates for future work.

While we find evidence of upward trends in within school segregation across grades 3-8, we have not yet explored the mechanisms shaping this trend. One possible mechanism is the introduction and growth of school choice options within a student's school district. Like many states, North Carolina saw growth in charter school sector over the past two decades. The threat of losing students or staff to charters may lead public school administrators to make strategic decisions to retain students and teachers in public schools. Increased within school segregation could be a byproduct of efforts to make public school more appealing, such as specialized tracking or school-within-a-school curricula. While the goal of tracking is not to separate students by income, this could be an unintended consequence. Of course, academic tracking may be on the rise for reasons unrelated to school choice growth. Our panel falls during the No Child Left Behind (NCLB) era, which may also have shaped how students were sorted into classrooms within schools. It is possible that school leaders responded to the high stakes testing pressures of NCLB by reintroducing or ramping up academic tracking. Clearly, rising socioeconomic segregation of students raises many questions about origins and implications. What is clear from the current paper is that socioeconomic segregation has occurred between school hallways just as much as between school buildings.

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Table 1. Descriptive Statistics

	n	Mean	S.D.	Min.	Max.
Grade	47564	4.97	1.62	3.00	8.00
Total Enrollment	47564	113.88	85.59	10.00	674.00
Schools Offering Grade Per District	47564	27.74	31.91	1.00	119.00
Percent Black	47564	27.46	25.22	0.00	100.00
Percent Hispanic	47564	11.84	11.59	0.00	82.76
Percent Asian	47564	2.17	4.20	0.00	78.57
Percent White	47564	53.09	29.14	0.00	100.00
Percent ED	47564	54.74	23.86	0.00	100.00
Percent of Grade with ED Status	47564	0.97	1.96	0.00	10.00
District Dissimilarity Index	46664	0.31	0.13	0.00	0.85
Grade Dissimilarity Index (All courses)	47487	0.23	0.13	0.00	1.00
Grade Dissimilarity Index (Math courses)	40827	0.25	0.15	0.00	1.00
Grade Dissimilarity Index (ELA courses)	41359	0.25	0.15	0.00	1.00
Charter Schools	47564	0.07	0.25	0.00	1.00
Observations	47564				

Number of time periods: 8 (2007-2014)
Unit of analysis is the grade/school/year

Table 2. Predictors of Between School Segregation

	(1) b/se	(2) b/se	(3) b/se
District Total (1000s)	0.005**	0.004**	0.004**
	(0.001)	(0.001)	(0.001)
Grade 3	OMMITTED	OMMITTED	OMMITTED
Grade 4	-0.004	-0.001	-0.003
	(0.013)	(0.013)	(0.007)
Grade 5	0.004	0.007	0.003
	(0.013)	(0.013)	(0.007)
Grade 6	-0.056**	-0.053**	-0.061**
	(0.013)	(0.013)	(0.007)
Grade 7	-0.057**	-0.053**	-0.063**
	(0.013)	(0.013)	(0.007)
Grade 8	-0.051**	-0.046**	-0.059**
	(0.013)	(0.013)	(0.008)
Grade 3 Trend	0.007**	0.005**	0.005**
	(0.001)	(0.001)	(0.001)
Grade 4 Trend	0.007**	0.004**	0.005**
	(0.001)	(0.001)	(0.001)
Grade 5 Trend	0.004**	0.002+	0.003*
	(0.001)	(0.001)	(0.001)
Grade 6 Trend	0.007**	0.005**	0.005**
	(0.001)	(0.001)	(0.001)
Grade 7 Trend	0.006**	0.004*	0.004**
	(0.002)	(0.002)	(0.001)
Grade 8 Trend	0.003+	0.001	0.001
	(0.001)	(0.001)	(0.001)
Percent Black		0.001**	-0.003**
		(0.000)	(0.001)
Percent White		0.001	-0.002+
		(0.000)	(0.001)
Percent Hispanic		0.004**	-0.001
		(0.001)	(0.001)
District Fixed Effects?	No	No	Yes
Observations	4604	4604	4604

Unit of analysis is the district-grade-year.
Standard errors in parentheses.
Errors clustered at the district/grade level.
+ p<0.10, * p<0.05, ** p<0.01

Table 3. Predictors of Within School Segregation

	All		Math		ELA	
	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Enrollment (100s)	0.008**	0.008**	0.025**	0.020**	0.026**	0.015**
	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)
Grade 4	-0.007*	-0.007*	-0.006	-0.007+	-0.008+	-0.009*
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Grade 5	-0.010**	-0.010**	-0.005	-0.006	-0.009*	-0.011**
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Grade 6	0.020**	0.009*	0.029**	0.020**	0.024**	-0.002
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Grade 7	0.029**	0.015**	0.040**	0.028**	0.033**	0.002
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Grade 8	0.027**	0.011**	0.042**	0.030**	0.032**	0.000
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
% Black	0.000	-0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
% White	-0.001**	0.000	-0.001**	0.000	-0.001**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
% Hispanic	0.000+	0.001**	0.000	0.001**	0.000**	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Grade 3 Trend	0.003**	0.003**	0.004**	0.005**	0.003**	0.004**
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 4 Trend	0.004**	0.004**	0.005**	0.006**	0.004**	0.005**
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 5 Trend	0.003**	0.003**	0.004**	0.005**	0.004**	0.004**
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 6 Trend	0.003**	0.003**	0.003**	0.003**	0.002**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 7 Trend	0.004**	0.004**	0.005**	0.005**	0.002**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 8 Trend	0.004**	0.004**	0.005**	0.005**	0.003**	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
School FE?	No	Yes	No	Yes	No	Yes
Observations	47487	47487	40827	40827	41359	41359

All models include district fixed effects.
Standard errors in parentheses.
+ p<0.10, * p<0.05, ** p<0.01

Table 4. Impact of Between School Segregation on Within School Segregation

	(1) b/se	(2) b/se
Total Enrollment (100s)	0.024**	0.016**
	(0.003)	(0.004)
Grade 4	0.005	0.005
	(0.009)	(0.007)
Grade 5	0.009	0.010
	(0.009)	(0.007)
Grade 6	0.056**	0.032**
	(0.011)	(0.011)
Grade 7	0.076**	0.049**
	(0.013)	(0.012)
Grade 8	0.094**	0.068**
	(0.014)	(0.014)
Percent Black	0.000	-0.000
	(0.000)	(0.000)
Percent White	-0.001**	-0.000
	(0.000)	(0.000)
Percent Hispanic	0.000	0.000
	(0.000)	(0.000)
Lag of District Dissimilarity Index		
Grade 3	0.056+	0.066*
	(0.031)	(0.030)
Grade 4	0.033	0.040+
	(0.024)	(0.024)
Grade 5	0.013	0.022
	(0.025)	(0.025)
Grade 6	-0.049	0.015
	(0.038)	(0.030)
Grade 7	-0.063	0.012
	(0.042)	(0.032)
Grade 8	-0.108*	-0.039
	(0.049)	(0.042)
Time Trend	0.005**	0.005**
	(0.001)	(0.001)
School Fixed Effects?	No	Yes
Observations	35094	35094

Unit of analysis is the grade-school-year.
Models include district fixed effects (not shown).
Standard errors in parentheses.
+ p<0.10, * p<0.05, ** p<0.01

Appendix

Table A1: Predictors of Between School Racial Segregation (White/Black)

	(1) b/se	(2) b/se	(3) b/se
District Total (1000s)	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)
Grade 3	OMMITTED	OMMITTED	OMMITTED
Grade 4	0.007	0.007	0.004
	(0.022)	(0.022)	(0.011)
Grade 5	0.018	0.017	0.013
	(0.022)	(0.022)	(0.011)
Grade 6	-0.064**	-0.065**	-0.079**
	(0.023)	(0.023)	(0.011)
Grade 7	-0.074**	-0.076**	-0.092**
	(0.023)	(0.023)	(0.011)
Grade 8	-0.072**	-0.074**	-0.091**
	(0.023)	(0.023)	(0.012)
Grade 3 Trend	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)
Grade 4 Trend	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)
Grade 5 Trend	-0.004+	-0.003	-0.003
	(0.002)	(0.002)	(0.002)
Grade 6 Trend	0.000	0.001	0.000
	(0.002)	(0.002)	(0.002)
Grade 7 Trend	0.000	0.001	0.000
	(0.002)	(0.002)	(0.002)
Grade 8 Trend	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)
Percent ED		-0.000	0.000
		(0.000)	(0.000)
District Fixed Effects?	No	No	Yes
Observations	4638	4638	4638

Unit of analysis is the district-grade-year.
Standard errors in parentheses.
Errors clustered at the district/grade level.
+ p<0.10, * p<0.05, ** p<0.01

Table A2: Predictors of Within School Racial Segregation (White/Black)

	All		Math		ELA	
	(1)	(2)	(3)	(4)	(5)	(6)
	b/se	b/se	b/se	b/se	b/se	b/se
Total Enrollment (100s)	0.030**	0.018**	0.030**	0.018**	0.042**	0.022**
	(0.001)	(0.004)	(0.001)	(0.004)	(0.002)	(0.005)
Grade 4	-0.009+	-0.011**	-0.009+	-0.011**	-0.009	-0.012*
	(0.005)	(0.004)	(0.005)	(0.004)	(0.006)	(0.005)
Grade 5	-0.015**	-0.018**	-0.015**	-0.018**	-0.011+	-0.018**
	(0.005)	(0.004)	(0.005)	(0.004)	(0.006)	(0.005)
Grade 6	0.027**	0.008	0.027**	0.008	0.039**	0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
Grade 7	0.043**	0.020**	0.043**	0.020**	0.055**	0.018*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
Grade 8	0.032**	0.009	0.032**	0.009	0.042**	0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
Percent ED	0.000**	0.000	0.000**	0.000	0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Grade 3 Trend	0.002**	0.003**	0.002**	0.003**	0.004**	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 4 Trend	0.002*	0.002**	0.002*	0.002**	0.004**	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 5 Trend	0.002**	0.003**	0.002**	0.003**	0.004**	0.005**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 6 Trend	0.001	0.002	0.001	0.002	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 7 Trend	-0.001	0.000	-0.001	0.000	-0.003*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Grade 8 Trend	0.001	0.002*	0.001	0.002*	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
School FE?	No	Yes	No	Yes	No	Yes
Observations	47488	47471	47488	47471	41349	41328

All models include district fixed effects
Standard errors in parentheses.
+ p<0.10, * p<0.05, ** p<0.01