Is School Segregation Good or Bad?

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Fifty years after the landmark Supreme Court decision in *Brown v. Board of Education,* racial disparities in achievement are a robust empirical reality. Black children enter kindergarten lagging behind white children, and these differences grow throughout the school years (James S. Coleman et al., 1966; Fryer and Steven D. Levitt, 2004). Even in affluent neighborhoods, achievement gaps are startling (Ronald F. Ferguson, 2002). Including myriad controls to proxy for environmental factors, socioeconomic status, and family composition, the test score gap remains essentially unchanged (Christopher Jencks and Meredith Phillips, 1998). The *Brown* decision provided unprecedented hope for a future of educational equality—a hope that has yet to be realized.

Many believe that the dramatic differences between blacks and whites in achievement are due, in part, to school segregation (Eric A. Hanushek et al., 2002).[1] Since the *Brown* decision, there have been extensive efforts to integrate schools, though some of the initial progress has eroded in recent years (Gary Orfield, 2001).

There is an impressive literature on the effects of segregation across schools on achievement. Jonathan Guryan (2004) estimates that half of the decline in black drop-out rates between 1970 and 1980 is attributable to desegre-gation plans. Robert Crain and Jack Strauss (1985) find that students randomly offered the chance to be bused to a suburban school were more likely to work in professional jobs nearly 20 years after the experiment. Based on a meta-analysis of 93 studies, Crain and Rita Mahard (1981) conclude that desegregation has a significant effect on black achievement, especially among younger children, though other meta-analyses are less conclusive (Nancy H. St. John, 1975).

In the spirit of Martin Luther King, who dreamed that one day "little black boys and black girls will be able to join hands with little white boys and white girls and walk together as sisters and brothers," some argue that society should strive for integration *within* schools not just *across* them (Roslyn A. Mickelson, 2001). Within-school segregation, commonly referred to as "second-generation segregation," is thought to be as important as segregation across schools in inhibiting the educational opportunities of racial and ethnic minorities (Mickelson, 2001).

We measure within-school segregation as the extent to which students interact socially with other students of the same race. Technically, the measure is an application of the "Spectral Segregation Index" (SSI), developed by Echenique and Fryer (2005). Previous studies use traditional measures of segregation (such as exposure and dissimilarity) to measure segregation across schools. These measures do not disaggregate to the individual level and do not use information on students' actual social contacts. Our paper is the first empirical study of the relationship between within-school racial segregation and outcomes.

I. Measuring School Segregation

In this section, we provide a skeletal derivation of the SSI developed in Echenique and Fryer (2005).

The basic building blocks for SSI are a set of individuals, *V*, who belong to the same race/ethnicity, and information on whether any two

[1] Other explanations for the achievement gap range from the genetic inferiority of minorities (Richard J. Herrnstein and Charles Murray, 1994) to active discrimination on the part of teachers or schools (Elizabeth Haller, 1985).

individuals in V interact.[2] Our measure identifies segregation of the members of a group with the intensity of the social interactions among the members of that group.

Given two individuals, v and v' in V, let the number $r_{vv'} \geq 0$ denote whether or not they interact socially. This paper uses data from a survey in which children were asked to name their ten closest friends. We say that $r_{vv'} > 0$ if v names v' or v' names v as one of her friends, and set $r_{vv'} = 1/n$, where n is the total number of friends of v (including v').[3] The basic economics underlying this assumption is that students have a budget constraint—they can spend one unit of time on social interactions—and absent any information on the intensity of any particular friendship, we weight them equally.

Let B be a matrix with as many rows and columns as members of V, and typical entry $r_{vv'}$. The matrix B summarizes all the information on same-race interactions among the members of the race. Note that we still retain information about interactions with individuals of different races. For example, if v interacts only with students of her race, then v's row in B will have n nonzero entries. If, on the other hand, v interacts only with students of other races, her row will have only zero entries. This difference implies, according to our measure, that v is more integrated when he has social relations with individuals of other races.[4]

A *segregation index* is a function that assigns a real number, $S(B)$, to each matrix B of same-race interactions, along with functions assigning a real number, $s_v(B)$, for each individual member v of V, such that $S(B)$ is the average of the individual $s_v(B)$.

Three properties jointly define our measure of segregation. The first property requires that an increase in same-race interactions lead to an increase in segregation. A matrix B' has *more intense interactions* than matrix B if each individual v has more friends ($r_{vv'} > 0$) of her race

in B' than in B. Say that a segregation index satisfies the property of *monotonicity* if, whenever B' has more intense interactions than B, $S(B) \leq S(B')$.

The second property is a normalization of the index. A segregation index is *homogeneous* if, when all individuals in B have exactly n friends and d same-race friends, $S(B) = d/n$.

We introduce some auxiliary concepts to present the third property. Let N_v be the set of v's friends of her same race—her friends in V. In a similar vein, consider all friends (in V) of v's friends, and friends of friends of friends, and so on. The resulting set of individuals, with direct or indirect connections to v, is called the *connected component* of B that v belongs to; denote this set of individuals by C_v. Components can be interpreted as same-race cliques.

The third property says that $s_v(B)$ should be the average $s_{v'}(B)$ among v's same-race friends, relative to the average segregation of the individuals in v's connected component. In symbols, if S^{C_v} is the average segregation of individuals in C_v, a segregation index satisfies *linearity* if

$$s_v(B) = \frac{1}{S^{C_v}} \sum_{v' \in N_v} r_{vv'} \, s_{v'}(B).$$

There are two qualitative assumptions behind the linearity property. The first is that v's segregation depends on her friends' segregation. This is the key innovation of the spectral index. The second is that the dependence is modulated by the connected component's segregation. A decrease in the segregation of one of v's friends will affect v less if v interacts with a highly segregated component. The idea is that v receives the effects of segregation from her different friends, and any one friend is less important when the component is highly segregated.

The SSI is the (unique) segregation index that satisfies the properties of monotonicity, homogeneity, and linearity.[5]

II. Data and Preliminary Analysis

The National Longitudinal Study of Adolescent Health (Addhealth) database is a nationally representative sample of 90,118 students enter-

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[2] This can be defined on any number of discrete groupings: race, gender, political affiliation, and so on.

[3] What is essential for our framework is that $r_{vv'} > 0$ if and only if $r_{v'v} > 0$; see Echenique and Fryer (2005). Adopting a more restrictive definition, $r_{vv'} > 0$ if and only if v and v' list each other as friends, changes little.

[4] This feature, along with other ways to incorporate cross-race interactions, is discussed in detail in Echenique and Fryer (2005).

[5] Echenique and Fryer (2005) show how the three properties define an index uniquely.
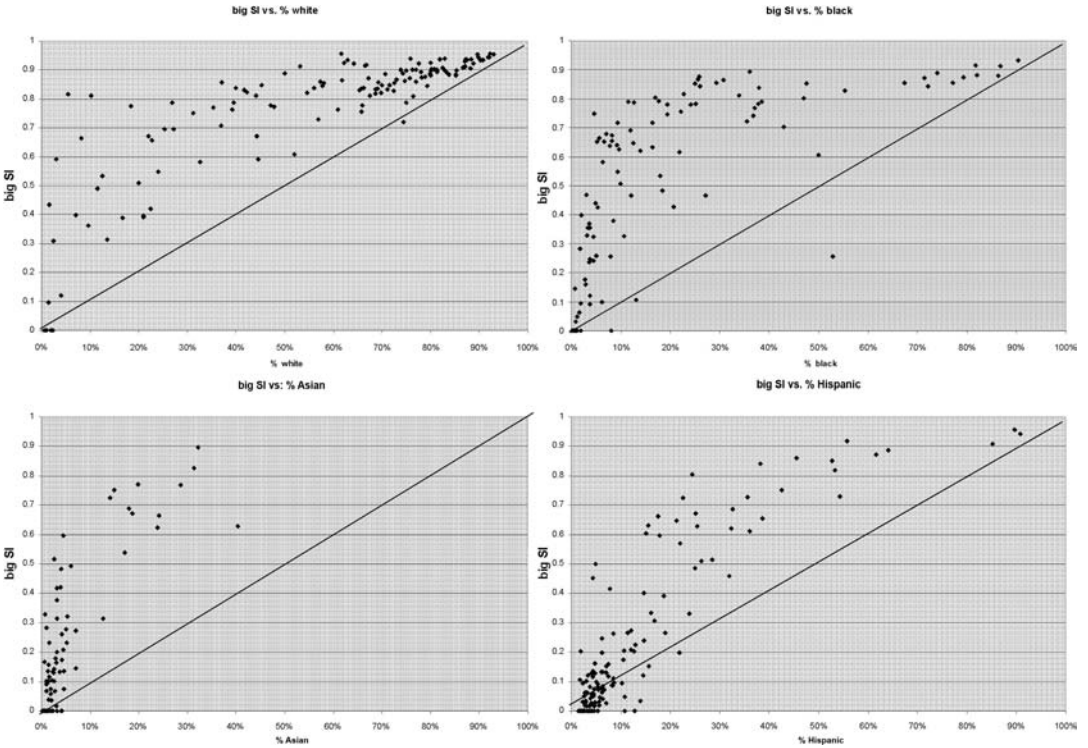
FIGURE 1. THE RELATIONSHIP BETWEEN GROUP SIZE AND GROUP SEGREGATION, BY RACE

ing grades 7 through 12 in the 1994–1995 school year. A stratified random sample of 20,745 students was given an additional in-home interview. Information has been collected on these students at three separate points in time: 1995, 1996, and 2002. There are 175 schools from 80 communities included in the sample. Students who are missing data on race or grade level are dropped from the sample.

A wide range of data is gathered on the students, as described in detail on the Addhealth Web site (http://www.cpc.unc.edu/projects/ addhealth). Our primary outcome variables are divided between measures of academic achievement and those that are more associated with social behaviors. The social variables include smoking, skipping school (without a valid excuse), interracial dating, and whether or not a student is happy at school. Smoking and skipping school are answers to the question, "During the past 12 months, how often did you . . . ?" Answer choices range from never to nearly every day. Interracial dating is a dichotomous variable equal to one if the student reports ever

dating interracially, and zero otherwise. Happiness measures whether or not students report being happy at their school. The academic variables include: Peabody Vocabulary Test (PVT) scores, whether or not a student plans to attend college, grades in the previous grading period, and a measure of how much effort the student exerts. All responses (including grades) are self-reported. For each student, grades were calculated by aggregating grades in four subjects: math, history, science, and English.[6]

Figure 1 depicts the relationship between the percentage of minority students in a school and the level of segregation for each minority student in that school. Each observation is a school. Grade levels 7 through 12 are combined.

Many researchers assume that the relationship between the segregation of a racial group within a school and the percentage of that group

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[6] Details on the construction of these variables can be found in a Data Appendix posted at http://post.economics. harvard.edu/faculty/fryer/fryer.html.

Table 1—The Relationship Between Individual Level Segregation and Outcomes

	Smoking	Skip school	Test scores	No college	Interracial dating	Happiness	Grades	Effort
Black	−0.143**	−0.010**	−0.424**	−0.013*	0.085**	−0.091**	−0.216**	0.027**
	0.004	0.003	0.026	0.006	0.017	0.007	0.011	0.002
Asian	−0.081**	−0.008*	−0.303**	−0.047**	0.372**	−0.025*	0.258**	0.036**
	0.006	0.004	0.042	0.007	0.029	0.010	0.015	0.003
Hispanic	−0.040**	0.026**	−0.426**	0.065**	0.460**	−0.016*	−0.182**	0.003
	0.005	0.003	0.026	0.006	0.017	0.007	0.010	0.002
Individual	0.000	0.000	0.001	0.000	−0.007**	0.000	0.001	0.000
segregation	0.001	0.000	0.003	0.001	0.002	0.001	0.001	0.000
Black* individual	−0.003*	−0.001	−0.025*	0.000	−0.004	0.003	0.000	0.000
segregation	0.001	0.001	0.013	0.003	0.009	0.003	0.005	0.001
Asian* individual	−0.006	−0.008**	−0.102**	0.000	−0.067**	0.021**	0.017	0.004*
segregation	0.005	0.002	0.030	0.007	0.017	0.006	0.014	0.002
Hispanic* individual	−0.006*	−0.002	−0.047**	0.012**	−0.015	0.004	−0.013**	0.004**
segregation	0.003	0.002	0.014	0.003	0.014	0.004	0.004	0.001
Age	0.029**	0.009**	−0.034**	0.021**	−0.002	−0.037**	−0.024**	−0.011**
	0.001	0.001	0.006	0.001	0.003	0.001	0.002	0.001
Male	−0.002	0.019**	0.124**	0.085**	0.004	0.047**	−0.184**	−0.047**
	0.003	0.002	0.014	0.003	0.008	0.004	0.006	0.001
Mother college	−0.024**	−0.002	0.099**	−0.080**	0.001	0.031**	0.154**	0.006**
educated	0.004	0.002	0.019	0.004	0.010	0.005	0.008	0.002
Father college	−0.032**	−0.010**	0.078**	−0.075**	0.014	0.021**	0.163**	0.013**
educated	0.004	0.002	0.021	0.004	0.012	0.005	0.008	0.002
Mother professional	−0.002	−0.001	0.067**	−0.024**	0.011	−0.006	0.062**	0.003*
	0.004	0.002	0.019	0.004	0.010	0.005	0.007	0.002
Father professional	−0.008*	0.000	0.127**	−0.048**	0.018	0.022**	0.114**	0.001
	0.004	0.002	0.020	0.004	0.011	0.005	0.008	0.002
Constant	−0.220**	−0.108**	0.725**	−0.125**	0.117*	1.134**	3.216**	0.989**
	0.017	0.011	0.088	0.019	0.049	0.022	0.035	0.008
Observations	78,075	77,903	14,387	69,257	9,553	73,837	72,744	79,599
R-squared	0.07	0.04	0.28	0.1	0.37	0.05	0.18	0.08

Notes: Dependent variables vary by column. In all cases, dummies for missing values are included. Robust standard errors are beneath the coefficients.
   * Significant at 5-percent level.
   ** Significant at 1-percent level.

in the school is linear (see, for example, Orfield, 1983). This approximation is a good first pass for whites (though we find nearly all white data points above the 45° line), but less true for Hispanics and Asians. For blacks, the relationship between percent own-race in a school and own-race segregation is even more nonlinear. As the percentage of black students increases from 0 to 25 percent, black segregation rises sharply. Above 25 percent, blacks are near complete segregation.

Table 1 presents estimates of individual-level measures of segregation on individual outcomes. We estimate models of the form

$$outcome_i = X\beta + \gamma segregation_i$$

$$+ \xi_1 black \cdot segregation_i$$

$$+ \xi_2 asian \cdot segregation_i$$

$$+ \xi_3 hispanic \cdot segregation_i + \varepsilon_i,$$

including school-level fixed effects. The coefficient γ measures the relationship between the segregation of individual i and a given outcome for i. In the forthcoming analysis, we concentrate on ξ_i, which measures the differential effect of individual segregation for group i relative to whites, and $\gamma + \xi_i$, which captures the "raw" relationship between segregation and outcomes for group i, not relative to whites.

For blacks, individuals who are more segregated are less likely to smoke (a behavior predominant among white teens) and have lower test scores. Asian students who are

more connected to each other are less likely to skip school and have lower test scores. They also put in more effort and report being happier. Among Hispanics, more segregation is associated with less smoking, lower test scores, lower probability of attending college, and lower grades. Interestingly, students of all races are less likely to date interracially when schools are more segregated. Similar results are obtained when one excludes school fixed effects.

III. Conclusion

It has been well documented that segregation across schools—denying access to resources, inferior educational production functions, and so on—exacerbates racial differences in achievement. Using an individual measure of social connections within schools, we have shown that this form of segregation—Asian kids sitting together in the cafeteria—has a substantively unimportant relationship with academic achievement or social behavior in school or later in life. There are important caveats to our analysis: (a) our estimates of the relationship between within-school segregation and outcomes are not causal; and (b) friendships may not be the only relevant cross-race social interaction that occurs within a school.

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