

60 Years After *Brown*: Trends and Consequences of School Segregation

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Abstract

Since the Supreme Court's 1954 *Brown v. Board of Education* decision, researchers and policymakers have paid close attention to trends in school segregation. Here we review the evidence regarding these trends and their consequences. In general, the evidence regarding trends in segregation suggests that the most significant declines in school segregation occurred at the end of the 1960s and the start of the 1970s. Although there is disagreement about the direction of more recent trends in segregation, this disagreement is largely driven by different definitions of segregation and different ways of measuring it. We conclude that the changes in segregation in the last few decades are not large, regardless of what measure is used, though there are important differences in the trends across regions, racial groups, and institutional levels. In addition, we discuss the role of desegregation litigation, demographic changes, and residential segregation in shaping these trends.

One of the reasons that scholars, policymakers, and citizens are concerned with school segregation is that segregation is hypothesized to exacerbate racial or socioeconomic disparities in educational success. The mechanisms that would link segregation to disparate outcomes have not often been spelled out clearly or tested explicitly. We develop a general conceptual model of how and why school segregation might affect students and review the relatively thin body of empirical evidence that explicitly assesses the consequences of school segregation. This literature suggests that desegregation in the 1960s and 1970s was beneficial to blacks; evidence of the effects of segregation in more recent decades, however, is mixed or inconclusive. We conclude with discussion of aspects of school segregation on which further research is needed.

60 Years After *Brown*: Trends and Consequences of School Segregation

1. Introduction

In the 60 years since the Supreme Court's 1954 *Brown v. Board of Education* decision (347 U.S. 483) outlawing *de jure* school segregation in American public schools, the patterns of residential and school segregation in the United States have changed dramatically. These changes in segregation patterns, however, have been inconsistent across time and place in both their pace and direction. Prior to *Brown*, school segregation was absolute in the South, and very high in many school districts in other parts of the country. Several forces have altered these patterns over the last six decades, including continuing changes in the legal and policy landscape, demographic changes, changes in residential segregation patterns, and changes in public attitudes regarding the value and feasibility of school integration.

In this article, we review the evidence regarding these trends and their consequences. In particular, we begin with an extensive review of the empirical research describing trends in school segregation in the six decades since *Brown*. Because these trends differ depending on the type of segregation (black-white, Hispanic-white, multiracial, or socioeconomic, for example) and the level of aggregation (national, metropolitan, district, or school-level) of interest, there is no single answer to the question of how school segregation has changed over the last 60 years. Moreover, segregation can be measured in a number of ways, which further complicates simple descriptions of segregation trends and patterns. Our goal in this first section of the article, then, is to provide a review of the evidence on segregation trends and patterns across these multiple dimensions.

Second, we discuss the causes of the trends in school segregation. As we note, segregation patterns have changed for a number of reasons in the last 60 years. A number of Supreme Court decisions have changed the legal landscape of desegregation efforts. Demographic changes, particularly the rapid growth of the Hispanic population, have changed the composition of the

school-age population. Declining residential racial segregation and rising income segregation have changed the spatial distribution of families and patterns of school segregation over the last 50 years (Jargowsky 1996; Charles 2003; Logan et al. 2004; Watson 2009; Logan & Stults 2011; Reardon & Bischoff 2011a; 2011b; Glaeser & Vigdor 2012; Iceland & Sharp 2013). Finally, public opinion has become more racially tolerant, but increasingly opposed to busing and other school segregation practices (Orfield 1995).

Third, we review the evidence regarding the consequences of school segregation for students. One of the reasons that many scholars, policymakers, and citizens are concerned with school segregation is that segregation is hypothesized to exacerbate racial or socioeconomic disparities in educational success. Our review of the literature, however, suggests that the mechanisms that would link segregation to disparate outcomes have not often been spelled out clearly or tested explicitly. Indeed, much of the research purporting to assess the links between segregation and student outcomes tests instead measures the association between school composition and student outcomes. Such research can be considered a test of the effects of segregation only in a limited sense, under the assumption that segregation affects student outcomes primarily through school composition mechanisms, rather than through other possible mechanisms such as the unequal distribution of resources and disparities in school and teacher quality. Thus, we begin our review of the literature on the consequences of segregation with a brief discussion of a general conceptual model of how and why school segregation might affect students. Following this, we review the relatively thin body of empirical evidence that explicitly assesses the consequences of school segregation.

Despite the extensive body of research on trends and patterns of school segregation, and the somewhat thinner body of research on its effects, a number of questions remain. We conclude with discussion of questions where further research would be valuable.

2. Trends in School Segregation

Trends in school segregation may differ depending on the groups of interest (racial/ethnic or socioeconomic groups) and the geographic scale and organizational units of interest (schools, districts, metropolitan areas, and the nation). Most segregation research in the United States has focused on black-white segregation between schools and within school districts. In part, the black-white focus is driven by the historical legacy of slavery and the continuing salience of black-white inequality; the within-district, between-school focus is driven by the fact that legal, policy, and practical constraints make it easier to affect between-school segregation within districts than segregation at larger (between-district) or smaller (within-school) institutional levels. Nonetheless, any complete accounting of segregation patterns and trends must take into account segregation among other racial/ethnic groups (including Hispanic-white segregation) and socioeconomic segregation patterns, as well as between-district segregation. We review segregation trends along each of these dimensions, to the extent there is available research, below. First, however, we digress briefly to discuss the measurement of segregation.

2.a. Measures of Segregation

School segregation is typically measured using one of two types of segregation indices: measures of isolation or exposure and measures of unevenness (Massey and Denton, 1988). These different ways of measuring segregation often yield very different conclusions about the direction and magnitude of trends in segregation.

Indices of unevenness measure the extent to which a student population is unevenly distributed among schools. For example, the black-white dissimilarity index represents the proportion of the black (or white) population who would have to change schools in order to yield a pattern of school enrollment in which each school has identical racial proportions (Duncan & Duncan 1955; James & Taeuber 1985; Massey & Denton 1988). Other indices of evenness include Theil's information theory index, the variance ratio index, and the Gini index of segregation (James

& Taeuber 1985; Massey & Denton 1988). These measures generally are scaled from 0 to 1, with 0 indicating no segregation (every school has the same racial composition) and 1 indicating complete segregation (no child attends school with any other child of a different race); values above 0.60 are considered indicative of “high segregation” (Massey & Denton 1989).

Indices of exposure or isolation, however, measure the extent to which students are enrolled in schools with high or low proportions of a given racial group. For example, the black isolation index is defined as the average proportion of black students in black students’ schools; likewise, the white-black exposure index is the average proportion of black students in white students’ schools (Coleman et al 1975; Lieberson & Carter 1982, Massey & Denton 1988). Another measure of isolation that is sometimes used is the proportion of students who attend “racially isolated” schools—often defined as schools with a high proportion of minority students (see, e.g., Orfield, 2001). Massey & Denton (1989) describe isolation indices above 0.70 (or, equivalently, exposure indices below 0.30) as indicating “high segregation.”

The evenness measures and the exposure/isolation measures capture different dimensions of segregation. To see this, consider a school district in which 90% of students are black. If all schools in the district had enrollments that were 90% black, we would have low unevenness, but high black isolation (or, equivalently, low black-white exposure), because the average black student would attend a predominantly black school. Conversely, in a school district with very few black students, isolation might be low even if students were very unevenly distributed by race. Put differently, exposure and isolation measures are sensitive to the overall racial composition of a school district, while the evenness measures are not.

This distinction has implications for any assessment of trends in segregation, because changing racial population composition may lead to increases in measured isolation, even if the extent to which students are evenly/unevenly distributed among schools doesn’t change. However, there is not one “correct” measure of segregation. To the extent that we think that segregation

affects students through peer or compositional effects, or mechanisms correlated with school composition, then exposure measures are an appropriate measure. To the extent we think that segregation operates by exposing students to different school environments, however, evenness is the appropriate measure, because under perfect evenness, all students experience the same average school environments.

2.b. Trends in Black-White Segregation

2.b.1. Black-White Segregation in the Desegregation Era, 1954-1980

Black-white school desegregation trends can be divided roughly into two periods: the period from 1954 through the 1970s, and the period from the 1980s to the present. In the first period, black-white segregation declined dramatically, particularly in the South, though most of that decline happened after 1968. Immediately following the *Brown v. Board of Education* decision in 1954, states and school districts did little to reduce racial segregation. In the South, many school districts initially put into place so-called “freedom of choice” desegregation plans, which were arguably designed largely to preserve racial segregation by putting the onus on black families to enroll their children in white schools, an option unappealing to most black families given the animosity of many white families to integration (Coleman et al. 1975; Welch & Light 1987; Clotfelter 2004).

Not surprisingly, such plans achieved relatively little desegregation: Clotfelter (2004) estimates that 81% of black students in the South and 72% of those in the border states still attended majority black schools as of 1968; likewise, Orfield (2001) estimates that in the South 99% of blacks in 1964 and 86% in 1967 attended majority black schools. Segregation was nearly as high in the rest of the country, by any measure. Nationally, 77% of black students attended majority black schools in 1968 (Orfield 2001); over half of black students attended school where 90% or more of their classmates were black (Orfield 1983; Welch & Light 1987); and the average black student was enrolled in a school where only 22% of students were white, despite the fact that

the public school student population was 79% white (Coleman et al. 1975). Studies using evenness measures likewise report very high levels of segregation in 1968: the average within-district index of dissimilarity between black and white public school students was about 0.80 (Logan & Oakley 2004; Johnson 2011); the average within-district variance ratio segregation index was 0.63 (Coleman et al. 1975). All of these measures exceed Massey & Denton's (1989) threshold values for "high segregation."

In 1968, the Supreme Court's *Green* decision (*Green v. County School Board of New Kent County*, 391 US 430) required school districts to adopt more effective plans to achieve integration. By the mid-1970s's hundreds of school districts were subject to court-ordered desegregation plans (Logan & Oakley 2004). As a result, school segregation levels declined substantially between 1968 and the mid-1970s. The average within-district variance ratio index dropped from 0.63 in 1968 to 0.37 in 1972; the black-white exposure index increased from 0.22 to 0.33 over the same time period (Coleman et al. 1975), with the largest declines in segregation occurring in the South (Coleman et al. 1975; Welch & Light 1987; Johnson 2011). The index of dissimilarity declined by about 0.30 over the same time period, again declining more in the South than the North (Logan & Oakley 2004; Welch & Light 1987). By 1980, only one-third of black students attended schools where 90% or more of their classmates were black—still a substantial proportion but much lower than in the late 1960s (Orfield 1983; Welch & Light 1987).

At the same time as within-district segregation was declining from 1968 to 1972, between-district segregation was increasing (Coleman et al. 1975). This was particularly true in the North where school districts are, on average, much smaller than districts in the South, where districts often encompass whole counties. Coleman et al. (1975) find that within-district segregation (defined by a measure of evenness) declined in every region from 1968 to 1972, particularly in the South and Midwest, but that between-district segregation *increased* in every region. Particularly in

the non-South, declines in segregation *within* school districts were offset by increases *between* districts.

2.b.2. Resegregation or Stalled Progress? Black-White Segregation Since 1980

The evidence is generally clear that school segregation between blacks and whites declined substantially from 1968 to the mid-1970s and continued to modestly decline into the 1980s; this is true whether one relies on measures of evenness or exposure. The evidence on trends in segregation since the late 1980s, however, is less clear. On the one hand, Orfield and colleagues have argued that the period from 1988 to the present is characterized by a gradual trend of “resegregation” of black students (Orfield & Eaton 1997; Orfield 2001; Frankenburg & Lee 2002; Frankenburg et al. 2003; Orfield & Lee 2007). To support this argument, they generally rely on trends in exposure and isolation indices, reporting for example, that the black-white exposure index was 0.27 in 2005, down substantially from its peak of 0.36 in 1988 and even lower than its level of 0.32 in 1970 (Orfield & Lee 2007; Orfield 2001; Frankenburg et al. 2003). Similarly, the proportion of black students attending predominantly minority schools has risen from 63% in 1988 to 73% in 2005 (Orfield & Lee 2007).

In contrast, other scholars have argued that segregation has not risen significantly in the last two decades. Using measures of evenness, Logan and colleagues find a very small increase in black-white between-school segregation during the 1990s (Logan et al. 2002, 2008; Logan 2004; Logan & Oakley 2004). Similarly, Stroub and Richards (2013) find that black-white segregation in metropolitan areas rose very modestly from 1993-1998, but then declined from 1998-2009, for a net decrease in average between-school metropolitan area segregation over the period from 1993-2009. Black-white segregation between school districts also increased slightly during the 1990s and remained higher than segregation within school districts (Clotfelter 1999; Reardon et al. 2000; Logan et al. 2008; Logan & Oakley, 2004). During the 2000s, however, between-district racial segregation declined slightly, but remains high (Stroub & Richards 2013).

Researchers have paid special attention to segregation trends in the South, given the historically high levels of segregation and the focus of desegregation litigation on the region. Orfield and colleagues argue that the resegregation of black students since 1988 is particularly pronounced in the South and in the border states. By most measures, the South has been the least segregated region of the country since the early 1970s, but it moved rapidly back to 1968 segregation levels (as measured by black-white exposure) beginning in the late 1980s (Orfield and Lee 2007). Several studies find that black-white segregation in the South increased during the 1990s, whether measured using the exposure index or Theil's entropy index, an evenness measure which assesses segregation while taking demographic changes into account (Yun & Reardon 2002; Reardon & Yun 2003; Stroub & Richards 2013). The increase, however, is not large, and reversed following 1998 (Stroub & Richards 2013).

The debate about whether the last two decades can be characterized as a period of "resegregation" largely hinges on whether one uses exposure or evenness measures of segregation. The trends noted by Orfield and colleagues are due in part to changes in the racial composition of the U.S. public school student population, which is substantially less white than it was 25 years ago. Because of this, measures of black-white exposure would be expected to decline, even if the reduction in white enrollments happened uniformly across all schools so that evenness measures did not change (Logan 2004; Fiel 2013). Thus, it seems fair to say that the last 25 years have been characterized by largely stable patterns of sorting of students among schools (unevenness) while the racial/ethnic composition of the student population has changed substantially, a pair of trends that yields declining black-white exposure measures but no significant change in evenness measures of segregation. Whether this represents progress or stagnation depends on one's theory of how and why segregation matters.

2.c. Trends in Hispanic-White, Asian-White, and Multiracial Segregation

Given the historical context of the *Brown* case and its focus on black-white segregation, less research has examined segregation among students of other races. Changing racial classifications, particularly with regard to Hispanics, also limits the documentation of long-term trends in segregation of other groups. As the student population has become more multiracial, new efforts have been made to document segregation among all groups. Orfield and colleagues, again relying on exposure measures, argue that Hispanic students have experienced continually increasing segregation from whites since 1968, as Hispanic students' exposure to white students has steadily fallen since the late 1960s and representation in majority-minority schools has steadily risen (Orfield 2001; Frankenburg & Lee 2002; Frankenburg et al. 2003; Orfield & Lee 2007). Evenness measures of segregation, however, show only a very slight increase in Hispanic-white and Asian-white segregation during the 1990s and 2000s (Logan et al. 2002; Stroub & Richards, 2013). The discrepancy between these findings, again, is due to the difference in segregation measures used.

Three studies assess the trends in multiracial segregation in the last two decades (Reardon et al. 2000; Stroub & Richards, 2013; Fiel 2013). Each uses an index (Theil's H) that assesses the evenness with which white, black, Hispanic, and Asian students are distributed among schools. The studies conclude that segregation between whites and non-whites was flat or increased very slightly during the 1990s while segregation among minority groups declined during this time. However, from 1998-2009, segregation between whites and minorities declined modestly, while segregation among minority groups continued to decline; as a result, multiracial segregation was 10% lower in 2009 than in 1993 (Stroub & Richards, 2013).

2.d. Trends in Economic Segregation

Many scholars have documented the high levels of poverty in majority-minority schools, arguing that school segregation concentrates minority students in high-poverty schools, which tend to have lower resources and student achievement (Orfield 2001; Frankenburg et al. 2003; Orfield & Lee 2005, 2007; Logan et al. 2012; Saporito & Sohoni 2007). Orfield & Lee (2007) show that in

2005, the average black or Latino student attended a school in which 60% of students were poor; the average white student attended a school in which a third of the students were poor.

While researchers note the link between racial and economic school composition, there is surprisingly little research explicitly measuring economic segregation among schools. Studies of residential income segregation show that neighborhood income segregation grew considerably between 1970 and 2009 (Reardon and Bischoff 2011a; 2011b; Watson 2009; Jargowsky 1996). Much of the growth in income segregation was due to the increasing segregation of the rich from all other families. These trends would suggest that economic school segregation may have increased as well over the last 40 years, since most children attend school relatively near their neighborhood. Studies of school segregation, however, are limited by the fact that there is no systematic source of detailed family income data at the school level. Instead studies of school segregation measure income using free lunch eligibility, a very coarse measure of income that may obscure patterns of segregation at the high or low ends of the income distribution. Nonetheless, studies using these data show that economic segregation increased modestly in the 1990s, particularly in elementary grades and in large school districts (Rusk 2001; Owens et al. 2013), but economic segregation did not change appreciably in the 2000s (Owens et al. 2013). These patterns do not match the reported neighborhood segregation trends (Reardon & Bischoff 2011a; 2011b), though it is not clear whether that is due to the fact that they rely on a much coarser measure of income or because school enrollment patterns have not mirrored neighborhood segregation patterns closely. However, one other study (Altonji & Mansfield 2011) provides suggestive evidence that segregation by family income between schools did indeed follow the neighborhood segregation trends: the proportion of variance in family income between schools rose in the 1970s and 1980s but declined in the 1990s.

Although it is difficult to measure trends in income segregation between schools, it is possible to estimate levels of between-district segregation using Census data that tabulates the

number of school age children, by family income, enrolled in public school in each school district in the U.S. Using these data, Owens and colleagues (Owens 2013; Owens et al. 2013) find that between-district economic segregation among public school students increased during the 1990s and the 2000s in three-quarters of the 100 largest metropolitan areas. This increase was largely driven by increases in segregation in the top two-thirds of the income distribution. Taken as a whole, the trends in income segregation suggest that students have grown more segregated between districts, but segregation within school districts has remained relatively constant over the last 20 years.

2e. Factors Shaping Trends in School Segregation

Court-ordered desegregation was the single most important factor shaping the rapid declines in segregation in the 1960s and 1970s. Segregation declined sharply in school districts in the years immediately following court orders and implementation of desegregation plans (Guryan 2004; Reber 2005; Johnson 2011; Lutz 2011). However, other factors mattered as well. Logan and Oakley (2004) note that desegregation also occurred in many districts that did not have desegregation plans in place. For example, in the South, the dissimilarity index fell from 0.72 to 0.30 in districts not covered by desegregation plans and from 0.87 to 0.47 in districts that were subject to desegregation plans from 1968 to 2000. Therefore, declines in segregation during this time also occurred in response to other federal government actions aimed at equal rights and racial equality, districts preemptively undertaking voluntary desegregation plans before legislation occurred, and district leaders finding desegregation to be a worthy social and educational goal (see also Cascio et al. 2010). Even if districts were not subject to desegregation legislation, the shift in the legal and social environment and enforcement by political leaders contributed to declining segregation in nearly all districts.

Because court-ordered desegregation generally dealt solely with patterns of within-district, between-school segregation, legal desegregation efforts were largely ineffective at reducing

between-district segregation. In 1974, the Supreme Court's *Milliken v. Bradley* (418 U.S. 717) decision ruled out court-ordered inter-district desegregation plans, unless it could be shown that the state was responsible for between-district segregation patterns, a burden of proof difficult to meet. This is one reason that today racial segregation is higher between districts than within districts, between schools (Stroub & Richards 2013). Fiel (2013) shows that the high degree of sorting by race between school districts is more consequential for minority student isolation and exposure to whites than within-district sorting.

There is some evidence that desegregation efforts also contributed to increasing between-district segregation, as a result of so-called “white flight”—the movement of white families to districts with fewer blacks in order to avoid racially integrated schools (Coleman et al. 1975; Farley et al. 1980; Rossell 1975; Wilson 1985). Although some of the decline in white enrollments in desegregating districts can be attributed to declining white birth rates, several studies suggest that white flight in response to desegregation also played a substantial role (Welch & Light 1987; Reber 2005). Reber (2013) shows that white enrollment losses reduced the effects of desegregation plans by about one-third.

In addition to white flight to other districts, whites also left the public school system. In response to desegregation in the 1960s and 1970s, white enrollment in private schools increased, particularly in majority black school districts (Clotfelter 1976, 2004) Reardon and Yun (2003) found that this pattern continued into the 1990s in the South; further, they find that the between-district public school segregation was about 40% higher than residential segregation, as a result of high rates of whites private school attendance in majority black districts. In contrast, Logan et al. (2008), however, find mixed evidence that the availability of private schooling is associated with racial segregation from 1970 to 2000.

Since the 1980s, several countervailing trends have operated to keep segregation levels relatively stable. The changing legal context led to increases in segregation levels in some districts.

Between 1990 and 2010, hundreds of districts that had court-ordered desegregation plans were released from court oversight (Reardon et al 2012). As a result, these districts became, on average, increasingly segregated (U.S. Commission on Civil Rights, 2007; An & Gamoran 2009; Clotfelter et al. 2006; Lutz 2011; Reardon et al. 2012). In addition, the Supreme Court's 2007 decision in the *Parents Involved in Community Schools v. Seattle School District No. 1* (551 U.S. 701) outlawed the use of students' race in voluntarily-adopted school assignment plans, making it harder for districts to voluntarily desegregation.

One potential countervailing force to this changing legal climate is the increased use of socioeconomic-based student assignment plans (SBSAs), which attempt to create socioeconomic integration in schools. Although there are some successful examples (Kahlenberg 2002, 2006), most SBSAs have done little to reduce either socioeconomic or racial segregation (Flinspach et al. 2003; Reardon et al. 2006; Reardon & Rhodes 2011). The student assignment plans in place today, then, are much weaker than desegregation plans of the 1960s and 1970s that substantially integrated schools.

A more powerful countervailing force to the retreat from desegregation efforts is the gradual decline in racial residential segregation. Black-white racial segregation has declined slowly and steadily from 1980 to 2010; segregation between non-Hispanic whites and Hispanics and non-Hispanic whites and Asians has remained fairly stable (and lower than black-white segregation) during this time (Farley & Frey 1994; Logan et al. 2004; Logan & Stults 2011; Iceland & Sharp 2013). Because residential patterns partly determine school segregation patterns, this decline in residential segregation has likely partially offset some of the increasing segregation due to the decline in desegregation efforts. Nonetheless, although residential patterns are important, they are not determinative of student body composition for several reasons. First, neighborhood and school attendance zones map onto one another imperfectly. Second, many districts do not operate neighborhood schools, instead offering assignment and choice plans through which students could

attend school outside their neighborhood. Third, some parents opt to send their child to private school. Reardon & Yun (2003) provide evidence that residential and school segregation do not necessarily follow one another: in the South, black-white neighborhood segregation declined in the 1990s while school segregation increased slightly in many Southern states and metro areas.

Finally, one reason that between-district segregation may have increased in recent decades is that large-scale residential patterns, which particularly affect segregation between school districts, has rose in the 1990s (Lee et al. 2008; Reardon et al. 2009). Consistent with this trend, between-district racial segregation rose through the 1990s (Rivkin 1994; Clotfelter 2001; Reardon et al. 2000; Stroub & Richards 2013).

3. Consequences of School Segregation

3.a. A Stylized Model of Segregation Effects on Students

Prior to reviewing the evidence on the consequences of segregation, it is useful to consider the mechanisms through which school segregation may affect student outcomes. Here we lay out a very general model for thinking about how segregation might affect students.

We can think of each school as having a set of resources that are beneficial to their enrolled students. These resources may include the physical facilities of the school, the skills of the teachers and staff, the school climate and curriculum, the social capital of the parents of the enrolled students, and so on. To the extent that a student's peers' characteristics—such as their academic skills, socioeconomic status, and race—affect his or her academic or social outcomes (including attitudes, beliefs, friendship patterns, etc.), we can consider aggregate student characteristics as a potential school resource as well. Suppose a student outcome Y is affected by the availability of various school resources (denoted R_1, \dots, R_K) and by other factors. Then we can write (assuming an additive linear relationship between resources and outcomes):

$$Y = \sum_k a_k R_{ks} + e.$$

[1]

Here a_k is the effect of school resource k on student outcome Y . The model is, of course, oversimplified by its linear nature and assumption that resources have the same effects on all students, but it is a useful stylized model for our purposes here.

Schools will, in general, differ in the degree to which they have access to various types of resources, in part because some of the potential resources are tied to the student composition, and in part because school districts and governments have some control over the allocation of certain types of resources among schools (they may determine who teaches in which schools, or how financial resources are distributed among schools). Moreover, the total amount of such resources within a school system need not be fixed—states may allocate more or less money to schools; districts may be more or less successful at recruiting skilled teachers; parents with resources and social capital may move in or out of the district; and so on. In a general sense, then, segregation may affect both the total quantity of a given resource within an educational system and the allocation of the resource among schools. A stylized model of the association between the availability of resource k in school s could be written

$$R_{ks} = b_k V_d + c_k P_s + u_{ks},$$

[2]

where P_s is the proportion black (or proportion poor, or some other measure of school composition) in school s and V_d is the variance ratio measure of segregation (a measure of evenness; see Coleman, 1975) in the school district. We use the variance ratio for simplicity here, as it makes the derivations below straightforward.

It is useful to consider, in concrete terms, what the coefficients in Equation [2] represent. The coefficient b_k indicates the relationship between the segregation level of the district and the

total quantity of resource R_k available in the district. Because V_d is constant across schools in a district, the quantity $b_k V_d$ is constant across schools for a given value of segregation. For example, in the South, prior to the *Brown* and *Green* decisions, Southern states spent very little on black schools relative to what they spent on white schools. Desegregation, however, led to rapid increases in state spending on education, driven by white-controlled legislatures' desire to ensure that white students' school quality did not decline with integration (Johnson 2011). In this case, the state invested fewer total resources in the segregated school system than in the desegregated system, implying that $b_k < 0$ when R_k measures financial resources. However, segregation might also lead to higher total available resources. For example, if segregation between schools causes more high-income families to remain in a school district, and if we think of such families as a resource to the schools their children attend (perhaps because they have more political power, on average, or because they serve as role models for their children and their children's classmates, or because they are more likely to have time to volunteer or be otherwise involved in the school), then segregation may lead to greater total resources in the district. In this case, $b_k > 0$ when R_k measures parental social and economic capital.

A second way that segregation may affect students is by affecting how the district's available resources are distributed among students. This is described by the coefficient c_k in Equation [2], the association between school racial composition (proportion black) and the availability of resource R_k in a district. For example, suppose that, within a district, more skilled teachers are more likely to teach in low-poverty schools than in high-poverty schools (perhaps because higher-income parents are able to persuade district leaders to assign certain teachers to their children's schools, or because high-poverty schools are less able to attract and retain the most skilled teachers). If this is true, then segregation may heighten the disparity in the average quality of teachers available to poor and non-poor students within a district, implying $c_k < 0$ if R_k measures teacher quality. Similarly, if peers affect one another's academic or social outcomes, then

segregation may lead to a more unequal distribution of peer resources among schools: poor students will have less exposure to higher-achieving classmates (given the correlation between income and academic skills prior to school entry) than will non-poor students, again implying $c_k < 0$ when R_k measures average student academic skills. Conversely, if districts react to socioeconomic segregation among schools by allocating more of their resources to high-poverty schools, then segregation may (in principle) lead to a positive disparity (more resources in the school of the average poor student than the average non-poor student). In this case, $c_k > 0$.

Note that in the above discussion, our point is not to make claims regarding whether and how specific resources affect student outcomes, nor to assess how the quantity or allocation of resources is affected by segregation. Rather, our point here is to suggest two general classes of mechanisms through which segregation may affect student outcomes: by affecting the total pool of available resources in a school district (in which case $b_k \neq 0$); and/or by affecting the distribution of available resources among schools (in which case $c_k \neq 0$).

From the model above, we can derive several useful relationships. First, note that Equations [1] and [2] imply that the average outcome in the district will be

$$\begin{aligned}
 E[Y|d] &= \sum_k a_k E[R_{sk}|d] + E[e|d] \\
 &= \sum_k a_k (b_k V_d + c_k E[P_s|d]) \\
 &= \sum_k a_k b_k V_d + a_k c_k P_d \\
 &= V_d \sum_k a_k b_k + P_d \sum_k a_k c_k \\
 &= b^* V_d + c^* P_d,
 \end{aligned}$$

[3]

where P_d is the proportion black in the district as a whole and where $b^* = \sum_k a_k b_k$ and $c^* = \sum_k a_k c_k$. Note that in this stylized model, the average outcome Y in a district will be a function

of its segregation level. For simplicity here, assume that the racial composition of a district is held constant while its segregation level is altered; then b^* is the total effect of segregation on student outcomes. This total effect is the sum of the effects of each resource k that is both affected by segregation (i.e., $b_k \neq 0$) and that affects student outcome Y (i.e., $a_k \neq 0$). If segregation increases the availability of some resources and decreases the availability of others, then some pathways through which segregation affects outcomes may partially cancel each other out; that is, $b^* = 0$ does not imply that segregation has no effect on resources or that resources do not affect achievement. The key insight provided by this model is that we can think of the total effect of segregation as the sum of a set of mechanisms. Understanding if and how segregation affects student outcomes depends in part on knowing how segregation affects school district resources and how school resources affect students.

Equation [3] describes the relationship between segregation and average student outcomes. Next we consider how segregation affects disparities in school resources and student outcomes. Equation [2] implies that the difference in school resources in the schools of black and white students will be

$$\begin{aligned}
 E[R_{ks}|black] - E[R_{ks}|white] &= (b_k V_d + c_k E[P_s|black]) - (b_k V_d + c_k E[P_s|white]) \\
 &= c_k (\bar{P}_s^{black} - \bar{P}_s^{white}) \\
 &= c_k V_d,
 \end{aligned}$$

[4]

where \bar{P}_s^{black} and \bar{P}_s^{white} are the average proportion black in the schools of black and white students, respectively (these are exposure indices). Conveniently, the difference $\bar{P}_s^{black} - \bar{P}_s^{white}$ is equal to the variance ratio index measure of segregation V_d . Therefore, the difference in the exposure of black and white students to school resource R_k is determined by the segregation level of the district and the extent to which school racial composition affects the allocation of R_k among schools (c_k).

Finally, note that Equation [1] implies that the black-white difference in average student outcome Y will be

$$\begin{aligned}
 E[Y|black] - E[Y|white] &= \sum_k a_k (E[R_{kS}|black] - E[R_{kS}|white]) \\
 &= \sum_k a_k (c_k V_d) \\
 &= V_d \sum_k a_k c_k \\
 &= c^* V_d.
 \end{aligned}$$

[5]

Equation [5] makes clear that segregation will affect racial disparities in student outcomes if $c^* = \sum_k a_k c_k \neq 0$. That is, if school racial composition affects the allocation of resources among schools, and if those resources affect students, then segregation will lead to disparities in student outcomes.

This stylized model formalizes the two mechanisms through which segregation may affect student outcomes that we described above. First, if segregation changes the total pool of resources available to a school district, it will affect average student outcomes (so long as those resources affect student outcomes). And second, if school resources are allocated among schools in ways correlated with school racial composition, then segregation will lead to racial disparities in the outcome Y (again, so long as those resources affect student outcomes). Of course, this stylized model is overly simple—it assumes homogeneous, linear, additive effects of segregation and racial composition on school resources and of school resources on student outcomes—but it is nonetheless useful for clarifying the parameters of interest in understanding the effects of segregation.

3.b. Evidence on the Consequences of School Segregation

As is evident in the stylized model of segregation effects above, there are a number of parameters relevant to understanding the effects of segregation. The total effects of segregation on average outcomes and on disparities in outcomes are captured by the parameters b^* and c^* . It is useful to estimate these parameters, because they describe the total effects of segregation on average outcomes and outcome disparities, respectively. The individual a_k , b_k , and c_k parameters are also of interest, of course, because they describe the specific pathways through which segregation affects outcomes; knowing these parameters is useful from both the perspective of sociological theory and social policy. Direct estimation of any of these parameters, however, is complicated by the fact that school resources, segregation levels, and school racial composition levels are rarely ignorably assigned. There are, however, a small number of studies that provide credible estimates of some of these parameters.

Several studies estimate the impacts of school segregation by examining how black and white students' outcomes changed during the era of school desegregation. These studies use the exogenous variation in timing of desegregation court orders or implementation to estimate the effects of desegregation on students' outcomes and disparities in those outcomes (i.e., they estimate b^* and/or c^*). Guryan (2004) finds that desegregation led to a decline in black dropout rates during the 1970s of 2-3 points, accounting for about half the decline in the black dropout rate during this time. Johnson (2011) finds that blacks' odds of graduating from high school increased by about 1 percentage point and their educational attainment increased by about 1/10 of a year for every additional year they were exposed to a school desegregation order. Neither study finds significant effects on the educational attainment of whites, suggesting that school desegregation was not harmful for whites. In other words, they suggest that desegregation had a positive effect on average attainment and reduced racial attainment disparities. Other studies also find a positive relationship between school integration and educational outcomes for blacks (Boozer et al. 1992; Reber 2010).

In addition to educational attainment, scholars have examined the impacts of desegregation on later life outcomes (see Wells and Crain, 1994, for a review). Several studies show that increased exposure to school desegregation improved black adult males' earnings, reduced the odds of poverty, and increased the odds of working white-color jobs (Crain and Strauss 1985; Boozer et al. 1992; Ashenfelter et al. 2006; Johnson 2011).

Other studies find effects of desegregation on social outcomes like criminality and health. Exposure to desegregation orders reduces the probability of men's deviant behavior, homicide victimization, arrests, and incarceration (Johnson 2011; Weiner, Lutz, and Ludwig 2009) and improves adult health (Johnson 2011). Taking a multi-generational view, Johnson (2013) found that school desegregation affects not only those exposed to it, but also their children and grandchildren. Exposure to school desegregation positively affects the reading and math test scores, educational attainment, college quality, and racial diversity at college of the "children and grandchildren of *Brown*," with parent and grandparent educational attainment serving as a key mechanism.

Another way to assess the impact of school desegregation on student outcomes is to examine what happens once court orders have been dismissed. Lutz (2011) found that the dismissal of court-ordered desegregation plans increased black dropout rates outside the South, and Saatcioglu (2010) found that the end of desegregation policy in Cleveland led to higher dropout rates among black and Hispanic students. Vigdor (2011), however, found that the black-white test score gap did not widen among elementary schools following the end of busing in Charlotte-Mecklenburg. It could be the case that desegregation affects test scores and dropout differently, as little research examined test scores using variation in desegregation orders due to data limitations.

Finally, a few studies have examined the relationship between city or metro area segregation levels and test score gaps. Card and Rothstein (2007) examine the effects of neighborhood and school segregation on the black-white test score gap and find that the black-

white test score gap is higher in more segregated cities but that school segregation has no independent effect when neighborhood segregation is accounted for. Mayer (2002) finds that *neighborhood* economic segregation, which may be correlated with school economic segregation, increases educational attainment for high-income students but slightly reduces low-income children's attainment, with little net effect overall.

The studies reviewed here often try to test mechanisms that explain why desegregation improved black students' outcomes. Most focus on how segregation shapes the distribution of resources rather than the overall level available in the district (that is, they test whether $c_k = 0$). Generally, they find that desegregation in the South equalized the length of school year, student-teacher ratios, teacher quality, and per-pupil expenditures that the average black and white student experienced (Ashenfelter et al. 2006; Card & Krueger 1992; Guryan 2004; Johnson 2011; Reber 2010). Several studies also consider peer effects, arguing that exposure to white peers may benefit blacks because whites tended to be higher-SES, and they might be more highly motivated or higher achieving (Guryan 2004; Reber 2010; Ashenfelter et al. 2006; Saatcioglu 2010).

Finally, researchers acknowledge that the act of desegregation itself may have helped black students feel more enfranchised, optimistic about their futures, and dedicated to their studies, perhaps also increasing parental involvement, all of which could improve their educational outcomes (Ashenfelter et al. 2006; Guryan 2004). Desegregation may also increase the expectations of parents, teachers, and other adults who interact with black children (Johnson 2011).

3.c. Evidence on the Consequences of School Composition

A number of studies have tried to estimate the effect of school racial composition on student outcomes, as a way of understanding the effects of segregation (see Hallinan 1998, Vigdor and Ludwig 2008, Mickelson and Bottia 2009 for reviews). This can be problematic, however, because racial composition may not directly affect student outcomes, but may operate through its effect on

other resources. To see this, consider the result of substituting equation [2] into Equation [1] above:

$$\begin{aligned}
 Y &= \sum_k a_k (b_k V_d + c_k P_s + u_{ks}) + e \\
 &= b^* V_d + c^* P_s + e^*,
 \end{aligned}$$

[6]

where $e^* = \sum_k a_k u_{ks} + e$. Regressing Y on school racial composition (P_s), holding segregation constant, will yield an estimate of c^* , the total effect of racial composition on achievement, which is identical to the effect of segregation on racial disparities in outcomes. However, because schools are rarely assigned to have different racial compositions, the estimation of c^* from [8] will generally lead to biased estimates, unless the regression model includes adequate control variables or a quasi-experimental design is used to identify c^* .

Studies that include control variables in Equation [8], however, run the risk of increasing the bias in the estimates of c^* , however, if the covariates are affected by racial composition. To see this, consider the regression model below, where j indexes various school covariates (the X_j 's), some of which may be resources that affect student outcomes included in Equation [1]:

$$Y = b' V_d + c' P_s + \sum_j a'_j X_{js} + e'.$$

[7]

Allowing each X_j to be a function of district segregation, school racial composition, and some other factors uncorrelated with school composition, we can rewrite [7] in the same form as Equation [6]:

$$\begin{aligned}
 Y &= b' V_d + c' P_s + \sum_j a'_j (b_j V_d + c_j P_s + u_{js}) + e' \\
 &= \left(b' + \sum_j a'_j b_j \right) V_d + \left(c' + \sum_j a'_j c_j \right) P_s + e'^* \\
 &= b^* V_d + c^* P_s + e^*
 \end{aligned}$$

[8]

Equation [8] shows that the coefficient on racial composition in Equation [7] will be equal to

$$c' = c^* - \sum_j a'_j c_j.$$

[9]

Thus, fitting Equation [7] will not yield an unbiased estimate of c^* unless none of the school covariates included in [7] are associated with school racial composition (i.e., $c_j = 0$ for all X_j in the model). Put differently, controlling for downstream mediators of school composition will lead to biased estimates of the effects of school composition. Because it is not always clear which variables should be considered correlates of composition (which should be controlled for) and which should be considered downstream mediators of the effects of school composition (which should not be controlled for), there is an inherent ambiguity in regression-based estimates of the effects of school composition. In most cases, neither estimates of c^* from Model [6] or of c' from Model [7] can be considered to have a strong causal warrant, and should not be used to infer the effects of segregation.

As a result of these challenges, there are relatively few studies that provide compelling estimates of the effects of school composition. Several studies, however, use research designs that provide some plausible exogeneity in the sorting of students into schools. First, two studies use data from the Texas School Project and take advantage of plausibly random variation in cohort demographics over time. They find that a reduction in black enrollment increases reading and math test scores for black students and does not harm whites' test scores (Hanushek et al. 2002; Hoxby 2000). Second, several studies take advantage of random assignment of children to schools or neighborhoods to examine how changing school composition may affect educational outcomes. Sanbonmatsu et al. (2006) find no significant effects on test scores among children whose families received housing vouchers to be used in low poverty neighborhoods. Few children whose families

received housing vouchers and moved changed schools, however, so the study cannot test the impacts of exogenous changes in school environments on educational achievement. Schwartz (2010) takes advantage of the fact that Montgomery County randomly assigns students in public housing to different schools and compares the performance of those who attended the district's most versus least advantaged schools. She finds that by their fifth year of elementary school students from public housing in low-poverty elementary schools had significantly higher scores in math and reading than equally poor students assigned to high-poverty schools. These positive impacts accumulate over time—by the seventh year of school, low-income students in low-poverty schools outperformed their peers at high-poverty schools by 0.4 standard deviations in math and 0.2 standard deviations in reading. This study provides the best experimental evidence that school economic composition affects test scores.

4. Conclusion

Although the 1954 *Brown* decision is rightly hailed as the most significant Supreme Court decision concerning schools in U.S. history, it had little immediate impact on school segregation. Indeed, the most significant changes in school segregation in the United States did not begin until 1968, following the *Green* decision, after which black-white school segregation declined sharply over a period of 5-10 years. Over the last 25 years, however, and despite claims of re-segregation on the one hand (Orfield 2001; Orfield & Lee 2007) and “the end of the segregated century” on the other (Vigdor and Glaeser 2012), school racial segregation has changed very little. There have been modest decreases in the exposure of minorities to whites, but these have been driven primarily by demographic changes in the school-age population (Fiel 2013; Logan 2004). Segregation measured as unevenness has declined very modestly over the last two decades.

One of the conclusions evident from a review of the research on trends in segregation is that we know a great deal about trends in racial segregation among K-12 public schools, but relatively

little about a number of other dimensions of segregation. First, due to data limitations, we know relatively little about trends in economic segregation in the last two decades, and virtually nothing about economic segregation prior to 1990. Second, very few studies consider trends in segregation in postsecondary education (two recent exceptions are Hinrichs 2012; Carnevale & Strohl 2013) or in pre-school settings. Third, few studies examine trends in segregation between private and public schools or among private schools (but see Reardon & Yun 2002; Fiel 2013). And fourth, we have relatively little research on patterns and trends of within-school segregation, though studies of tracking (e.g., Oakes 1985; Lucas 1999), teacher assignment (Clotfelter et al. 2006; Kalogrides & Loeb 2013) and students' friendship networks (Tatum 1997; Moody 2001; Flashman 2013; Grewal 2012; Fletcher et al. 2013) suggest high levels of within-school segregation. We know very little about how these patterns have changed over time (though see Conger 2005, for within-school segregation trends in New York City). In each of these areas, research to identify the key patterns and trends would be very useful for understanding the extent to which schools have become more or less segregated along many dimensions.

Research on patterns and trends in segregation are generally motivated by a concern that segregation leads to racial and socioeconomic disparities in educational outcomes. Surprisingly, however, the sociological literature appears to lack a detailed and comprehensive theoretical model (or models) of exactly how segregation might affect educational and social outcomes. As a result, many studies estimate different parameters, all under the rubric of understanding the effects of segregation. Given the theoretical confusion in the literature, one of our aims in this review was to try to articulate a very general and stylized model for understanding how segregation might affect student outcomes and to characterize the types of parameters of interest in the issue. While our model is certainly incomplete and over-simplified, it may provide a useful framework for future theoretical specification.

Our model suggests that two types of parameters are of particular interest in the study of segregation: estimates of the effect of segregation *per se* on educational outcomes (what economists call “reduced form” estimates, and what sociologists think of as “total effects”); and estimates of the parameters defining the mechanisms through which segregation operates. To date, the research literature has been more successful at providing the first type of estimates, particularly in relationship to the effects of the segregation/desegregation in the 1960s and 1970s. Studies of this type show that desegregation led to improvements in the educational outcomes of black students while not harming those of white students. Studies of more recent segregation provide, however, weak and mixed evidence on the degree to which segregation is linked to achievement gaps today. Part of the reason for this disparity may be that some of the component mechanisms connecting segregation to educational outcomes have changed. Johnson (2011) and others argue that pre-1968 segregation was linked to substantial black-white inequality in school resources (inequalities that were substantially reduced by desegregation). Segregation today is not strongly linked to school resource inequality (in terms of financial resources). If segregation in the pre-*Green* era operated primarily through its effects on the inequality of school funding, it may be less consequential in the modern era of smaller funding disparities.

This last point indicates the need for much more theoretical and empirical understanding of the mechanisms through which segregation affects student outcomes. To this end, our conceptual model suggests that future research should focus on three types of questions to clarify the mechanisms through which segregation operates. First, how does the segregation of a schooling system affect the total quantity of available resources in the system? The list of resources of interest here should include not only financial resources, but a wide range of other resources, including human capital, social capital, peer characteristics, access to social networks, neighborhood conditions, and so on. Second, how are resources distributed among schools in relation to schools’ racial and socioeconomic composition? And third, how do these school

resources affect students' educational outcomes? These are not simple questions to answer, of course. Nonetheless, identifying and understanding the mechanisms through which segregation affects (or doesn't affect) students will likely do much more than will additional measurement of trends and patterns to advance our understanding of why and how segregation matters.

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