School Effects: Examining the Race Gap in Mathematics Achievement

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Abstract:

The gap in achievement between minority and non-minority students has become a national priority. To investigate the relationship between school racial composition and the race-based gaps in mathematic achievement, High School Effectiveness Study data on 3,392 students in 177 schools were analyzed. Multilevel analyses revealed that when at least half of the students in a school are Black or Hispanic, *all* student achievement is lower (for White as well as for ethnic minority students). Asian students' achievement remains lowered until the percentage of Black and Hispanic students is less than 15%. However, schools that are 30–49% Black and/or Hispanic have more egalitarian achievement between White and Hispanic students. Although there is no one-size-fits-all model, this research does confirm that being in a school with a high a concentration of Black and Hispanic students lessens all students' chances of academic achievement, even for students who otherwise should excel.

Keywords: Racial differences | Education | Academic achievement | Achievement gap | Minority groups | Race | Mathematics achievement

Article:

Introduction

Results from the National Assessment of Educational Progress (NAEP) data have documented the achievement gap over decades. The NAEP mathematics achievement gap between Hispanic and Black students in comparison to White students has remained large and significant since the inception of NAEP (beginning in 1973 for Hispanic students) and virtually unchanged since 1990 (U.S. Department of Education *2001*; Harris and Herrington *2006*). For Hispanics attending high school (17 years old), the gap began to narrow slightly in 1992, but began to widen again by 2004; a sharp drop occurred in Black student mathematics achievement in 1982 and 1990 (U.S. Department of Education *2001*). Since 1990, the gap between Black and White students has slightly widened. Though grouped under the category "other" in the early waves of NAEP, since

1990, Asian students have obtained mathematics achievement consistently higher than the achievement of all other racial groups since 1990 (U.S. Department of Education *2001*).

The gap in achievement between minority and non-minority students has become a national priority. Since the purpose of the *No Child Left Behind Act* (NCLB) is to close the achievement gap between high- and low-performing children, raising achievement levels among racial and ethnic minorities by closing racial achievement gaps is now a major objective of federal policy. This paper provides insight into the school context of achievement differentials between White and Non-White students. The goal of this research is to show how school racial composition is associated with the achievement gap.

Many researchers have attempted to understand, and some have tried to tackle the racial gap in educational outcomes. Bali and Alvarez (*2004*) documented that the Black–White achievement *gap* begins before the first grade, while the Hispanic-White *gap* in *mathematics* does not manifest itself until after the first grade. This gap continues to grow as students progress through the school system (Bali and Alvarez *2004*; Jencks and Phillips *1998*). By the time minority students reach high school the gap has grown so much that Black student achievement may be as much as 0.34 standard deviations below the population mean (Phillips et al.*1998*).

Background

Initially, the achievement differentials between White and non-White students were of no concern to educators. Children of color were seen as inferior to White children; there was no reason to expect that children of color would achieve at levels equal to the achievement of White children. Thus, there was limited research comparing the achievement (most often IQ score) of the child of color with that of the White child. Instead, earlier accounts proceeded on the assumption that children of color were deficient, for reasons that were genetic, biological, hereditary or based upon parenting style or family rearing (for more on this topic see the works of Arthur Jensen, Richard Herrnstein, Sandra Scarr, and Richard Weinberg). For years, the minority child was deemed deficient and diametrically inferior to the White child; the achievement gap was endemic and not worth trying to fix.

When the minority population began a quest for equality, achievement differentials were viewed differently. Brown v. Board of Education (*1954*) was one such equality initiative that focused on the lack of educational opportunities for children of color. The proposition in Brown was that Black children received a disservice by attending racially segregated schools that were not as well equipped as White schools. This differentiated system of resources was created by segregation and as such was supposed to be rectified by desegregation efforts. The quest for equality negated the genetic deficit/ family deficit models; instead, focus shifted to the school environment as the impetus of differentiated outcomes.

The Brown v. Board of Education ruling and subsequent desegregation of America's public schools generated an abundance of research on the significance of the school racial composition for student academic outcomes. Since then, the question of how school racial composition influences student achievement outcomes has been framed in different ways. Early research on desegregation focused on whether desegregated schools were beneficial for minority students while not being detrimental for White students. Results indicated that this was the case (Krol *1984*).

After the process of desegregation was accepted as legitimate, attention shifted from the outcome of initial desegregation efforts, to outcomes associated with schools with different racial compositions. *Equality of Educational Opportunity* by Coleman et al. (*1966*) showed that students within schools with larger percentages of White and affluent students had higher achievement; even after statistically taking into account their individual race and social class. Since this publication, empirical research has documented the impact of school structural factors on the performance of racial minorities, noting that student outcomes vary in different types of schools. Theories, policy, and research now have focused on school composition as well as school inputs (such as the curriculum and climate) as the reason for the race gap.

Previous Research on School Racial Composition

Once desegregation was not seen as harmful to White students and thus would remain a part of education policy, researchers began to examine the influence of school racial composition on the achievement of minority students. Although some have argued that it was not school desegregation that caused minority student achievement to increase (Armor *1995*), the bulk of research demonstrated desegregation had a positive effect on the achievement outcomes for minority students (Wells and Crain *1994*; Braddock and Eitle *2004*).

However recent research has shown the negative impact that continuing, de facto racial segregation (since the passing of Brown v. Board of Education) has on the achievement of minority students (Borman et al.*2004*; Brown-Jeffy *2006*; Hanushek et al. *2002*). A decade ago Roscigno (*1998*) found a strong influence of racial segregation on student mathematics achievement. Bankston and Caldas (*1996*) found that the mathematics score of Black students was 5.7 percentage points higher in predominantly white schools than in predominantly black schools.

Like Coleman et al. (*1966*), Borman and Dowling (*2006*) found that both school racial composition and social class composition influence student educational outcomes. They also found that the school effect influenced educational outcomes more than students' family backgrounds. Others contend that, in fact, it is the social composition of the school that is significant. Because race is highly correlated with socioeconomic status, they argue, the effect of school racial composition could be the result of concentrated poverty (Kahlenberg*2001*; Rumberger and Palardy *2005*).

The mechanisms through which school racial composition influences achievement outcomes are complex. Schools with larger percentages of Black and Hispanic students also are more likely to be urban public institutions having a higher percentage of students that are from socioeconomically disadvantaged backgrounds; including many who live in poverty (Lee and Bryk *1989*; Fan and Chen *1999*; Orfield and Lee, *2004*; Sterbinsky et al. *2006*). These schools are likely to possess a weaker academic climate, have lower expectations of their students, and offer fewer advanced courses (Kahlenberg *2001*; Lee and Burkham *2002*; Natrieilo et al. *1990*). In addition, social interactions within schools may vary based upon the racial composition of the teachers and student body (Finn and Voelkl *1993*, Weiher *2000*). In short, Black and Hispanic students often are disadvantaged because of the particular characteristics of the schools they attend. Schools with more minority students have fewer crucial educational resources.

Where We are Now

The recent demise of many school desegregation policies has impacted efforts to close the achievement gap between White and non-White students. As school desegregation plans were being terminated, results of efforts to narrow the achievement gap began to stall. The student achievement and desegregation (or at least the school racial composition) are somehow linked.

In light of recent policy decisions to reject the use of race in student assignment, this research asks whether there are modifiable influences on student performance that schools can introduce to lessen the racial achievement gap in mathematics. I examine how students fare in schools with different racial compositions. I hypothesize that structural differences in school organization are at least as important as social or personal characteristics of students and their families in affecting student performance. Differences in the structural practices of schools affect student responses differently among differing social minorities. Consequently uniform solutions may not solve academic problems. Focusing on the early 1990s when the convergence of the Hispanic–White and Black–White achievement gaps ended, this research will focus on structural aspects of school that may have led to this initial change in the size of the achievement gaps.

The social composition of the school can have significant effects on student achievement, independent of student background characteristics. The collective enterprise occurring within classrooms and schools, which can be strongly affected by who attends the school, affects student outcomes.

Data and Measures

To investigate the relationship between school racial composition and the race-based gaps in mathematic achievement data was obtained from the High School Effectiveness Study (HSES), which was developed as part of the first follow-up of the Department of Education's National Educational Longitudinal Study of 1988 (NELS). NELS is a nationally representative probability sample of eighth graders in all public and private schools containing eighth grades in the fifty states and the District of Columbia. In 1990, a subset of the original NELS students in 247

schools located in the 30 largest metropolitan statistical areas (a central city, its entire urban area, and the remainder of the county or counties in which the urban area is located) were selected to be part of HSES. Thus, the data were augmented with about 6,000 more students to achieve an optimal sample size of approximately 30 students per school. In addition to academic testing, information was collected from parents, students, teachers, and the head school administrator.

Because the focus of this study is on school effects, students who changed schools between the 10th and 12th grades were excluded from this analysis. Thus the base analytic sample consists of high school students who attended the same school during the 10th and 12th grades. In addition, schools and students without full information on all variables were excluded, so this sample consists of 3,392 students in 177 schools. Sample statistics are presented in Table 1.

[Table 1 Omitted]

Dependent Variable

In this study, the dependent variable is 12th grade mathematics achievement. The Item Response Theory (IRT) Estimated Number Right Score uses the pattern of right, wrong, and omitted items to create an ability scale. With IRT scoring, it is possible to measure gains in achievement from the 10th to the 12th grade years. The 81-item exam gauged students' understanding of whole numbers, decimals, fractions, powers and root, problem solving, and simple and complex multi-step word problems (Scott et al. *1996*). The mean 12th grade mathematic IRT score is 51.52 correct responses out of 81 (SD = 15.40).

Independent Variables

Student Level

Race, gender, and social class are the source of much of the inequality that exists in American society. Race, gender, and socioeconomic differences in mathematics achievement begin early and continue throughout the educational experience (Jencks and Phillips *1998*; Lee and Burkham *2002*; Penner and Paret *2008*). As such, the achievement differences among these groups are seen at most grade levels. At the individual student level, this study utilizes a select set of sophomore year (10th grade) student characteristics to predict the 12th grade mathematics achievement. Fifty percent of the sample is male. Socioeconomic status (SES) is a *z*-scored construct calculated from the father's education level, mother's education level, father's occupation, mother's occupation, and family income. This variable is scaled such that higher values indicate the family has a higher SES level. To capture the influence of prior mathematics ability, student 10th grade mathematics achievement score is used. The mean 10th grade mathematics IRT score is 47.94 correct responses out of 81 (SD = 16.25).

The racial categories, Black, Asian, Hispanic, and White, are used in this analysis. Eleven percent of the sample is Asian, 16% Black, 13% Hispanic, and 60% White. Native American

students are excluded from this analysis because their small number (less than 1%) does not permit accurate estimates. Table 1 shows the mathematics achievement differential by race. The average 10th grade mathematics achievement score is 36.79 for Black students, 39.11 for Hispanic students, 52.78 for Asian students and 49.42 for White students. The average 12th grade mathematics achievement score is 41.56 for Black students, 43.75 for Hispanic students, 59.01 for Asian students and 54.55 for White students.

As Table 1 makes clear, Black and Hispanic students tended to score lower on the mathematics test than White or Asian students in both the 10th grade and the 12th grade. “Mean scores” show the average score found in each racial group. Thus in the 10th grade, the average score for a White student was 49 out of 81 possible correct answers. Asian students fared even better: they averaged three more correct answers than White students. In contrast, the average Black 10th grader answered almost 37 out of 81 problems correctly. Hispanic 10th graders averaged about 39 correct answers.

The *range* of scores also differed by race. The standard deviation shows the range of scores found for 69% of the students in that group (if you double the standard deviation score, you see the range within which 95% of the students fell). Sixty-nine percent of the White 10th graders had scores between 36 and 63. For Asian students, this score was 40 to almost 66, while Black students’ scores ranged between 24 and 49. For Hispanic 10th graders, the mathematics score standard deviation range fell between about 27 and 51 correct answers out of 81 possible. Thus there was a clearly visible racial mathematics achievement gap by the 10th Grade. Moreover, this racial gap in achievement continued in the 12th grade. White students now averaged 54 correct answers out of a possible 81; Asian students averaged not quite 59 correct answers, contrasted with not quite 42 correct answers as the mean score for Black students, and an average score of almost 43 correct answers for Hispanic students. Thus Black students’ average 12th grade mathematics achievement score remained about 13 points lower than the White students’ average score, and 17 points lower than the Asian students’ average score. Hispanic students’ average 12th grade mathematics achievement score remained almost 11 points lower than the White students’ average score, and 15 points lower than the Asian students’ average score.

School Level

Since the Coleman report, school factors, particularly the composition of who attends the schools, have been an important consideration in the analysis of student academic outcomes. School processes and structures have value in explaining differences in student outcomes. Urban schools have a long track record of failure (Blanchett et al. *2005*). School sector (public, private, or Catholic) has also been addressed in the literature as graduates of Catholic and private schools tend to have better outcomes (Bryk et al. *1993*; Coleman and Hoffer *1987*) In this sample, 32% of the schools are suburban, 14% are located in small cities, and 54% are located in large cities (the comparison group). Sixteen percent of the schools in this sample are private, 15% of the schools are Catholic, and 69% are public (the comparison group).

Schools comprised of students from more affluent families tend to have better academic outcomes (Coleman et al. *1966*). School SES was aggregated from student SES. As with individual SES, average school SES is a *z*-scored variable where higher values indicate the school contains more students with higher SES level (a high SES school) and lower levels indicate the school has more students with lower SES. Schools also vary in terms of the percent of students enrolled in the academic (i.e., college prep) track. The average administrators' calculation of the percent of the school population enrolled in the academic track is 61.41% (SD = 33.05).

Interpersonal aspects of schools also are significantly related to academic outcomes (Finn and Voelkl *1993*, Weiher *2000*). "Teacher collegiality," a scale that captures the importance of staff cooperation, is created from variables that measure whether the surveyed teachers perceive that the goals and priorities of the school are clear, there is great cooperation among the staff, the schools seem like a big family, they can count on the staff for help, and colleagues share the same beliefs about the mission. This scale has an alpha reliability statistic of 0.79. "Academic press" is an indicator of the degree to which teachers pressure students to achieve, students place high priority on learning, students are expected to do work, and students are encouraged to enroll in academic courses. This scale has an alpha reliability statistic of 0.78. The scale measuring "student–teacher relationships" is an aggregate of student measures of how well students get along with teachers, if students feel teaching is good, if students feel teachers are interested in students, how often students feel put down by teachers (reverse coded), and whether they feel most teachers listen to students and praise their efforts. This scale has an alpha reliability statistic of 0.75. Because these measures of school organization have no natural metric, they were standardized to a mean of zero (0) and a standard deviation of one (1). For these standardized scales, higher values indicate that more teacher collegiality exists, there is more academic emphasis and there are better student teacher relationships within the school. Lower values indicate there is less teacher collegiality, less academic pressure, and worse student teacher relationships in the school. These scales have alpha reliability statistics greater than 0.70, making them acceptable measures (Darren and Mallery *1999*).

The distribution of Black and Hispanic student enrollments in American schools do not follow the normal bell shaped curve distribution. Instead the curve is bimodal, with many schools having a small percentage of Black and Hispanic students while other schools have a large percentage of Black and Hispanic students. The influence of school racial composition is thought to have a threshold effect. Prager et al. (*1986*) found that the critical percentage of Black students necessary for the success of Black students was between 9 to 28%. Kanter (*1977*) found in groups of fewer than less than 15% minority, those in the minority are seen as tokens, and this affects group dynamics. Larger percentages of minority students in schools have been associated with negative outcomes for students (Borman and Dowling *2006*, Brown-Jeffy *2006*). Thus research seems to indicate that different racial compositions are associated with varied outcomes for students.

To measure school racial composition, Black and Hispanic students were grouped together for this analysis because both groups are socially and academically disadvantaged. Asian students were grouped separately, even though they are non-White, because their achievement, racial isolation, and life chances are significantly different from Black, Hispanic, or Native American students (Kao *1995*; Kao and Thompson *2003*). Here school racial composition is broken into four groups: 50% or more Black and/or Hispanic (35% of the schools), 30–49% Black and/or Hispanic (10% of the schools), the comparison group 15–29% Black and/or Hispanic (18% of the schools), and less than 15% Black and/or Hispanic (37% of the schools). The racial composition of the teaching staff is measured as the percentage of Hispanic and Black teachers in the school. On average schools have 14.2% Black and/or Hispanic teachers (SD = 17.34).

Analysis

This study uses Hierarchical Linear Modeling (HLM), which makes it possible to examine school differences in mathematics achievement while simultaneously examining the race based gap in student mathematics achievement scores. HLM also measures the variance in outcomes that is attributed to the differences within schools. Forty percent of the total variance in mathematics achievement scores can be attributed to differences within schools. This research examines that school based variability.

The first step in HLM involves establishing a base-line model which only uses student-level predictors of student scores on the mathematics achievement tests. This level-one, within-school, model includes student race, SES, gender, and 10th grade mathematics achievement. The level-one model accounts for the fact that Black students, Hispanic students, and lower SES students tend to have low mathematics achievement. These variables measured during the 10th grade year serve as predictors of 12th grade achievement. The level-one model presented in Table 2 also examines whether the race-based differences in mathematics achievement are changed in various types of schools.

[Table 2 Omitted]

The level-two models presented in Table 3 spotlight the influence of schools on student achievement. More specifically, these level-two models examine, first, how average mathematics achievement differs in schools with various characteristics. Then the models examine the race gap in mathematics achievement seen within these same schools. Within the three models presented, both the average mathematics achievement between schools and the mathematics achievement differential between the races are presented. The outcome models presented in Table 3 are analyzed simultaneously with the student-level characteristics presented in Table 2.

[Table 3 Omitted]

Results

As shown in Table 2, which looks only at how personal characteristics of students affect achievement, the average mathematics achievement score is 52.19. Results indicate that students with higher 10th grade mathematics scores tend to have higher 12th grade mathematics achievement scores. Male students tend to have higher mathematics achievement scores than female students, and students from higher SES households have higher mathematics achievement scores. The table also shows the importance of SES as a determinant of student mathematics achievement. SES (a continuous variable) is the largest coefficient, thus having the greatest effect on mathematics achievement. It will be important to remember this strong SES effect as the school level characteristics are considered. Tests for statistical significance show that these findings are not resulting from the accident of which students or schools were included in this sample.

The disadvantage of Black and Hispanic students is clearly shown in Table 2. While all racial groups gained achievement between the 10th and 12th grades, on average, Black students' gains were smaller between the 10th and 12th grade tests: on average, Black students gained 1.74 fewer points than White students in mathematics, Hispanic students gained 1.80 fewer points than White students, while Asians students gained 2.66 points more than White students between the 10th and 12th grades. Although these coefficients do not seem large, they must be considered in the context of the existing racial gap in achievement that already existed in the 10th grade. Black and Hispanic students tend to have achievement scores that are lower than their peers throughout their educational experience (Jencks and Phillips *1998*; Rigsby et al. *1997*; Stevens et al. *2004*). Not only are their achievement scores lower when they start school, Black and Hispanic students also gain less in mathematics between the 10th and 12th grade year. These results underline the point that White and other students begin their education experiences at different levels (Bali and Alvarez *2004*) and that they also experience different learning trajectories throughout their educational career, exacerbating the achievement gap at the end of high school. Thus, when taking into account the 10th grade scores, the 12th grade mathematics achievement gap between Black and White students leaves Black students ten points behind, the mathematics achievement gap between Hispanic and White students leaves Hispanic students eight points behind, and the mathematics achievement gap between Asian and White students leaves Asian students almost five points ahead.

The Chi-square statistics listed at the bottom of Table 2 test whether the difference in mathematics achievement varies significantly between schools in a way that could not occur by chance (for all tables presented here, readers should pay most attention to the results that are statistically significant; i.e., which indicates that they could expect to be found even if a different collection of schools had been sampled.). The Chi-square statistics for the intercept (mean achievement differences between schools) at the bottom of Table 2 shows that average mathematics achievement does, indeed, vary across schools. The chi-square statistic also shows not only that the achievement of students differs by the race of the student, and that the Black and Hispanic gaps are different across schools.

The Asian–White gap does not vary significantly between schools, but this gap will still be examined for comparative purposes. For years, Asian students have been treated as the other (even with NAEP data), receiving limited inclusion in research. Yet their achievement has consistently been greater than that of White students (Kao and Thompson *2003*). Although Asian students are classified within the US racial minority category, their achievement outcomes are not comparable with other minority groups in the United States (i.e., Blacks, Hispanics, and Native Americans). As their achievement is significantly different from White students, research should include an analysis of the Asian achievement gap as well.

The Cases: Looking at Differences in Schools with Differing Racial Composition

Table 3 shows the results of the between-school analyses. The top half of this table shows *average school achievement* among schools of different types. The bottom half of the table shows the *race/ethnicity gap*within these schools. The race/ethnicity gap can be estimated only in schools where there are students from both racial groups being examined. Because of this, not all 177 schools are used in the separate race gap multilevel analyses. Of the 177 schools, 120 schools are used in the analysis that included an estimate of the Black–White mathematics achievement gap, 115 schools are used in the analysis that included an estimate of the Hispanic–White mathematics achievement gap, and 103 schools are used in the analysis that included an estimate of the Asian–White mathematics achievement gap. Thus, the three cases do not include identical schools.

Case One: Schools with Both White and Black Students

The top half of Case One in Table 3 shows how average achievement differs in the 120 schools that have both Black and White students enrolled. Of all of the school characteristics, only school racial composition has a statistically significant relationship with the average mathematics achievement level within the school. Schools have different *average* achievement based upon the racial composition of the schools. Schools with 50% or more Black and/or Hispanic students have mean mathematics achievement that is 3.88 points lower than in schools with fewer Black and/or Hispanic students enrolled. The results seem to indicate that when at least half of the student body is Black and/or Hispanic, the average achievement within the school is low.

The bottom half of Case One examines the Black–White gap in mathematics achievement within these schools. The coefficient for the intercept for race (in this case being Black) is not statistically significant. This indicates that after controlling for the collection of *school* characteristics, the mathematics achievement of Black students does not differ significantly from that of White students. These results are consistent with research that reports that the reason why Black students are disadvantaged is because of the types of schools that they attend. Hence, these school factors may matter more for student achievement than the individual student factors. Case One reveals that regardless of what traits, skills or abilities students have,

all of these attributes are suppressed when they attend schools with 50% or more Black and/or Hispanic enrollment.

Case Two: Schools with Hispanic and White Students

Results for Case Two, which include the 115 schools used to examine the Hispanic–White gap, show that *schools* with 50% or more Black and/or Hispanic students have mean mathematics achievement that is just over four points lower than in schools with fewer Black and/or Hispanic students enrolled. As with Case One, the main determinant of the difference in average achievement scores is the racial composition of the schools; those schools that are 50% or more Black and/or Hispanic are severely disadvantaged.

Unlike the Black–White gap, the Hispanic–White gap remains statistically significant even after controlling for all of the school characteristics. In other words, even when taking into account this collection of school and student factors, there is still a gap in achievement between White and Hispanic students. The gap is quite large: variables that have statistically significant positive coefficients tend to decrease the gap while variables with negative coefficients tend to increase the race gap.

The Hispanic–White mathematics achievement gap is significantly smaller in schools with 30–49% Black and/or Hispanic students enrolled; this ratio suggests more equality between Hispanic and White students. Thus, it appears that Hispanic students benefit from attending racially integrated schools that are not overly Black and/or Hispanic but also have a sizeable proportion of White or Asian students in the school. These findings seem to coincide with two of the theories about why racial integration of schools is important. First, these results are consistent with the notion that highly minority schools are severely disadvantaged. Second, the degree of racial integration of the student body is positively related to student perceptions of feeling welcomed and supported in the school environment (Finn and Voelkl *1993*) and when students feel welcomed and supported, achievement is enhanced (Roeser et al. *1996*). Hence, this would explain why Hispanic student achievement is enhanced in schools with 30–49% Black and/Hispanic students but not so in schools with fewer Black and/or Hispanic students.

Private schools appear to be more egalitarian with respect to the Hispanic–White gap in mathematics achievement. Private schools tend to be more homogenous, with a smaller selective clientele especially with regard to socioeconomic status where most students come from more affluent backgrounds. Hispanic students may fare better in these schools because of these qualities. In this sample, Hispanic students in private schools have significantly higher socioeconomic status than Hispanic students in public and Catholic schools. Thus, the private school effects could say as much about individual student socioeconomic status, which was the largest individual level predictor of mathematics achievement, as contextual factors of schools.

The Hispanic–White achievement gap, however, is exacerbated in schools with more Black and Hispanic teachers. The original hypothesis was that Black and Hispanic students would have

better outcomes in schools with more Black and Hispanic teachers because they would feel a greater sense of belonging in schools with more teachers of their race. Yet, results presented in Case Two are contradictory to that belief, suggesting that Hispanic students are actually hurt by having more Black and Hispanic teachers in the school.

This result may be an artifact of the way the variable was created. There are more Black than Hispanic teachers in the sample and at least two-thirds of schools have more Black than Hispanic teachers. This variable may be more of a reflection of the number of Black than Hispanic teachers, denoting that there is not necessarily a race match of students and teachers, and potentially suggesting that having too many Black teachers in a school is not helpful for Hispanic students. Alternatively, this measure could be reflecting something about the socioeconomic status of the school since minority teachers are more likely to be concentrated in urban schools with large minority populations. Thus, further analysis needs to be considered to disentangle this finding to see whether Hispanic students' progress is truly hindered by the presence of Black and Hispanic teachers. Alternate research would need to focus more on creation of the variable and the understanding of the hypothesized relationship. Since minority teachers are most likely to be employed in schools with higher concentrations of minority teachers, a higher percentage of minority teachers may just be another indicator of a school with a high proportion of non-white students. Thus, future research would want to focus on categorizing this variable to see if there are "optimal" percentages of minority teachers.

Analysis of Case Two also shows that when more students are in the academic track, the Hispanic–White gap is larger. Black and Hispanic students are more likely to be found in the lower track with a weaker curriculum when the school is racially diverse (Lucas and Berends *2002*; Southworth and Mickelson *2007*) and are less likely to be admitted to the academic track, even when their achievement would warrant such (Mickelson *2001*). This result reflects the internal segregation that happens within schools and the divergence in the type of and quality of education that minority students receive. These results showcase the consequences of being given a weaker, lower track curriculum, as Hispanic (and Black) students are omitted from the academic track.

Case Three: Schools with Asian and White Students

Case Three, which includes the 103 schools with both Asian and White students enrolled, shows that schools with 50% or more Black and/or Hispanic students have mean mathematics achievement that is 3.61 points lower than in schools with fewer Black and/or Hispanic students enrolled. Unlike in the other two subsamples, Case Three schools with more Black and/or Hispanic teachers have higher mean mathematics achievement. The results are as predicted, a more diverse teacher pool has the potential to be associated with increased student achievement; however, since they were only found in Case Three, we cannot give much weight to this finding. The smaller number of schools for this case may be why the percentage of Black and Hispanic teachers is only a significant predictor of mean mathematics achievement differentials.

Although Asian students tend to have mathematics achievement scores significantly higher than their White counterparts (see Table 2), the intercept for race (the Asian–White gap) is not significant. However, results presented in Case Three indicate that Asian students have mathematics achievement scores significantly higher than White students in schools that are less than 15% Black and/or Hispanic. These results give a different picture of the Black and Hispanic student body composition effect on achievement. These results are consistent with the finding that student performance is hampered in schools with larger percentages of Black and Hispanic students. However, this finding adds that the Asian–White mathematics achievement differential, i.e., the Asian student advantage, is suppressed in schools with higher percentage of Black and Hispanic students. When there are very few Black and Hispanic students in the school, Asian student achievement soars.

The overwhelming presence of Black and Hispanic students hinders the achievement of all students in the school, and ensures that the achievement of Black, Hispanic, and White students is not equal. It also keeps Asian students from reaching their highest potential, indicating that Asian students have better outcomes in schools that are overwhelmingly White and/or Asian.

Discussion

This article focuses on the relationship between school racial composition and the race gaps in mathematics achievement. With this research, it was possible to examine the effects of high school racial composition on the race gaps in mathematics achievement while controlling for students' race, gender, socioeconomic status, and prior achievement level. As expected, race, gender, socioeconomic status, and prior achievement are indeed related to 12th grade student mathematics achievement. Asian students, White students, male students, those with higher socioeconomic status, and students with higher 10th grade mathematics achievement scores have higher mathematics achievement scores in the 12th grade. Socioeconomic status has the strongest influence on student academic achievement indicating that an individual's poverty status has a greater influence on their academic achievement than any other characteristic. Thus, individual resources that are afforded to those from high socioeconomic households pay off in mathematics achievement. Since minority populations are more likely to live in poverty, they are less likely to have an abundance of resources available to them (Massey and Denton *1993*).

Even with the student level individual SES control, which has been shown to have an impact on student achievement, is taken into account, all students have suppressed achievement in schools with student enrollment that is at least half Black and/or Hispanic. Being in a school with a high a concentration of Black and Hispanic students lessens all students' chances of academic achievement, even for students who otherwise, based on individual factors (i.e., high socioeconomic status) should excel. In these schools, the SES advantage, in effect, may be washed away. The lower achievement found in schools with large Black and Hispanic student populations is consistent with prior research that suggests that school with large minority populations provide a different quality of school environment for their clientele mostly because

of the insufficiency of schools with large minority populations (Mickelson *2001*; Ferguson *1998*).

Something about the racial mix of students in the school influences achievement, although there is not one clear situation that maintains enhanced achievement for all students. When half or more of the students in a school are Black or Hispanic, *all* student achievement is lower (for Whites who attend, as well as for ethnic minority students). For Asian students, their achievement remains lowered until the percentage of Black and Hispanic students is less than 15%. However, schools with 30–49% Black and/or Hispanic populations that have more egalitarian achievement outcomes between White and Hispanic students. Although there is no one-size-fits-all model that creates the best achievement for all students, this research does confirm that no one benefits in schools where at least half of the student body is Black and Hispanic.

These results seem to suggest that the *kinds* of schools may be less important than the percentages of students who are in the schools. Regardless of the location (suburban, small city, or large city) or type (pubic, private, or Catholic) the racial composition of the school is most significant. Although Hispanic students do very well in private schools, this may be an artifact of the private school population. Surprisingly, such school climate factors of teacher collegiality, academic pressure, and average student–teacher relationships were not significant. This could mean that there is similarity in these factors across all schools, regardless of the type of school. It also is quite possible that these scales include answers from many people who instead of reporting accurately gave “socially acceptable” answers and thus the observations are not the best measures of these concepts. The inability to sort this out is one of the pitfalls of secondary research. Future work would need to develop alternative measures and indicators that are not susceptible to the ruse of the socially acceptable response.

The results also suggest that school racial structure is not just a proxy for school socioeconomic status. At the school level, average school SES is not statistically significant. Prior research suggested that school racial composition is a significant predictor of student achievement because of the socio-economic differences between schools with different racial compositions (Kahlenberg *2001*; Rumberger and Palardy*2005*).

This research raises the question of the relationship between socioeconomic status and school racial compositions. Could part of the effects of school racial composition be the result of different levels of economic investments in schools with different tax bases, so that students are in larger classes with less learning resources available? Why do schools with higher percentages of Black and Hispanic students not benefit from community investment of resources, ranging from economic input to academic rigor and a strong teacher pool? If the lack of investment is producing the low achievement of the students in the school, it would appear that we are stuck in what could be a never ending pathological cycle.

Conclusion

Recognizing that racially segregated schools lead to unequal outcomes for America's students, educational policy for five decades has been used to orchestrate the racial composition of schools in an attempt to positively influence the learning of children, mostly minority children. Recently, policy has changed and student race can no longer be used to assign students to school to create racially integrated schools. Even though research consistently has shown that students fare poorly in schools with larger percentages of minority students, America has now lost the ability to orchestrate a racial balance through student assignment. This does not mean that the problem of highly minority schools has gone away, instead it means that another approach to creating equality must be used.

Bidwell and Kasarda (*1980*) maintain that schools merely provide a context in which schooling takes place. Learning, then, is a result of schooling, and not just of schools. Hence, research and policy will need to focus on the within-school processes that transform resources into learning. Thus focus should shift to what it is about the structure of highly minority schools that affects the low level learning of its clientele.

For example, research suggests that tracking is different in schools with differing racial compositions. Minority students are tracked into less stimulating courses and are often steered away from college preparatory and advance placement courses (Mickelson *2001*). If this type of tracking is less apparent in racially balanced schools (Southworth and Mickelson *2007*), much closer attention needs to be paid to why and how this equality in tracking is achieved. And if the average difference in improvement in mathematics*achievement* over time is as close as these data seem to indicate, could the criteria for assigning students to one track or another be loading the odds in ways that place minority students at a critical disadvantage which is not simply a response to level of learning and ability? Studying the process of student placement in academic classes within schools may be one way to help create school policies that in fact deflate the race-based gap in mathematics achievement.

Racial composition of a school affects learning in important ways that noticeably disadvantage minority students. Given that racial segregation of neighborhoods exists and the inability to construct racially diverse schools through student assignment policy, school characteristics that maximize learning opportunity need to be highlighted. Future research should focus on the "success" cases where higher-percent minority enrollments nonetheless lead to higher achievement. Future research must focus on the characteristics these exceptional cases have in common that differentiates them from lower-performing schools and emphasize ways to replicate best schooling practices.

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