SCHOOL DESEGREGATION AND EDUCATIONAL ATTAINMENT FOR BLACKS

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ABSTRACT

The desegregation of Southern schools following the Supreme Court's 1954 Brown decision was perhaps the most important innovation in U.S. education policy in the 20th century. This paper assesses the effects of desegregation on its intended beneficiaries, black students. In Louisiana, substantial reductions in segregation between 1965 and 1970 were accompanied by large increases in per-pupil funding. This additional funding was used to "level up" school spending in integrated schools to the level previously experienced only in the white schools. The effects of desegregation on the educational experiences of black students differed substantially depending on the black share of enrollment in the district. For historical reasons, blacks in districts with higher black enrollment shares experienced larger increases in funding, compared to their counterparts in lower black enrollment share districts. On the other hand, blacks in high black enrollment share districts saw smaller increases in exposure to whites (who were higher-income). Blacks in high black enrollment share districts experienced larger improvements in educational attainment, suggesting that the increase in funding associated with desegregation was more important than the increased exposure to whites. A simple cost-benefit calculation suggests that the additional school spending was more than offset by higher earnings due to increased educational attainment. Using a different source of variation and methodology, the results of this paper are consistent with earlier work suggesting that desegregation improved educational attainment for blacks and sheds new light on the potential mechanism behind this improvement in Louisiana: increased funding for blacks' schools.

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The Supreme Court's 1954 decision in *Brown v. Board of Education*—and the desegregation of schools that followed—was perhaps the most important development in U.S. education policy of the last century. Before *Brown*, Southern schools were explicitly and completely segregated by law, and many blacks attended schools that received fewer resources than those attended by their white counterparts.[1] Previous work has shown that desegregation policy reduced segregation and increased blacks' exposure to whites in school. In the case of Louisiana, school desegregation was also accompanied by dramatic changes in the state's system of school finance that, together with large increases in federal funding, substantially increased the average spending in the schools blacks attended. Desegregation in Louisiana virtually eliminated black-white gaps in student-teacher ratios within districts. Historically, those gaps had been largest in districts with high black enrollment shares, so blacks in high black enrollment share districts saw particularly large improvements in per-pupil spending over the short period when schools desegregated. The desegregation experience in Louisiana provides a unique setting in which to study the effects of large increases in school funding over a short period, contributing both to the literature on the effects of desegregation and the literature on the effects of school resources on educational outcomes.

After years of resistance, segregation in Louisiana's schools fell dramatically between 1965 and 1970. At the same time, average per-pupil revenue for schools increased by about $1,000 to more than $3,700 (constant 2003 dollars). But this new money was not distributed equally to all districts. Instead, districts with high black enrollment shares

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[1] The Coleman Report (1966) and Card and Krueger (1992) suggest that black-white school resource gaps had closed substantially over the first half of the 20th century, but were still present. According to Card and Krueger (1992), in 1954 the average student-teacher ratio for blacks was about 10 percent higher for blacks in Southern and Border states, compared to their white counterparts. Data for Louisiana show that in 1955 the average district's instructional spending for blacks was only about 71 percent of instructional spending for whites.

garnered substantially larger increases in funding. In Reber (2006), I show that these disproportionate increases in revenue for higher black enrollment share districts were necessary to prevent whites in those districts from seeing their school quality fall and were at least partly caused by desegregation policy. On the other hand, blacks in districts with higher black enrollment shares saw *smaller* increases in exposure to whites (since there were fewer whites in those districts).

In this paper, I examine the effects of these two changes—increases in black exposure to whites and increases in funding for blacks' schools—on educational attainment using variation in changes in these variables related to differences in districts' initial black enrollment share. Because changes in spending and exposure are both so closely tied to the black enrollment share (positively and negatively, respectively), I cannot separately identify the effects of these two factors. Instead, I estimate the net effect of desegregation-induced changes in funding and peers. Newly collected annual data on school registration (enrollment) by race and grade and the number of high school graduates by race for Louisiana school districts allow me to estimate the fraction of black 8th grade students continuing to 10th, 11th, and 12th grade and graduating from high school for cohorts of students attending school before and after desegregation.

The results indicate that the rate of continuing to the 11th and 12th grade, as well as high school graduation rates, increased more in higher black enrollment share districts after desegregation, suggesting that the additional funding that came with desegregation was more important than increased exposure to whites in increasing black educational attainment. It would also be interesting to estimate the effect of desegregation on educational attainment for white students. Unfortunately, non-random migration of white students—in particular,

"white flight" from districts with high black enrollment shares to "whiter" districts—

precludes conducting a similar analysis for whites.

The paper proceeds as follows: Section II provides background on the legal history

of desegregation, Louisiana's experience with desegregation, and the existing literature on the

effects of desegregation; Section III discusses the effects of desegregation on funding and

black exposure to whites; in Section IV, I discuss the methods and data; the results are

presented in Section VI. Section VI concludes.

II. Background and Previous Literature

A. Desegregation Policy and Trends in Segregation

In 1954, the Supreme Court declared separate schools for black and white children

to be "inherently unequal." But neither the 1954 *Brown* decision nor the 1955 *Brown II*

decision was specific about what districts were required to do to comply with this new

doctrine, and little progress was made for several years. Figure 1 shows trends in two

commonly used measures of segregation: black exposure to whites and white exposure to

blacks.[2] Black exposure to whites can be interpreted as the white enrollment share of the

average black's school (and vice-versa for white exposure to blacks); increases in black

exposure to whites indicate that blacks are in school with more whites, indicating a decline in

segregation.

The data reveal three major turning points for segregation, corresponding to changes

in legislation and the courts' interpretation of the *Brown* decision. Before the 1965 school

year (all years refer to the fall of the school year), there was very little progress toward

desegregation; in 1964, only about 1.2 percent of black students statewide were in school

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[2] For school years before 1967, black exposure to whites was imputed based on the share of blacks in school with any whites. See Appendix A for information on sources of segregation data and the method for imputation.

with any whites, and 61 of 64 counties in Louisiana still had completely segregated schools. The 1964 Civil Rights Act (CRA) gave the Justice Department the authority to join desegregation cases, and denied Federal funding to segregated districts, while the 1965 Elementary and Secondary Education Act (ESEA) expanded Federal funding for education significantly. Together, these policies are thought to have brought about the first moves towards desegregation in many Southern districts between 1965 and 1968.[3] By 1968, only 11 of 64 counties in Louisiana were still completely segregated, but the average black was still in a school that was only about 8 percent white, while whites comprised over 60 percent of enrollment. Finally, following a 1968 Supreme Court decision[4], larger-scale desegregation plans began to be required. By 1970, the average black Louisianan was in a school that was more than 30 percent white, and segregation stayed around that level through at least 1976. This pattern is similar to trends in segregation for other states in the former Confederacy.

In the analysis, I use data for 1960-1975, dividing the years into three periods: 1960-1965 (before desegregation), 1966-1969 (transition), and 1970-1975 (after desegregation).

B. Desegregation and Black Educational Attainment: Mechanisms

This paper examines educational attainment as the primary outcome of interest. In a standard model of human capital accumulation, individuals attend an additional year of school if the return on the labor market is greater than the discount rate. Desegregation could increase the return to schooling by changing school quality for blacks through two main channels. First, desegregation clearly changed the composition of students in blacks' schools, as black exposure to whites increased. Previous work (discussed below) has found a negative relationship between the black share of enrollment and educational outcomes, but it

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[3] See, for example, Card and Krueger (1992); Boozer, et al (1992); and Cascio, Gordon, Lewis, and Reber (2006).
[4] *Green vs. New Kent County Board of Education,* 391 U.S. 430 (1968).

is unclear whether this relationship is causal or if school quality on other dimensions and student background varies with black enrollment share. In fact, it is not obvious *a priori* whether more white peers would be good or bad for school quality from blacks' perspective, although white peers are typically assumed to have a positive effect on outcomes, in part because whites tended to have higher socioeconomic status and better scores on achievement tests.

Second, desegregation changed the average spending—and possibly other, less-tangible aspects of school quality—in schools blacks attended by moving them to higher-spending formerly white schools. In the case of Louisiana, desegregation also increased overall average school spending so that spending could be equalized by "leveling up" to the levels previously experienced only in the white schools, rather than "leveling down" closer to that of the formerly black schools.

C. Previous Literature: The Effects of Desegregation on Education Outcomes

Many studies have examined the effects of desegregation in a particular district or a small number of districts, and have come to varying conclusions about the benefits of desegregation.[5] A number of larger-scale studies have examined the relationship between the racial composition of students' schools or classes and educational outcomes, but have been less able to focus on changes in the racial composition due to desegregation policy, as opposed to self-selection into districts with different racial composition. Guryan (2004) is a recent exception, which I discuss further below.

The *Equality of Educational Opportunity* study, also known as the Coleman Report (1966) was the first to document a negative relationship between being in predominately black schools and lower student test scores. Boozer, et al. (1992) use the National Survey of

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[5] St. John (1975), Crain and Mahard (1981), Cook (1984), and Armor (2002) (also reviewed in Guryan (2004)).

Black Americans data from 1979-1980 to show that blacks who attended segregated high schools had lower educational attainment and lower wages. Rivkin (2000) similarly finds that among a cohort of students who were sophomores in 1980, those who went to schools with higher black enrollment shares had lower test scores, educational attainment, and earnings. To assess the role of desegregation policy more directly, Boozer, et al. instrument for being in a segregated high school with an interaction of the state where an individual grew up and whether they went to high school after 1964 (when there appear to have been reductions in segregation in Southern and Border states); the point estimates suggest that being in a segregated school is bad for blacks' outcomes, but the estimates are quite imprecise.

Card and Krueger (1992, 1996a) examine the effects of pre-*Brown* narrowing of black-white school quality gaps in Southern and Border states and North and South Carolina on wages. They conclude that improvements in resources in the black schools relative to white schools improved wages for blacks and contributed to the subsequent narrowing of the black-white wage gap. This paper shows that black-white school quality gaps persisted in Louisiana after the period examined by Card and Krueger and examines the effects of the virtual elimination of these gaps due to desegregation in the late 1960s.

Guryan (2004) provides the best-identified effects of desegregation *plans*. He exploits variation in the timing of implementation of desegregation plans across districts, using Census data to assess the effects of desegregation on black high school drop-out rates for a national sample of large school districts implementing major court-ordered desegregation plans. He compares changes in dropout rates between the 1970 and 1980 Censuses for districts that implemented a plan during that decade to changes for those that implemented plans before 1970 and after 1980. He estimates that implementation of a desegregation plan reduced dropout rates for blacks by about 3 percentage points. This paper complements

Guryan's by using a different methodology and source of variation to examine the effects of desegregation on educational outcomes. In addition, I am able to examine the mechanisms—namely changes in funding and peers—by which desegregation may affect outcomes.

III. How did Desegregation Change Blacks' Schools? Effects on Peers and Resources

Desegregation had dramatic effects on the characteristics of the schools that black Louisianans attended. The two major classes of inputs—peers and money—changed significantly statewide, but blacks in some districts saw bigger changes than others. These differential changes across districts arose due to the historical differences in the way districts with different black enrollment shares financed education.

A. Effects of Desegregation on School Spending

One potentially important input to school quality is money,[6] which allows schools to reduce student-teacher ratios and buy other inputs. In this section, I will focus on changes in student-teacher ratios, both because teachers represent a large portion of the school budget and, more pragmatically, the student-teacher ratio can be measured separately for blacks and whites. (Measures such as per-pupil revenue and expenditure are generally reported only at the school district level; cross-district changes in revenue and expenditure are consistent with those reported for student-teacher ratios.)

In previous work (Reber, 2006), I explore changes in the financing of Louisiana schools brought by desegregation in detail. Because understanding changes in funding is important for the analysis of educational attainment, I summarize the key findings here. To

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[6] The role of school spending (and other measures of resources available to schools) in improving educational outcomes is controversial. See Hanushek (1986) and Card and Krueger (1996a, 1996b) for a summary of the extensive literature on this topic.

understand the changes in districts' finances, one must first understand the pre-desegregation school finance regime in the South, in particular the importance of a district's black share of enrollment in its finances. Before desegregation, black-white spending gaps were largest in states, counties, and school districts with higher black enrollment shares. Research on school finance in the South during this period[7] suggests an explanation for this relationship: Southern state governments generally distributed aid on a per-pupil basis, but local school officials had discretion over how to distribute aid among black and white schools.[8] Under this system, whites in districts with large black populations could satisfy their increasing demand for school quality by directing state money allocated for black students to white schools, resulting in larger gaps between student-teacher ratios in "blacker" districts.[9]

Despite the "separate but equal" requirement of *Plessy* (never mind the desegregation requirements of *Brown*), significant gaps between resources available in black and white schools in Louisiana persisted in the 1960s.[10] From 1960-1965 (the "before" period), the average student-teacher ratio in Louisiana's black schools was 29, compared to 24 for whites.[11] These gaps were significantly larger in districts with higher black enrollment shares.

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[7] See Bond (1934), Margo (1990), and Card and Krueger (1992).

[8] For the results on educational attainment, it is not necessary to know the precise mechanism behind the relationship between black enrollment share and black-white student teacher ratios. In any case, the data indicate a strong positive relationship that was eliminated during the period of desegregation.

[9] There is a political economy explanation for the persistence of this system of school finance. Representatives to the state legislature were allocated based on total population, but blacks were generally not permitted to vote. Whites in districts with high black enrollment shares were over-represented in the legislature relative to whites in low black enrollment share districts. This may account for the between-district inequality of funding across districts among whites that the system perpetuated.

[10] Trends in funding for other Southern states after 1950 have not been documented to my knowledge.

[11] Normally, school-level data would be required to calculate the average student-teacher ratio separately for blacks and whites. When students and teachers are completely segregated by race (black teachers only teach black students), the student-teacher ratio for blacks in the district can be calculated using the total number of black students and black teachers (and similarly for whites). According to the Southern Education Reporting Service, students and teachers in Louisiana were still completely segregated through at least 1966, with the exception of the Orleans Parish school district. The Louisiana Department of Education's *Annual Financial and Statistical Report*, from which these data were collected, also published instructional spending separately for blacks and whites through 1959-60, when the average district spent 72 cents per pupil in the black schools for

The left panel of Figure 2 shows the relationship between the 1960[12] black enrollment share and the black-white gap in student-teacher ratios (black student-teacher ratio less white student-teacher ratio) for 1960-1965, before significant desegregation had occurred. The slope of the regression line in the left panel of Figure 2 is 9.4 with a t-statistic of 4.1, indicating that a 10 percentage point increase in black enrollment share was associated with an increase in the black-white student-teacher ratio gap of about 0.94 students. The 1960 black enrollment share is fairly evenly distributed between 10 and 70 percent.

By requiring blacks and whites to attend the same schools, desegregation reduced whites' ability to divert funding for black children to their own schools.[13] As a result, overall school funding was increased during the period of desegregation so that whites were approximately "held harmless" and did not see student-teacher ratios rise as their schools combined with blacks' schools. Because pre-existing black-white gaps were larger in higher black enrollment share districts, blacks in those districts saw larger improvements in the student-teacher ratios as a result of equalization. The right panel of Figure 2 shows the relationship between 1960 black enrollment share and the average black-white student-teacher ratio gap for 1970-1972 on the same scale as that for the left panel.[14] The black-white gap in student-teacher ratios was virtually eliminated and the relationship between the black-white gap and black enrollment share disappeared.[15]

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every dollar in the white schools. According to Margo (1990), this ratio was less than 20 cents per dollar around 1910.

[12] Throughout the analysis, I use the black enrollment share for 1960 because 1960 is early enough that the black enrollment share was plausibly unaffected by desegregation policy. In fact, districts' black enrollment share is very stable over time, and the results are very similar if the black enrollment share from another year is used.

[13] Some ability to direct resources within schools to whites, especially through tracking in high school, most likely offset some of the reduction in between-school inequality.

[14] The OCR survey stopped collecting school-level data on teachers after 1972.

[15] See Appendix B for more information about how student-teacher ratios by race were calculated.

Figure 3 shows how changes in the two major classes of inputs—student-teacher ratios and peers—related to initial black enrollment share. The left panel shows the *change* in the black student-teacher ratio from 1960-1965 to 1970-1972 against the initial black enrollment share. The slope of the regression line is -7.4 (with a t-statistic of 3), indicating that blacks in districts with a 10 percentage point higher initial black enrollment share saw a 0.74 student larger decline in student-teacher ratios, on average, from before to after desegregation.[16] The large reductions in student-teacher ratios in higher black enrollment share districts was due to the closing of the relatively large black-white student-teacher ratio gaps that existed before desegregation.

B. Effects of Desegregation on Peers

That changes in blacks' exposure to whites upon desegregation would vary with the share of enrollment that is white—and therefore the black enrollment share—is straightforward. Before desegregation, blacks in all districts had the same level of exposure to blacks—none. But after desegregation, whites in districts that initially had low black enrollment shares had significantly higher exposure to whites. This is expected, as even if schools within districts are integrated, blacks cannot be exposed to many whites if there are not many whites in their district. The right panel shows the strong negative relationship between initial black enrollment share and the change in black exposure to whites—the regression line has a slope of -1.05 (t=13.3).

IV. Methods and Data

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[16] In Reber (2006), I examine changes in school finance in more detail and argue that the observed changes were *caused* by, not just coincident with, desegregation policy. Using annual data on per-pupil revenue by source, I show that the timing of increased spending corresponds very well with desegregation, rather than reflecting a gradual increase in revenue over time. Data limitations prevent a similar analysis of annual student-teacher ratios, but teachers appear to be the primary category on which additional revenue was spent, so results would most likely be similar. For this study, it is not critical that the changes in student-teacher ratios and exposure to whites were caused by desegregation as it is that they were large and rapid. Some readers may rather interpret the results as the effect of increased spending and changes in peers, rather than the effects of desegregation policy, *per se*.

A. Empirical Approach

Changes in peers and resources varied systematically with initial black enrollment share, so I examine how changes in educational attainment related to initial black enrollment share. Whether blacks in higher enrollment share districts are expected to have more or less improvement in educational outcomes as a result of desegregation depends on whether exposure to whites (who probably also had higher achievement) *per se* or exposure to more resources is more important. Because changes in both spending and revenue are so closely tied to the initial black enrollment share, their effects cannot be separately identified, and the estimated differential change in educational attainment represents the net effect of changes in peers and changes in funding.

The simplest specification relates the change in attainment from before to after desegregation to the initial black enrollment share. In this case, the dependent variable of interest is simply the average attainment for 1970-1975, less the average attainment for 1960-1965 (omitting the transition years): $\Delta attain_c = \frac{1}{6} \sum_{t=1970}^{1975} attain_{ct} - \frac{1}{6} \sum_{t=1960}^{1965} attain_{ct}$. The most basic specification is a univariate regression:

(1a) $\qquad \Delta attain_{ct} = \beta_0 + \beta_1 1960\% black_c + \varepsilon_c ,$

where $\Delta attain$ is described above, *1960%black* is the black share of enrollment for county[17] c in 1960[18] and ε_c is an error term. The estimate of β_1 indicates the extent to which subsequent changes in attainment varied with initial black enrollment share. If increases in resources

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[17] Because some data are available only at the county level, I estimate the regression at the county, rather than district, level. Louisiana had three City districts; these were combined with their county for analysis.
[18] The black enrollment share of a county is fairly stable over time; results are similar if the black enrollment share from another year is used. I use data from 1960 because it is early enough that it is unlikely to have been influenced by desegregation.

were more important than increased exposure to whites, β_1 is expected to be positive and vice-versa if exposure to whites is more important than increased funding.

Controls for other characteristics of counties that might be related to both *1960%black* and *changes* in attainment can also be included in the regression:

(1b) $$\Delta attain_c = \widetilde{\beta}_0 + \widetilde{\beta}_1 1960\%black_c + \widetilde{\beta}_3 \Delta employ_c + X\widetilde{\beta}_4 + \mu_c,$$

Where $\Delta employ$ is the proportional change in employment in the county and X is a vector of pre-existing county characteristics. I discuss the control variables in more detail when I present the results below.

If differential changes in attainment by black enrollment share are *caused* by changes in schools related to desegregation, we would expect the changes in attainment to be closely timed with the observed differential changes in black exposure to whites and funding[19] rather than a gradual trend over the whole period (which would show up as a statistically significant estimate of β_1 in equation (1a) and $\widetilde{\beta}_1$ in equation (1b)). In order to observe the timing of differential changes in attainment by black enrollment share, I estimate the equations of the following form:

(2) $$attain_{ct} = \theta_t + 1960\%black_c \times \gamma_t + v_{ct},$$

where *1960%black* is the 1960 black enrollment share (as above) and separate intercepts (θ_t) and coefficients (γ_t) are estimated for each year between 1960 and 1975. This is equivalent to estimating univariate regressions of *attain* on *1960%black* separately for each year (the constant and main *1960%black* effect are excluded in favor of a full set of year effects and interactions). If γ_t is increasing with t, this indicates that attainment grew faster in higher

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[19] As discussed above, student-teacher ratios are a better measure of race-specific resources than county-level per-pupil revenue and expenditure, but student-teacher ratios are not available annually.

black enrollment share districts over time, and vice-versa if γ_t is declining with t. The pattern of γ_t's shows the timing of differential changes in attainment by black enrollment share. I present the results of estimating equation (2) graphically.[20]

B. Measuring Educational Attainment

High-frequency individual-level data with county identifiers on completed attainment or school enrollment status are unavailable for this period. A proxy for the dropout rate for each cohort-district-year can be created using Louisiana administrative data on the number of students enrolling in school by grade, district, year, and race. To check the validity of the attainment estimates, I first present estimates of state-wide trends in the educational attainment variables for 1960-1975 based on the Louisiana administrative data and compare these to trends estimated from the 1980 Census IPUMS. I will apply a similar methodology below to estimate educational attainment variables at the district level using the administrative data.

If families did not move into or out of the state (and there were no mortality), I could infer the share of each cohort continuing to each grade by following a cohort through its entire school career, estimating dropout rates at every grade. For example, for the cohort entering 1st grade in the Fall of 1961, 1st grade data would be taken from the 1961 report, 2nd grade data from the 1962 report, and so on; the share of the cohort reaching at least 12th grade would be the ratio of 12th grade registration in 1972 to 1st grade registration in 1961.[21]

Of course, in practice, the change in a cohort's size between 1st and 12th grade also reflects movements of families into and out of the state. In order to reduce the scope for such movements to affect the estimated 12th grade enrollment rates, I divide 12th grade

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[20] Similar to equation (1b), controls for pre-existing characteristics of counties could be included by estimating a separate coefficient on each characteristic for each year (or groups of years). Because the control variables have little substantive effect on the coefficients, I do not present the results.

[21] This also assumes that patterns of grade repetition are not changing over time.

registration by 8th grade registration 4 years prior (rather than 1st grade), assuming that there is no "true" dropping out until after the fall of 8th grade. I refer to the share of a cohort that registers for 12th grade as the 12th grade "continuation rate," and similarly for 10th and 11th grade; the estimated share of a cohort completing high school is referred to as the graduation rate. If migration of families with older and younger children is similar, changes in cohort size for younger grades can be used to net out the effects of migration. Thus, I construct the 12th grade continuation rate, net of the average 4-year change for cohorts in 5th-8th grades in the same year as follows: $contrate_t^{12} = \dfrac{reg_t^{12}}{reg_{t-4}^8} - \dfrac{1}{4}\sum_{g=5}^{8}\dfrac{reg_t^g}{reg_{t-4}^{g-4}}$, where reg_t^g is total black registration for grade g in year t. Continuation rates for 10th and 11th grade and high school graduation rates are constructed similarly.[22]

For comparison, I estimate trends in the fraction of blacks born in Louisiana who attended *at least some* 10th, 11th, and 12th grade[23] or graduated from high school using the 1980 Census IPUMS.[24] If the estimates based on the administrative data are not contaminated by differential migration of families with younger and older children, these two series should track each other. Figure 4 presents the series based on the Census and the administrative data from Louisiana for each of the continuation rates. To better compare the trends (and because only the trends and not the levels of continuation and graduation rates are meaningful), I rescale continuation and graduation rates from the administrative data to

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[22] Calculations for 10th and 11th grade ratios and high school graduates are as follows:

$contrate_t^{10} = \dfrac{reg_t^{10}}{reg_{t-2}^8} - \dfrac{1}{4}\sum_{g=5}^{8}\dfrac{reg_t^g}{reg_{t-2}^{g-2}}$, $rerate\ _t^{11} = \dfrac{reg\ _t^{11}}{reg\ _{t-3}^8} - \dfrac{1}{4}\sum_{g=5}^{8}\dfrac{reg\ _t^g}{reg\ _{t-3}^{g-3}}$,

$gradrate_t = \dfrac{grads_t}{reg_{t-4}^8} - \dfrac{1}{4}\sum_{g=5}^{8}\dfrac{reg_t^g}{reg_{t-2}^{g-2}}$.

[23] The category "did not finish 10th grade" and higher indicates that an individual started, but did not finish, 10th grade and most closely corresponds to the 10th grade continuation rate, which measures the number of students registered for 10th grade in the fall (and similarly for 11th and 12th grade).

[24] See Appendix B for more information on how attainment was estimated from the Census.

equal the estimate from the Census for 1960. Trends from the two sources track reasonably well, especially for 12th grade continuation rate and high school graduation rate.

Recall that increases in black exposure to whites and the accompanying increases in funding were concentrated in 1965-1970, especially 1968-1970 (Figure 1). The state-wide average trends in educational attainment for blacks in Louisiana do not appear to be well-explained by the timing of desegregation policy. Attainment rose through about 1968, leveling off or declining slightly in the early 1970s. Other factors may have influenced these trends, however, potentially masking improvements due to desegregation.

There is no readily available control group, but comparisons to trends for blacks in other regions (where desegregation did not occur or took a different form) and whites are suggestive of improvements in educational attainment in the post-desegregation period. Figure 5 shows trends in educational attainment for those born in Louisiana, the states of the former Confederacy, the Border states, and the rest of the country[25] separately for blacks and whites. Graduation rates for whites in all regions and blacks outside the Confederate states were declining after 1970, while graduation rates were flat or increasing for blacks in Louisiana and the Confederate states as a whole.[26] While far from definitive, this is suggestive that desegregation may have improved educational attainment for Southern blacks. On the other hand, the largest improvements in Louisiana-born blacks' graduation rates (absolutely and relative to other groups) occurred around 1964 or 1965, before the effects of desegregation policy on spending and black exposure to whites kicked in. Ashenfelter, Collins, and Yoon (2006) pursue this approach more systematically, comparing

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[25] The usual Census region "South" is subdivided into Confederate and Border states due to their slightly different history with desegregation. The Census Bureau also classifies Missouri as in the Midwest region; I have reclassified it as part of the Border region here. Trends for the three non-Southern regions (West, Midwest, and Northeast) are similar, so they are combined in "Non-South".

[26] The downward trend in the early 1970s could result from the acquisition of GEDs for earlier cohorts, while later dropouts have not had as much time to acquire a GED. Estimates of trends in dropouts for these cohorts based on the 1990 Census are similar, but do show a slightly smaller decline in the early 1970s.

educational attainment and wages for different cohorts of blacks and whites born in different regions. They conclude that the desegregation effort did contribute to improvements in educational attainment and wages for blacks.

I construct continuation rates at the district level using the same methodology and administrative data below. The district-level estimates cannot be compared to Census data, but it is reassuring that the statewide trends for the two data sources match reasonably well.

C. Data Sources

Louisiana has 64 county (Parish) school districts; at the beginning of the period, there were also three city districts. One of the city districts combined with its county in the late 1960s. Because some of the variables are available only at the county level, I combine the city districts with their respective counties and conduct the analysis at the county level.[27] The key variables in the analysis were collected from the Louisiana Department of Education *Annual Financial and Statistical Reports* for 1954-1975, which report information on a variety of variables at the school district level, including the number of teachers by race (used to construct student-teacher ratios for 1960-1965), fall registration by grade and race (used to construct continuation rates), the number of high school graduates by race, total revenue and total expenditure.

Proxies for pre-existing socioeconomic status and voter registration at the county level were taken from the 1960 Census county tabulations and a dataset compiled by Matthews and Prothro for their studies of voting in the South.[28] Data on segregation (black exposure to whites and white exposure to blacks) were taken from two sources. For 1960 to

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[27] Cameron Parish (county) is excluded from the analysis. The district had substantial oil reserves on school district property (Section 16 lands), which generated substantial revenue for the district during this period. The finances of the schools were therefore quite different from those of other school districts, and the district is an extreme outlier in funding and student-teacher ratios.

[28] I am grateful to Jim Alt for providing an electronic version of the Matthews-Prothro data.

1966, black exposure to whites was estimated based on data collected by the Southern

Education Reporting Service and published in various editions of *Statistical Summary of School*

Segregation-Desegregation in the Southern and Border States.[29] For later years, I use the school-level

surveys of students and teachers by race conducted by the U.S. Department of Health

Education and Welfare (HEW) Office of Civil Rights (OCR).[30]

Appendix A provides more detail on all the data sources.

V. Results

As shown graphically in Figure 3, blacks in high black enrollment share districts saw

larger increases in resources and smaller increases in exposure to whites compared to blacks

in lower black enrollment share districts. I can also show this with and without controls for

preexisting district characteristics by estimating equations (1a) and (1b) with the change in

black exposure to whites (Table 1a) and black student-teacher ratios (Table 1b) on the left-

hand-side. The first column of Table 1a shows the mean and standard deviation for the

control variables. The regression of the change in black exposure on *1960%black* shows a

strong negative relationship between black enrollment share and black exposure to whites,

with an estimated coefficient of -1.05; controls for pre-existing characteristics have little

effect on the coefficient. Table 1b shows that a 10 percentage point increase in *1960%black* is

associated with an additional reduction in black student-teacher ratio of 0.74 (first column);

the inclusion of controls reduces the estimates (in absolute value) by about a third.

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[29] SERS reports the share of black students in school with any whites. When only a small share of blacks were in school with whites, exposure of blacks to whites is approximately equal to the share of blacks with any whites (since those in school with whites were in schools that were virtually 100 percent white and the remaining blacks were in schools that were virtually 100 percent black). The segregation data are described in greater detail in Appendix A.

[30] I am grateful to Ben Denckla for converting the school-level OCR data from its antiquated format.

Because of the method used to estimate school continuation rates (the share of each cohort continuing to each grade), it is critical that mobility among counties in Louisiana during the period of the study not be correlated with the county's initial black enrollment share. Recall that I estimate the 12th grade continuation rate for a district as the ratio of students registering for 12th grade to the number of students registering for 8th grade four years prior. If students leave (enter) the district, I will under (over) estimate the continuation rate.[31] However, if those movements are *not correlated with initial black enrollment* share, migration will not bias estimates of the coefficient on *1960%black*, but will simply introduce classical measurement error to the dependent variables.

Fortunately, I can assess the plausibility of this assumption by examining the relationship between black enrollment share and changes in continuation rates for *younger* grades. If there is no true dropping out among younger children[32], then continuation rates for younger children can be used to assess whether mobility is correlated with black enrollment share. Indeed, the analysis of continuation rates for younger grades provides no evidence that black mobility was correlated with initial black enrollment share, suggesting that changes in continuation rates for upper grades are likely to reflect differential changes in the true rate of dropping out.[33] White mobility, on the other hand, was significantly related to black enrollment share, as white enrollment shifted dramatically from higher to lower black enrollment share counties during the period of desegregation (Reber, 2006). This precludes using a similar methodology to assess the effects of desegregation on white educational attainment.

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[31] Note that the enrollment data employed in the analysis include private school enrollment, so movements from public to private school or vice versa are not problematic for the construction of continuation rates by district. Black private enrollment is quite small in any case.

[32] It is possible that some younger children have low attendance rates, but it seems unlikely that many would not *register* for school at all. The measure of enrollment I employ here is based on fall registration.

[33] This requires the additional assumption that families with older and younger children do not migrate differentially in a way that is correlated with districts' initial black enrollment share.

A. Continuation Rates for Younger Grades

Table 2a shows the relationship between changes in continuation rates and initial black enrollment share for 6th, 7th, and 8th grade (6th, 7th, and 8th grade registration divided by 4th grade registration 2, 3, and 4 years prior, respectively; these can be compared to results for 10th, 11th, and 12th grade continuation rates, respectively). The first column in each set shows the results for equation (1a) with no controls; the second and third columns with controls (equation (1b)) are reported for consistency with the results reported in Table 4 for higher grade continuation rates; the controls do not substantially affect the coefficients of interest. The coefficients on initial black enrollment share are not significantly different from 0 for any of the grades or specifications, indicating that changes in the continuation rates for younger grades were not related to initial black enrollment share. I show the results estimating equation (2) for the 6th, 7th and 8th grade continuation rates together with the results for the upper grades below. These also show no differential trend in continuation rates for lower grades among districts with higher initial black enrollment shares.

To reduce noise in the lower grade registration rates, I take advantage of data for a larger number of lower grades, estimating equations (1a) and (1b) for the average 2-, 3-, and 4-year "lagged" continuation rates for 5th-8th grade (again, for comparison to 10th, 11th, and 12th grade continuation rates). The average lagged continuation rate is $avgrate_t^l = \frac{1}{4}\sum_{g=5}^{8}\frac{reg_t^g}{reg_{t-l}^{g-l}}$, where l indexes the number of years lagged and g indexes grade. The results with *avgrate* as the dependent variable are presented in Table 2b. Again, the coefficients on *1960%black* are insignificant and close to zero. The standard errors are smaller than when a single grade's registration rate is analyzed alone, yielding relatively precisely estimated zeros.

Changes in continuation rates for lower grades show no significant correlation with initial black enrollment share, providing support for the assumption that mobility is unrelated to *1960%black*. I therefore turn to the analysis of registration rates for higher grades.

B. Main Results: Continuation Rates Older Grades

To estimate registration rates for 10th, 11th, and 12th grade and high school graduation rates, registration in the relevant grade (or number of high school graduates) is divided by 8th grade registration (the closest year unaffected by true dropping out) for the same cohort;

thus $contrate_t^{10} = \dfrac{reg_t^{10}}{reg_{t-2}^{8}}$, $contrate_t^{11} = \dfrac{reg_t^{11}}{reg_{t-3}^{8}}$, $contrate_t^{12} = \dfrac{reg_t^{12}}{reg_{t-4}^{8}}$, and $contrate_t^{HS} = \dfrac{grads_t^{HS}}{reg_{t-4}^{8}}$. I

compare those with 6th, 7th, and 8th grade registration divided by 4th grade registration for the same cohort, respectively, as well as the 2-, 3-, and 4-year lagged *avgrate*, respectively, described above.

To test the hypothesis that the continuation rates rose differentially by *1960%black*, I estimate equation (1a) for the upper grades. Because the results for younger grades show no evidence of differential migration, I also estimate equation (1a) for the upper grades, *controlling* for the change in the 5th-8th grade lagged continuation rate. The results, with and without controlling for the change in average 5th-8th grade lagged registration rates, are presented in Table 3. The point estimates indicate that black educational attainment rose more in districts with higher *1960%black*. Controlling for changes in low-grade continuation rates, the coefficients on *1960%black* indicate that a 10 percentage point increase in *1960%black* was associated with a 1.3, 1.9, and 1.8 percentage point larger increase in the continuation rates for 11th grade, 12th grade, and high school graduation, respectively; the estimated coefficients are statistically significantly different from zero at the 10 percent level

for 11th grade and at the 5 percent level for 12th grade and high school graduation. The coefficient for the 10th grade continuation rate is relatively small and statistically insignificant. (The 1960 black enrollment share ranges from about 10 to 70 percent, with a mean and median both around 40 percent; the standard deviation of this variable is 0.16.)

The results show that high black enrollment share districts saw larger increases in educational attainment during the period of desegregation.

C. Specification Checks

If black enrollment share is correlated with other characteristics of counties that were related to changes in attainment, the estimated relationship between *1960%black* and attainment could be due to factors other than the desegregation-induced changes in funding and peers. For example, if blacks in high black enrollment share districts were less educated at the beginning of the period, they might naturally improve at a faster rate over time, and the effects of increases in funding due to desegregation (due to higher initial black enrollment share) would be overstated.

There are three important potential confounders for which I can include proxies in the regression. First, the socioeconomic status of blacks living in a district may be correlated with black enrollment share, and counties with different socioeconomic status may be on different educational attainment trends. I use several proxies for SES of blacks and the population of the county as a whole from the 1960 Census (nonwhite median income, nonwhite median education, percent of households with complete plumbing, and the percent of population living in urban areas).[34]

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[34] Note that the poverty line was not defined until after 1960, so county tabulations of poverty rates are not available from the 1960 Census. (Poverty status is available on the 1960 IPUMS, but county identifiers are not.) I therefore, use the prevalence of complete plumbing as a proxy for poverty.

Second, during the 1960s, black participation in politics increased following the passage of the Voting Rights Act (VRA). Before VRA, black registration was particularly low in predominately black counties; to the extent that VRA helped equalize registration across counties, political participation would have increased more in blacker districts. In addition, blacks are a larger share of the voting-age population in blacker districts, so increased black participation may translate to improved circumstances for blacks more in those counties. I control for the share of the black voting age population (VAP) registered to vote in 1960 and the change from 1964 to 1968 in the share of black VAP registered, collected by Matthews and Prothro (1963a, 1963b).

Finally, the economic climate, especially the availability of employment, is an important input to the decision to enroll in school, as expanded employment opportunities increase the opportunity cost of schooling. Frequent district-level data on employment are not available for this period; but I am able to control for the log change in total employment from 1963 to 1970-1975.[35]

Another potential contributor to changes in educational attainment is changes in compulsory schooling laws. Some Southern states changed compulsory schooling laws during the period of desegregation because the state did not want to force whites to go to integrated schools. Fortunately for this study, there were no changes in compulsory schooling laws in Louisiana during this period.[36]

Tables 4a and 4b show the results of estimating equation (1b), including controls for pre-existing county characteristics. The first column (no controls) of Table 3 is repeated for comparison. Except for 10th grade continuations rate (where the estimated coefficient on

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[35] Technically, employment could be affected by changes in schools; however, the share of the potentially employed whose work decision may be affected by changes in schooling is most likely very small.
[36] Personal communication with Ann Huff Stevens and Marianne Page; data collected for Oreopoulos, Page, and Stevens (2003).

1960%black was already small and insignificant), the inclusion of controls increases the coefficients by about a quarter. If anything, high black enrollment share districts had other characteristics associated with declining educational attainment for blacks.

In addition to controlling for pre-existing county characteristics and changes in employment, I can examine the timing of changes in attainment in more detail. The differential increases in funding and exposure to whites were concentrated between 1965 and 1970; so if the differential improvements in attainment documented above were due to these changes, we would expect them to be concentrated in these same years (or at least not a gradual upward trend over the whole period). Two factors limit our ability to assess the timing of changes in black educational attainment somewhat. First, the annual attainment data are somewhat noisy, so year-to-year changes are not as precisely estimated as the differences in averages over longer periods. Second it is not obvious *ex ante when* changes in funding and peers should translate into changes in outcomes. We might expect lags between changes in schools and changes in outcomes, but we would not expect changes in outcomes to *lead* changes in schools due to desegregation. Despite these difficulties, the estimates of equation (2) are instructive, suggesting the differential improvements in educational attainment among high black enrollment share districts were concentrated between 1967 and 1971, consistent with a causal effect on attainment of increased funding around the same time.

The first panel of Figure 6 shows the results of estimating equation (2) for the 10th grade registration rate and plotting the interactions of *1960%black* with the year dummies. (Recall that this is equivalent to estimating year-by-year univariate regressions of 10th grade registration rate on *1960%black*.) For comparison, I also plot the results for the 6th grade continuation rate (6th grade registration divided by 4th grade registration two years prior) and

the average 5th-8th grade 2-year lagged continuation rate. The remaining panels of Figure 6 show the results for the 11th and 12th grade continuation and high school graduation rates, with the relevant low-grade comparison groups. First, Figure 6 shows that for none of the younger grade continuation rates is a trend in the coefficients evident, confirming that blacks' mobility was not correlated with initial black enrollment share.

The coefficient for the 10th grade continuation regressions increased around 1972, and for 11th grade continuation, it increased around 1969 or 1970. The coefficient for the 12th grade continuation and high school graduation rate regressions rose slightly earlier around 1968. The results are consistent with a larger increase in black continuation rates for high *1960%black* districts around the time of desegregation, when those districts experienced larger increases in per-pupil funding but smaller increases in exposure to whites.

Controlling for changes in younger grades, the results are similar to those shown in Figure 6 and are presented in Figure 7. Estimates of the coefficient on black enrollment share for the 10th and 11th grade registration rates began rising around 1969 and were higher on average in the post-desegregation period (left panel). The estimates for 12th grade registration and high school graduation rates increased substantially around 1968 and continued to rise thereafter (right panel).

The main finding that black educational attainment increased more in higher black enrollment share counties during the period of desegregation is not substantially influenced by the inclusion of control variables. Further, the timing of the increases closely matches the timing of differential increases in funding and reductions in student-teacher ratios for blacks due to desegregation, suggesting that desegregation policy—and the changes in the system of school finance it brought—helped improve black educational attainment in Louisiana.

VI. Conclusion and Discussion

The analysis presented above shows that, during the five years of the most intensive desegregation activity in Louisiana, districts with higher black enrollment shares saw substantially larger increases in per-pupil funding. Blacks in those districts saw large reductions in student-teacher ratios as black-white school quality gaps closed but also smaller increases in exposure to whites. The finding that blacks in higher black enrollment share districts experienced significantly larger increases in educational attainment during this period suggests that the increased funding that came with desegregation was more important than the increased exposure to whites.

The results suggest that increased funding associated with desegregation improved educational attainment for blacks, but the magnitudes of the coefficients presented in Tables 3 and 4 are not easily compared to the existing literature. I therefore provide two "back-of-the-envelope" calculations of the effects of school funding on educational attainment implied by the estimates. First, I estimate the elasticity of high school graduation rates with respect to school spending. I am not aware of existing literature estimating the cost of programs that increase high school graduation rates, however, so it is not clear to what this estimate should be compared. I therefore also conduct a simple cost-benefit analysis: I compare the net present value of additional wages induced by desegregation-related increases in school spending to the net present value of additional school spending for the affected cohorts. While the calculation necessarily requires a number of assumptions, desegregation-induced spending appears to have had positive net benefits for reasonable values of the relevant parameters.

To estimate the increase in high school graduation rates *per additional dollar spent*, we need to know the differential increase in spending for high black-enrollment-share districts. Estimating equation (1) with per-pupil revenue as the dependent variable yields a coefficient

on *1960%black* of 1.7 (thousands of 2003 dollars), indicating that a 10 percentage point

increase in *1960%black* is associated with an additional increase in per-pupil revenue of $170

(not reported).[37] Dividing the coefficient on the *1960%black* from the high school graduation

rate regression (0.19) by that from the per-pupil revenue regression yields an estimate of

0.11; thus, a $1,000 differential increase in funding (in constant 2003 dollars) during the

period of desegregation was associated with an 11 percentage point increase in the black

high school graduation rate. Average per-pupil spending in the pre-desegregation period

(1960-1965) was $2,400. Based on the 1980 Census, the average high school graduation rate

for pre-desegregation cohorts was 68 percent. The estimates suggest, therefore, that a 42

percent desegregation-induced increase in per-pupil revenue resulted in a 17 percent increase

in high school graduation rates.

A fuller accounting of the effect of desegregation on educational attainment should

include increases in educational attainment at points in the educational distribution below

high school graduation (starting in 10th grade). Based on the coefficients from the 10th, 11th,

12th grade continuation rate and high school graduation rate regressions, I estimate that a 10

percentage point increase in *1960%black* was associated with an additional increase in average

black educational attainment of 0.05 year for those cohorts represented in the "after" years.[38]

The average cohort in the in the "after" period was exposed to higher levels of funding for

3.5 years. Thus, $595 of additional spending[39] (3.5 X $170 per pupil per year) corresponded

to 0.05 additional years of educational attainment. Estimates from the literature on returns to

schooling suggest that an additional year of education raises wages by 8-12 percent; I use an

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[37] This is similar to an instrumental variables approach, regressing the change in educational attainment on the change in per-pupil revenue, using initial black enrollment share to instrument for per-pupil revenue. Because there are other channels through which black enrollment share may have affected outcomes—most important, changes in black exposure to whites depended on initial black enrollment share—I do not take an IV approach.
[38] See Appendix B for the details of the cost benefit calculation this section.
[39] Technically, the present discounted value of spending should be used. At reasonable discount rates, discounting will have little effect over such short time periods.

intermediate value of 10 percent. According to the 1970 Census, black Louisianans between the ages of 20 and 50 with 10-12 years of education (but no high school degree) had annual average wages around $9,700 (in CPI-adjusted 2003 dollars).[40] Based on these assumptions and assuming a 5 percent discount rate, the net present value of additional wages surpasses the $595 increase in spending after 17 years in the labor force.

This calculation is necessarily rough, requiring many assumptions. The benefits of desegregation policy are potentially significantly underestimated, primarily because higher wages due to increased educational attainment were not the only benefits of the policy, and there may have been costs not captured here (for example, to whites). Still, the additional spending appears to have been "worth it." Evidence is mounting that education has beneficial effects on outcomes other than wages, in particular, health and criminality.[41] In addition, the quality of education for blacks likely rose as well, so blacks who did not change their attainment may also have seen benefits. On the other hand, this study has not been able to account for the effects of desegregation on whites. In previous work (Reber 2006), I find that funding and student-teacher ratios were "leveled up" to the level previously experienced by whites; this is suggestive that whites were "held harmless" in resources allocated to their schools, and we would not expect large effects on educational attainment and quality for whites through that channel. Still, the overall effect of desegregation on whites could be positive or negative.

Little is known about how desegregation affected school finances in other states, so it is difficult to assess whether the mechanism that operated in Louisiana to bring up school spending and black educational attainment after desegregation operated in other parts of the

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[40] This estimate includes blacks with 0 wages; the average wages among those who are working is nearly $15,000.

[41] See, for example Lochner and Moretti (2004), Currie and Moretti (2003), Lleras-Muney (2005).

country. Margo (1990) estimates that Louisiana had one of the largest state-wide black-white school spending gaps among Southern states in 1950. This suggests that by the time of desegregation, other states may not have had as large a black-white quality gap to close, so there may have been less scope for improvement in blacks' outcomes through the mechanisms shown here.

The findings here are consistent with Guryan's (2004) results that implementation of a court-ordered desegregation plan reduced black dropout rates. Using a different methodology and different source of variation than that employed in earlier studies, I find evidence that desegregation improved educational attainment for blacks. The results presented here contribute to the growing literature suggesting that the policies designed to equalize educational opportunities of blacks and whites around the middle of the century—including desegregation—contributed to improved outcomes for their intended beneficiaries.

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Appendix A: Data Sources and Imputation of Segregation Measures

A. Data Sources

Louisiana Administrative Data

The *Annual Financial and Statistical Report* is published annually by the Louisiana Department of Education. The following variables were collected at the district level for 1960-1975 school years (all years refer to the fall of the school year): total black fall registration in public and nonpublic schools, total white fall registration in public and nonpublic registration, total revenue, total black classroom teachers in public schools, and total white classroom teachers in public schools.

To create the continuation rate variables (the outcome of interest), I also collected black registration in public and nonpublic schools for each grade for the 1956 to 1975 school years, as well as the number of high school graduates. (The analysis is restricted to 1960-1975, but in order to construct the 12th grade continuation and high school graduation rate, data on the number of 8th graders 4 years prior is required, so I employ data on registration by grade starting in 1956.) To account for the possibility of movement between public and private schools in the same district, I use the sum of public and nonpublic registration by grade to calculate the continuation rates (although few blacks were enrolled in private schools).

Data on student-teacher ratios at the school level are not available before 1970. However, according to the Southern Education Reporting Service, students and teachers were completely segregated by race through 1965 (white teachers did not teach in black schools and *vice-versa*). Thus, the average student-teacher ratio for the district is the total number of black students in the district divided by the total number of black teachers in the district. Student-teacher ratios by race for later years are calculated from Office of Civil

Rights (OCR) data. The OCR data (described below) contain information on the number of teachers in every school, as well as the number of black students and the total number of students. To calculate the black student-teacher ratio for 1970-1972, I calculated the student-teacher ratio (total students, any race, divided by total teachers, any race) in every school; I then calculated the weighted average student-teacher ratio for schools in each district, with black enrollment in the school as weights.

Per-pupil revenue is total revenue received by the district divided by total public registration (black and white).

Preexisting County Characteristics and Voter Registration

The percent of households with complete plumbing and the percent of the population living in urban areas at the county level, originally from the county tabulations of the 1960 Census, were taken from the City and County Databook. Nonwhite median income and the nonwhite median years of education were collected by Matthews and Prothro (1963a, 1963b), also from county tabulations of the 1960 Census. The percent of the black voting-aged population (VAP) registered to vote in 1960, 1964 and 1968 were collected by Matthews and Prothro from reports of the U.S. Commission on Civil Rights.

Employment

Information on employment by county was taken from *County Business Patterns* for 1964 and 1970-1975. The variable *Ln Change in Employment* is the average of the natural log of employment in 1970 through 1975 less the natural log of employment in 1964 (the only year in the "before" period for which data are available).

Educational attainment by state of birth

To estimate the share of cohorts of students attending 10th through 12th grade in 1960 to 1975, I use the 1980 Census IPUMS. Individuals were assigned to the state in which

they were born. Cohorts are identified by the school year in which they are expected to have been in the relevant grade. For example, an individual who is expected to have entered 12th grade in the 1965-66 school year is assigned to the 1965 cohort for the 12th grade ratio, 1964 for the 11th grade ratio, and 1963 for the 10th grade ratio. Individuals are assigned to a cohort based on their quarter and year of birth, assuming they entered 1st grade if they would have been 6 at the end of the 3rd quarter (individuals born in the 4th quarter are assigned to the following school year) and assuming they do not repeat grades.

B. Sources of Data on Segregation and Imputation Methods

I use data from the Southern Education Reporting Service's (SERS) *Statistical Summary, State by State, of School Segregation-Desegregation in the Southern and Border Area from 1954 to the Present* and surveys conducted by the Office of Civil Rights (OCR) of the Office of Education to estimate the measures of segregation for Louisiana school districts from 1960-1976. The exposure of blacks to whites is the percent white in schools, weighted by black enrollment and vice-versa for exposure of whites to blacks; data on racial composition at the *school level* are required to calculate these indexes. I obtained the original binary EBCDIC data files for the OCR surveys for 1968-1974 and 1976 (the survey was not conducted in 1975) and converted the files to ASCII for analysis. Similar school-level data on students and teachers by race were published for 1967 by the Office of Education; these data were entered for analysis. The exposure indexes where then calculated based on the school-level enrollment by race.

The OCR surveys were not comprehensive in all years, but the large size of Louisiana's school districts and the heavy involvement of the courts in desegregating its schools ensured that most Louisiana districts were included in the data in most years. Of the

66 districts in Louisiana, 45 were included in the 1967 survey, 61 in the 1969 survey, and all of the districts were included in the remaining years.

Before the 1967 school year, no school-level data on enrollment by race are available, but the Southern Education Reporting Service monitored desegregation efforts in Southern and Border states including Louisiana and reported on their findings in the *Statistical Summaries*. In some issues, the percent of blacks in school with any whites is listed at the district level for districts *with any desegregation activity*. Desegregation in this period generally took the form of a small number of black students enrolling in white schools. At low levels of desegregation of this form, the percent of blacks in school with whites provides an *upper bound* of exposure of blacks to whites. For example, consider a district that has one black school and one white school, each with half the total enrollment in the district. If 1 percent of blacks are moved to the white school, 1 percent of blacks are in a school that is 50/51 or 98 percent white, while 99 percent of blacks are in school with 0 percent white. Thus, the exposure of blacks to whites is $(0.98 \times .01) + (0.99 \times 0) = 0.0098$ or 0.98 percent. My method assumes that black exposure to whites is 1 percent; as the percent of blacks in school with any white increases and the percent black in the district increases, this method will overestimate exposure of blacks to whites more. The highest percent of blacks in school with any whites reported in the data is 5.5 percent. The small increase in black exposure to whites before 1966 represents an upper bound on the true increase in exposure.

The SERS publication only listed the percent of blacks in school with any whites for districts where there was at least some desegregation activity. The publication covering the 1964-65 school year appears to have complete coverage for districts with any desegregation; the Office of Education contracted with SERS to conduct a more complete accounting of the status of desegregation in that year, following the passage of the Civil Rights Act (CRA).

I therefore assume that any district that is not listed as having any blacks in school with whites in 1964 had no desegregation in earlier years and set exposure of blacks to whites to 0 for those years. In Louisiana, only 3 districts had any blacks in school with whites, with an average of about 2 percent of blacks in school with any whites. For 1966, SERS reported the *number* of blacks in school with whites; to estimate the percent in school with whites, I divided this by the number of blacks reported in the district in the 1967 OCR data if available. If a district is not listed as having any blacks in school with whites in 1966, black exposure to whites is set to 0 for 1966 and all previous years.

White exposure to blacks is not estimated from the SERS data, but the small numbers of blacks in school with whites indicates that this was also quite low before 1967. The trends presented in Figure 1 look similar if the sample is limited to districts that had data available in all years.

Appendix B: Cost-Benefit Analysis

Change in Revenue

The financial cost associated with desegregation is the additional revenue required to "level up" spending in integrated schools to the level previously experienced in the white schools. Because districts with high black enrollment shares traditionally had larger black-white spending gaps, spending had to increase more in high black enrollment share districts. In order to quantify the differential increase in revenue for high black enrollment share districts, I estimate equation (2) with per pupil revenue on the left-hand-side. The coefficient on *1960%black* is 1.7, indicating that a 10 percentage point increase in initial black enrollment share was associated with an additional $170 increase in per-pupil revenue between the before period (1960-1965) and the after period (1970-1975). The number of years that individuals were exposed to additional funding varied by year in the after period: observations in 1970 were exposed to increased funding for one year, observations in 1971 were exposed to two years, and so on. The average observation in the after period was therefore exposed to $(1+2+3+4+5+6)/6 = 3.5$ years of increased funding. Thus, a ten percentage point increase in *1960%black* was associated with an increase in cumulative average spending for cohorts in the "after" period of $170 X 3.5 = $595.

Change in Educational Attainment

In this analysis, I only consider the benefits of higher wages due to increased educational attainment. The educational benefits to blacks, therefore, are likely to be significantly underestimated. The estimates in Table 3 indicate the differential change in the share of students who attain *at least* 9th grade, 10th grade, 11th grade and high school

graduation.[42] I am interested in the change in average years of completed education, which is calculated as follows.

Because the estimates of the effects of desegregation on attainment focus on changes in 9th grade through high school graduation, for simplicity, I assume that everyone in the population attains at least 8th grade and not more than 12th grade. (Attainment outside of these ranges will difference out when I estimate changes in attainment due to desegregation policy.) The average education of the population is

(A1) $\quad \overline{educ} = \sum_{t=8}^{12} t \times p_t,$

where p_t is the share of the population attaining exactly t years of education. Let q_t be the share of the population that attains *at least* t years of education, then $q_t = p_t + q_{t+1}$. If everyone attains at least 8 and not more than 12 years (high school graduation), then $q_8 = 1$ and $q_{12} = p_{12}$. Substituting into (A1):

(A2) $\quad \overline{educ} = 8(1 - q_9) + 9(q_9 - q_{10}) + 10(q_{10} - q_{11}) + 11(q_{11} - q_{12}) + 12(q_{12})$

$\quad \overline{educ} = 8 + q_9 + q_{10} + q_{11} + q_{12}$

The change in educational attainment is therefore:

(A3) $\quad \Delta\overline{educ} = \Delta q_9 + \Delta q_{10} + \Delta q_{11} + \Delta q_{12}$

The coefficients on *1960%black* give the differential change in the q's. The differential change in average educational attainment is therefore the sum of the differential changes in attaining at least 9, 10, 11, and 12 years, the coefficients on *1960%black* for 10th, 11th, and 12th

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[42] Note that the 10th grade registration rate is the share of 8th graders who registered for 10th grade in the fall; I consider this to be a close proxy for the number of students who *completed at least* 9th grade; the 11th grade registration rate is the share that completed at least 10th grade, the 12th grade registration rate is the share that competed 11th grade; the High School Graduation rate is the share that completed at least 12th grade.

grade registration and high school graduation, respectively.[43] Using the second set of estimates from Table 3 (controlling for lower grade registration rates)[44], average educational attainment for blacks in a district that was 100 percent black would have risen by 0.040 + 0.132 + 0.191 + 0.184 = 0.547 years more than a district that was all white. Thus, a 10 percentage point increase in initial black enrollment share is associated with an additional increase in educational attainment of about 0.05 years during the period of desegregation.

Return to Education

Estimates from the literature on returns to schooling suggest that an additional year of education raises wages by 8-12 percent; I use an intermediate value of 10 percent.[45] According to the 1970 Census, black Louisianans between the ages of 20 and 50 with 10-12 years of education (but no high school degree) had annual average wages around $9,700 (in CPI-adjusted 2003 dollars).[46] Based on these assumptions and assuming a 5 percent discount rate, the net present value of additional wages surpasses the $595 increase in spending after 17 years in the labor force. See the main text for further discussion of the limits of this analysis.

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[43] I consider a student who registered for 10th grade to have attained 9 years of education, those who registered for 11th grade to have attained 10 years, and so on.

[44] I use the point estimates even where they are not statistically significantly different from zero.

[45] See Card (2001) for a review of the literature on returns to schooling.

[46] This estimate includes blacks with 0 wages; the average wages among those who are working is nearly $15,000.

Table 1a - Determinants of Changes in Black Exposure to Whites, 1960-65 to 1970-74

	Mean (std dev)	Change in Black Exposure to Whites		
Black Share of Enrollment, 1960	0.405	-1.051	-1.104	-1.024
	(0.162)	(0.064)***	(0.071)***	(0.081)***
Percent Black Voting Age Population Registered to Vote, 1960	0.359		0.097	0.048
	(0.282)		(0.048)*	(0.051)
Nonwhite Median Income, 1960	8.952		-0.007	-0.009
	(1.938)		(0.008)	(0.009)
Nonwhite Median Years of Education, 1960	3.365		0.005	0.005
	(1.082)		(0.014)	(0.014)
Percent of Households with Complete Plumbing	0.519		-0.136	-0.188
	(0.135)		(0.119)	(0.112)*
Percent of Population in Urban Areas	0.341		-0.140	-0.106
	(0.241)		(0.063)**	(0.061)*
Change in Percent of VAP Blacks Registered to Vote, 1964-1968	0.299			-0.174
	(0.178)			(0.079)**
Ln Change in Employment	0.353			0.067
	(0.206)			(0.048)
Constant		0.878	1.030	1.079
		(0.031)***	(0.094)***	(0.107)***
N	63	63	63	63
R-squared		0.74	0.82	0.83

Notes: Huber-White heteroskedasticity-adjusted robust standard errors in parentheses. See Appendix A for more information about variables.
* statistically significant at the 10 percent level; ** statistically significant at the 5 percent level; *** statistically significant at the 1 percent level.

Table 1b - Determinants of Changes in Black Student-Teacher Ratio, 1960-65 to 1970-72

	Change in Black Student-Teacher Ratio		
Black Share of Enrollment, 1960	-7.434	-4.166	-4.919
	(2.622)***	(2.405)*	(2.449)**
Percent Black Voting Age Population Registered to Vote, 1960		1.547	2.058
		(1.533)	(1.679)
Nonwhite Median Income, 1960		-0.108	-0.080
		(0.284)	(0.307)
Nonwhite Median Years of Education, 1960		0.991	1.004
		(0.381)**	(0.389)**
Percent of Households with Complete Plumbing		8.967	9.458
		(3.939)**	(3.775)**
Percent of Population in Urban Areas		-1.736	-2.088
		(2.187)	(2.157)
Change in Percent of VAP Blacks Registered to Vote, 1964-1968			1.804
			(2.541)
Ln Change in Employment			-0.310
			(1.796)
Constant	-2.924	-11.235	-11.971
	(1.155)**	(2.821)***	(3.384)***
N	63	63	63
R-squared	0.13	0.29	0.30

Notes: Huber-White heteroskedasticity-adjusted robust standard errors in parentheses. See Appendix A for more information about variables.

* statistically significant at the 10 percent level; ** statistically significant at the 5 percent level; *** statistically significant at the 1 percent level.

Table 2a - Determinants of Changes in Low Grade Continuation Rates, 1960-65 to 1970-75

	Grade 6			Grade 7			Grade 8		
Black Share of Enrollment, 1960	-0.025	-0.056	-0.061	-0.009	0.014	-0.007	-0.065	-0.080	-0.062
	(0.051)	(0.072)	(0.090)	(0.071)	(0.093)	(0.102)	(0.067)	(0.084)	(0.096)
% Black VAP Registered to Vote, 1960		-0.043	-0.025		-0.060	-0.027		-0.105	-0.096
		(0.040)	(0.037)		(0.059)	(0.062)		(0.061)*	(0.058)
Nonwhite Median Income, 1960		0.004	0.006		0.007	0.011		0.006	0.009
		(0.004)	(0.004)		(0.004)**	(0.005)**		(0.006)	(0.005)*
Nonwhite Median Years of Education, 1960		-0.014	-0.012		-0.028	-0.025		-0.037	-0.034
		(0.009)	(0.009)		(0.012)**	(0.013)*		(0.011)***	(0.011)***
% Households with Complete Plumbing		-0.047	-0.043		0.179	0.192		0.196	0.184
		(0.134)	(0.123)		(0.151)	(0.135)		(0.127)	(0.120)
% of Population in Urban Areas		0.021	0.009		-0.025	-0.048		-0.040	-0.047
		(0.059)	(0.054)		(0.068)	(0.067)		(0.066)	(0.064)
Change in % of VAP Blacks			0.056			0.106			0.020
Registered to Vote, 1964-1968			(0.082)			(0.115)			(0.094)
Ln Change in Employment			0.082			0.101			0.137
			(0.036)**			(0.056)*			(0.054)**
Constant	0.029	0.086	0.011	0.052	0.010	-0.103	0.079	0.103	0.013
	(0.024)	(0.074)	(0.068)	(0.031)	(0.080)	(0.095)	(0.031)**	(0.069)	(0.075)
N	63	63	63	63	63	63	63	63	63
R-squared	0.00	0.06	0.14	0.00	0.12	0.20	0.02	0.22	0.33

Notes: Huber-White heteroskedasticity-adjusted robust standard errors in parentheses. See Appendix A for more information about variables.

* statistically significant at the 10 percent level; ** statistically significant at the 5 percent level; *** statistically significant at the 1 percent level.

Table 2b - Determinants of Changes in Low Grade Continuation Rates. 1960-65 to 1970-75

	2-Year Lag			3-Year Lag			4-Year Lag		
Black Share of Enrollment, 1960	-0.014	0.002	-0.003	-0.016	0.007	0.012	-0.042	-0.014	-0.006
	(0.032)	(0.045)	(0.056)	(0.038)	(0.050)	(0.063)	(0.049)	(0.062)	(0.079)
% Black VAP Registered to Vote, 1960		-0.035	-0.022		-0.047	-0.039		-0.056	-0.051
		(0.032)	(0.032)		(0.040)	(0.036)		(0.047)	(0.041)
Nonwhite Median Income, 1960		-0.001	0.001		0.001	0.003		0.002	0.003
		(0.002)	(0.003)		(0.003)	(0.003)		(0.004)	(0.004)
Nonwhite Median Years of Education, 1960		-0.015	-0.014		-0.020	-0.018		-0.020	-0.019
		(0.007)**	(0.007)*		(0.008)**	(0.008)**		(0.009)**	(0.009)**
% Households with Complete Plumbing		0.118	0.121		0.162	0.159		0.205	0.200
		(0.085)	(0.078)		(0.089)*	(0.088)*		(0.101)**	(0.103)*
% of Population in Urban Areas		0.002	-0.006		-0.002	-0.008		-0.013	-0.017
		(0.038)	(0.036)		(0.042)	(0.043)		(0.049)	(0.051)
Change in % of VAP Blacks Registered to Vote, 1964-1968			0.039			0.023			0.012
			(0.060)			(0.063)			(0.069)
Ln Change in Employment			0.053			0.068			0.065
			(0.030)*			(0.036)*			(0.044)
Constant	0.034	0.035	-0.015	0.029	0.012	-0.040	0.036	-0.004	-0.047
	(0.015)**	(0.044)	(0.048)	(0.018)	(0.044)	(0.049)	(0.022)	(0.054)	(0.057)
N	63	63	63	63	63	63	63	63	63
R-squared	0.00	0.15	0.22	0.00	0.20	0.27	0.01	0.20	0.24

Notes: Huber-White heteroskedasticity-adjusted robust standard errors in parentheses. See Appendix A for more information about variables.

* statistically significant at the 10 percent level; ** statistically significant at the 5 percent level; *** statistically significant at the 1 percent level.

Table 3 - Changes in Continuation Rates v. Initial Black Enrollment Share, 1960-65 to 1970-75

	Grade 10		Grade 11	
Black Share of Enrollment, 1960	0.045	0.040	0.130	0.132
	(0.066)	(0.064)	(0.075)*	(0.077)*
Lower Grade Average Continuation Rate		-0.361		0.135
		(0.238)		(0.224)
Constant	0.037	0.049	-0.016	-0.020
	(0.029)	(0.029)	(0.034)	(0.035)
N	63	63	63	63
R-squared	0.01	0.03	0.05	0.05

	Grade 12		HS Graduation	
Black Share of Enrollment, 1960	0.177	0.191	0.179	0.184
	(0.076)**	(0.078)**	(0.075)**	(0.076)**
Lower Grade Average Continuation Rate		0.324		0.119
		(0.152)**		(0.141)
Constant	-0.027	-0.039	-0.020	-0.024
	(0.033)	(0.034)	(0.032)	(0.033)
N	63	63	63	63
R-squared	0.09	0.13	0.10	0.11

Notes: Huber-White heteroskedasticity-adjusted robust standard errors in parentheses. See Appendix A for more information about variables.
* statistically significant at the 10 percent level; ** statistically significant at the 5 percent level; *** statistically significant at the 1 percent level.

Table 4a - Determinants of Changes in 10th and 11th Grade Continuation Rates, 1960-65 to 1970-75

	Grade 10			Grade 11		
Black Share of Enrollment, 1960	0.045	0.019	-0.002	0.130	0.160	0.155
	(0.066)	(0.083)	(0.098)	(0.075)*	(0.099)	(0.115)
Lower Grade Average Continuation Rate		-0.472	-0.434		-0.035	0.067
		(0.242)*	(0.285)		(0.236)	(0.258)
% Black VAP Registered to Vote, 1960		-0.041	-0.031		-0.026	-0.031
		(0.058)	(0.063)		(0.052)	(0.064)
Nonwhite Median Income, 1960		0.001	0.001		-0.001	-0.003
		(0.008)	(0.008)		(0.010)	(0.010)
Nonwhite Median Years of Education, 1960		-0.021	-0.021		-0.023	-0.022
		(0.013)	(0.014)		(0.014)	(0.015)
% Households with Complete Plumbing		-0.126	-0.117		-0.038	-0.052
		(0.148)	(0.153)		(0.153)	(0.152)
% of Population in Urban Areas		0.110	0.104		0.134	0.141
		(0.059)*	(0.064)		(0.067)*	(0.072)*
Change in % of VAP Blacks			0.033			-0.027
Registered to Vote, 1964-1968			(0.107)			(0.113)
Ln Change in Employment			-0.039			-0.077
			(0.077)			(0.068)
Constant	0.037	0.164	0.168	-0.016	0.040	0.097
	(0.029)	(0.085)*	(0.114)	(0.034)	(0.096)	(0.123)
N	63	63	63	63	63	63
R-squared	0.01	0.10	0.11	0.05	0.14	0.17

Notes: Huber-White heteroskedasticity-adjusted robust standard errors in parentheses. See Appendix A for more information about variables.

* statistically significant at the 10 percent level; ** statistically significant at the 5 percent level; *** statistically significant at the 1 percent level.

Table 4b - Determinants of Changes in 12th Grade Continuation and High School Graduation Rates, 1960-65 to 1970-75

	Grade 12			HS Graduation		
Black Share of Enrollment, 1960	0.177	0.230	0.207	0.179	0.215	0.202
	(0.076)**	(0.090)**	(0.101)**	(0.075)**	(0.099)**	(0.118)*
Lower Grade Average Continuation Rate		0.185	0.214		0.020	0.019
		(0.177)	(0.208)		(0.188)	(0.219)
% Black VAP Registered to Vote, 1960		-0.017	-0.005		-0.017	-0.008
		(0.050)	(0.061)		(0.050)	(0.062)
Nonwhite Median Income, 1960		-0.007	-0.007		-0.003	-0.003
		(0.010)	(0.010)		(0.009)	(0.010)
Nonwhite Median Years of Education, 1960		-0.019	-0.019		-0.011	-0.011
		(0.014)	(0.014)		(0.014)	(0.014)
% Households with Complete Plumbing		0.085	0.095		0.047	0.055
		(0.135)	(0.137)		(0.160)	(0.156)
% of Population in Urban Areas		0.087	0.080		0.079	0.073
		(0.061)	(0.065)		(0.070)	(0.071)
Change in % of VAP Blacks			0.040			0.031
Registered to Vote, 1964-1968			(0.104)			(0.113)
Ln Change in Employment			-0.040			-0.003
			(0.070)			(0.067)
Constant	-0.027	0.010	0.013	-0.020	-0.013	-0.027
	(0.033)	(0.095)	(0.124)	(0.032)	(0.103)	(0.122)
N	63	63	63	63	63	63
R-squared	0.09	0.21	0.22	0.10	0.15	0.16

Notes: Huber-White heteroskedasticity-adjusted robust standard errors in parentheses. See Appendix A for more information about variables.
* statistically significant at the 10 percent level; ** statistically significant at the 5 percent level; *** statistically significant at the 1 percent level.

Figure 1
Trends in Segregation for Louisiana Counties
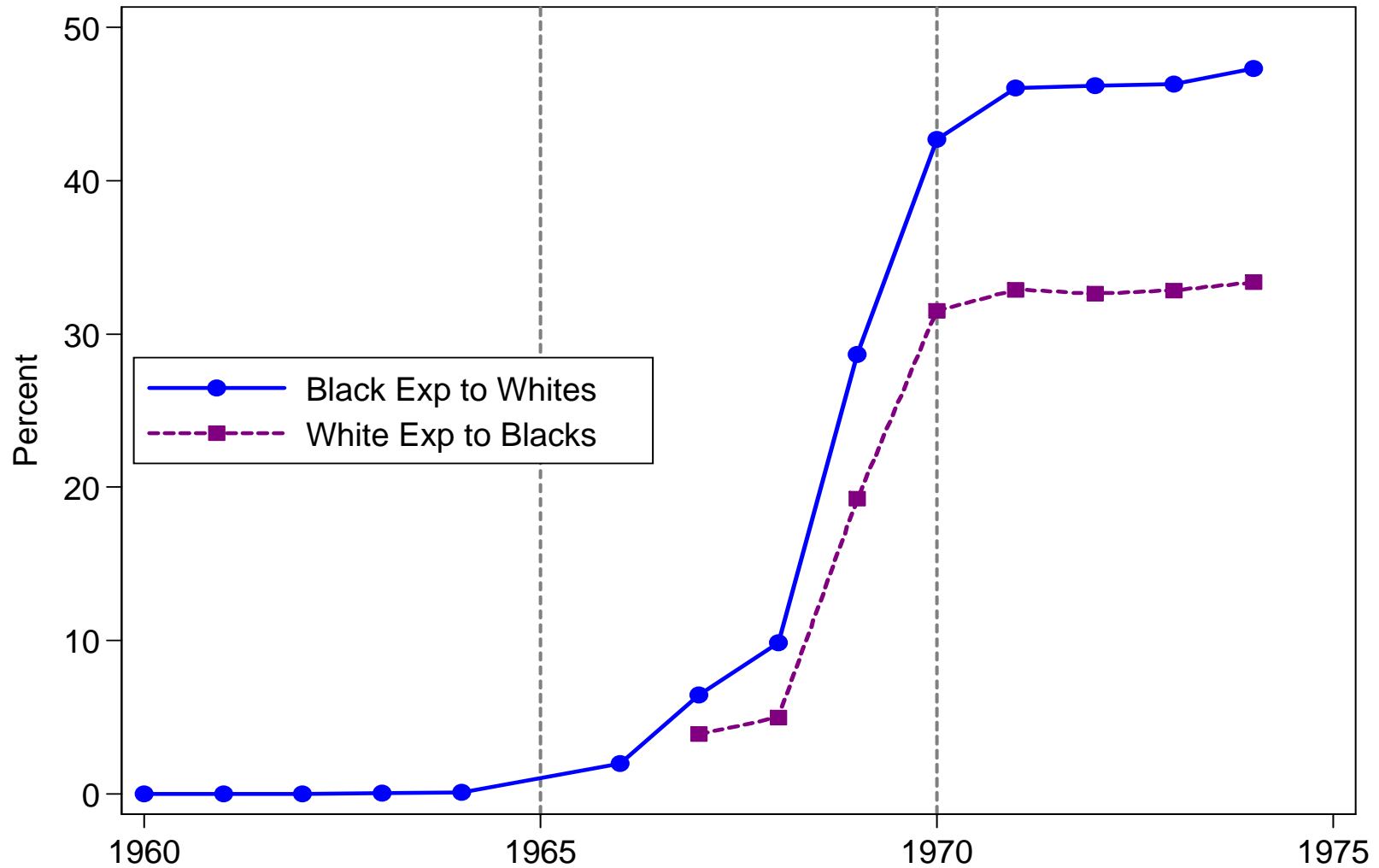
Notes: Authors calculations from *Southern Education Reporting Service* data (1960-1966) and Office of Civil Rights Surveys (1967-1974). Black exposure to whites for years before 1967 is estimated from the percent of blacks in school with any whites. See Appendix A for details.

Figure 2

**The Relationship between Black-White Student-Teacher Ratio Gaps and Black Enrollment Share Before and After Desegregation**
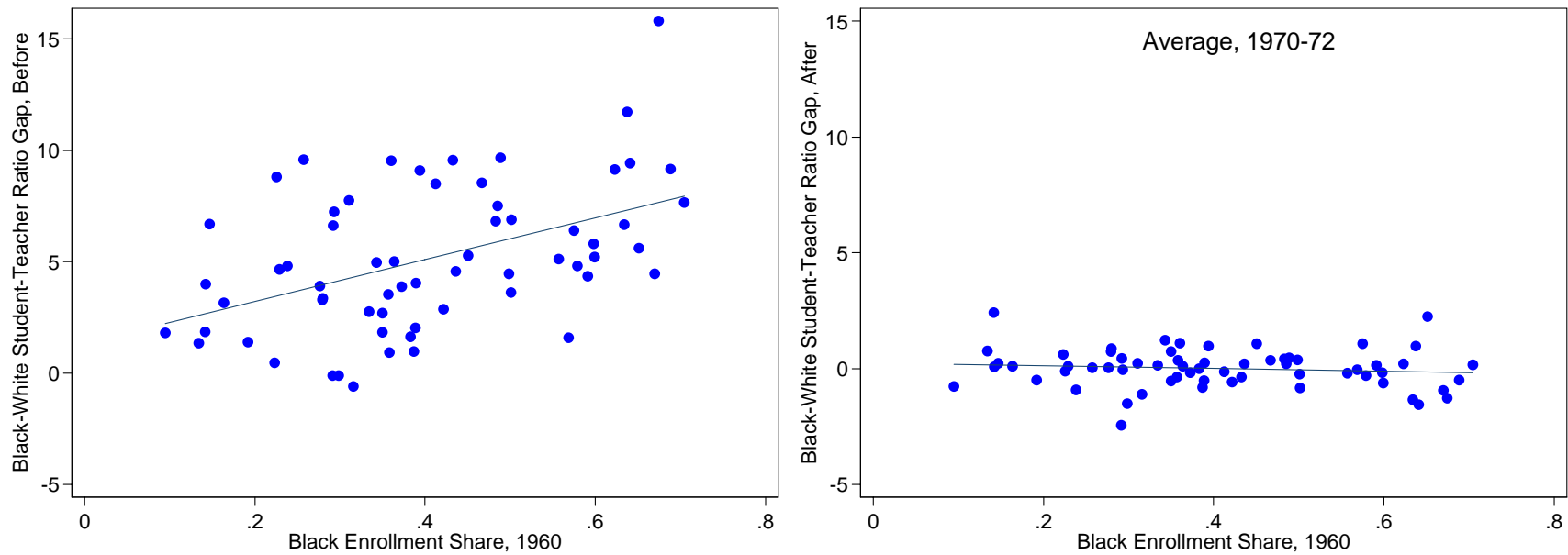
Notes: Author's calculations. Left panel shows the average gap between the student-teacher ratio for blacks and whites for 1960 to 1965 versus 1960 black enrollment share (based on *Annual Financial and Statistical Report*). Right panel shows the average gap between the student-teacher ratios for blacks and whites for 1970 and 1972 (based on Office of Civil Rights Survey). Data on student-teacher ratios by race is not available for other years between 1970 and 1975.

Figure 3
Changes in Peers and Resources by 1960 Black Enrollment Share
**Black Exposure to Whites and Student-Teacher Ratios**
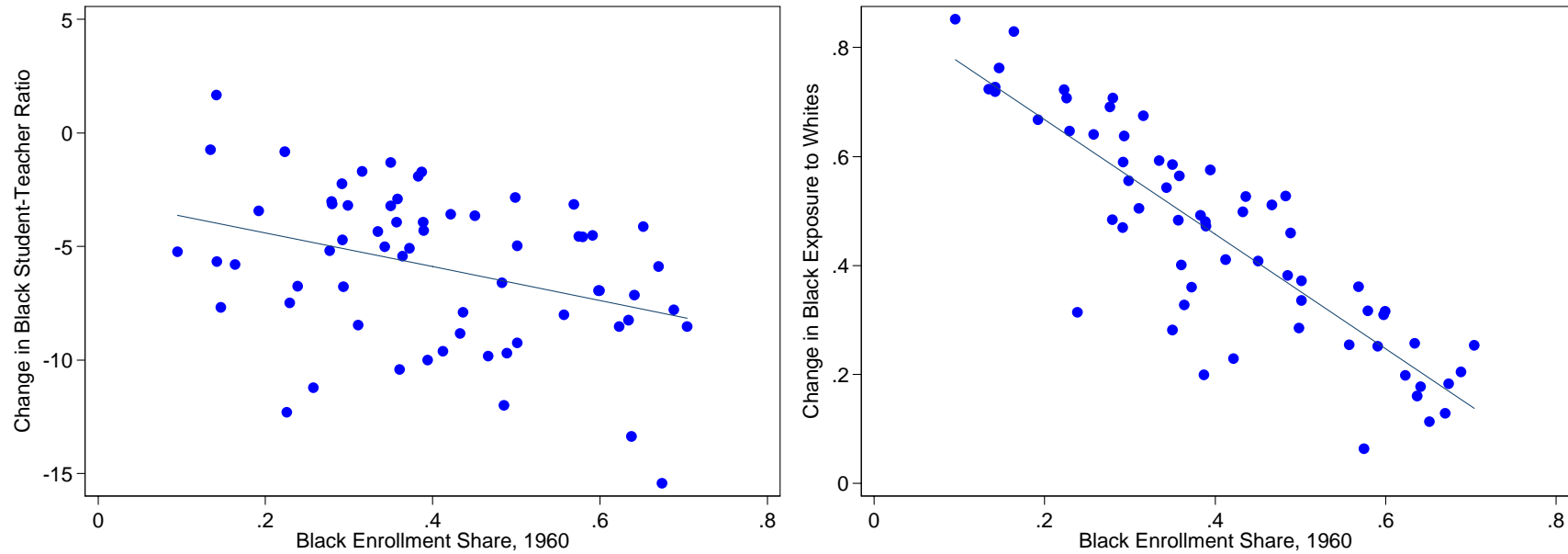
Notes: Author's calculations. Left panel shows the change in the student-teacher ratio from before (1960-1965) to after (1970-1972) desegregation. Black exposure to white is the white share of enrollment in the average black's school. Right panel shows the change in black exposure to whites from before (1960-1965) to after (1970-1974) desegregation. Segregation measures were imputed in some years, and black exposure to whites before desegregation was estimated from the percent of blacks in school with any whites (see Appendix A for details).

Figure 4
Trends in Black Educational Attainment in Louisiana
## Administrative and Census Data
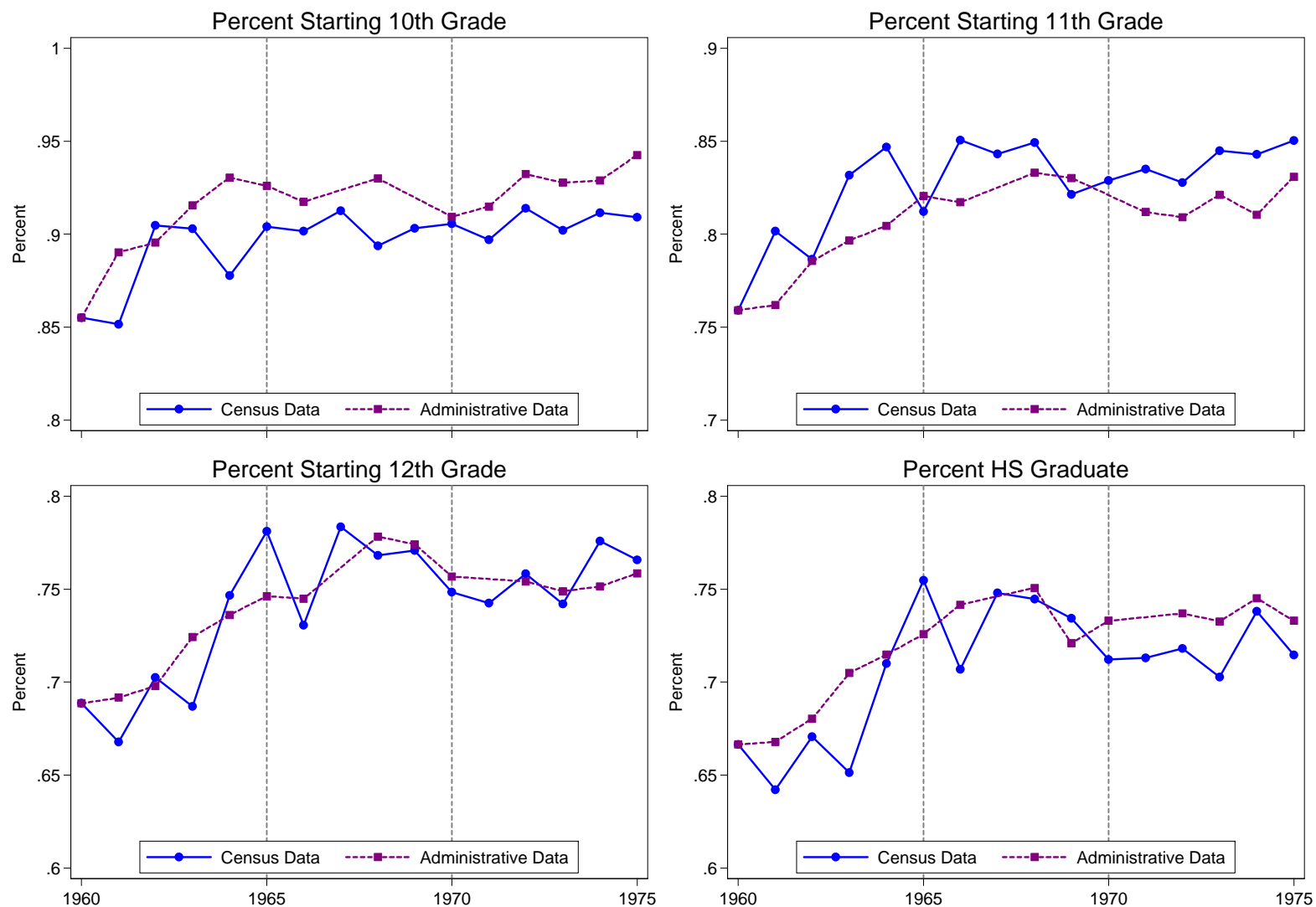
Notes: Author's calculations. Census series is the share of Louisiana-born blacks who reported attaining the specified level of education. Individuals are assigned to the year in which they would have attained the specified level. Series for administrative data are rescaled to be equal to Census series in 1960. See text for information on how attainment was calculated from administrative data.

Figure 5
**Percent with High School Degree, by Race and Region**
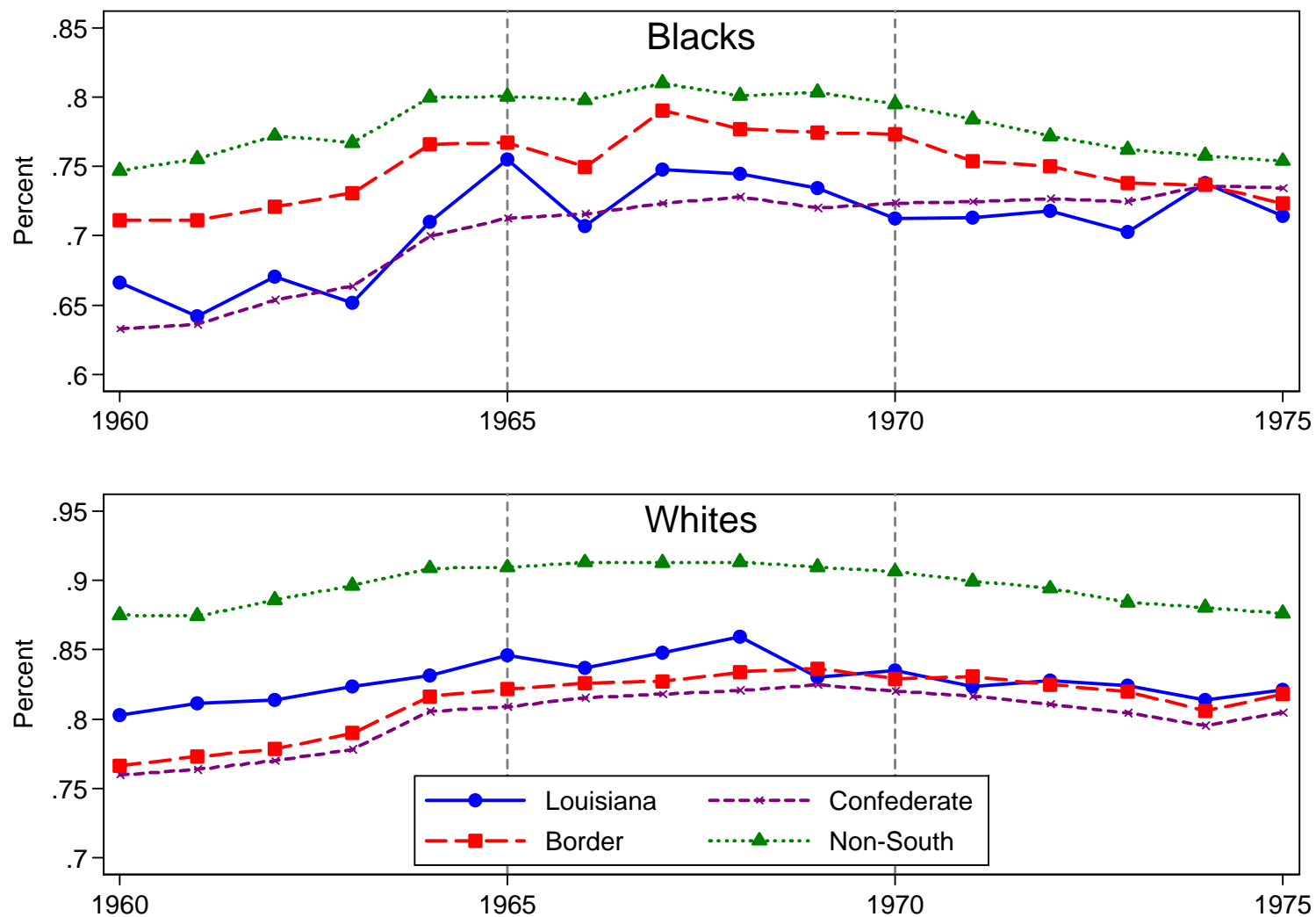
Notes: Author's calculations from 1980 Census IPUMS based on state of birth. Individuals are assigned to the year in which they would have graduated from high school.

Figure 6
Trends in Correlation between Initial Black Enrollment Share and Continuation Rates
By Grade
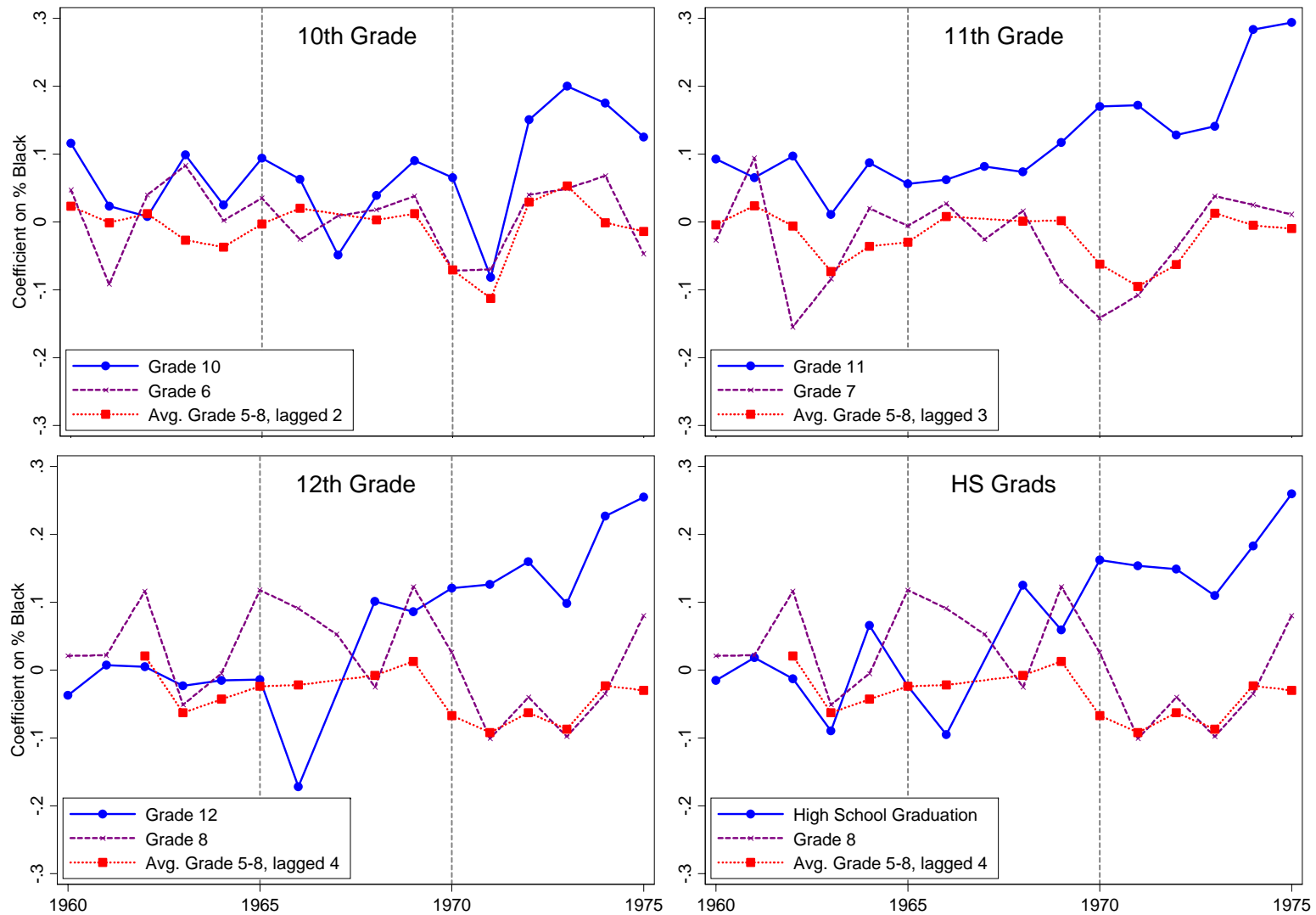
Notes: Author's calculations. Each point represents the coefficient on *1960%black* from a regression of the continuation or high school graduation rate on *1960%black*. Trends in the coefficient for lower grade continuation rates are presented for comparison.

Figure 7
Trends in Correlation between Initial Black Enrollment Share and Continuation Rates
Controlling for Lower-Grade Continuation Rates
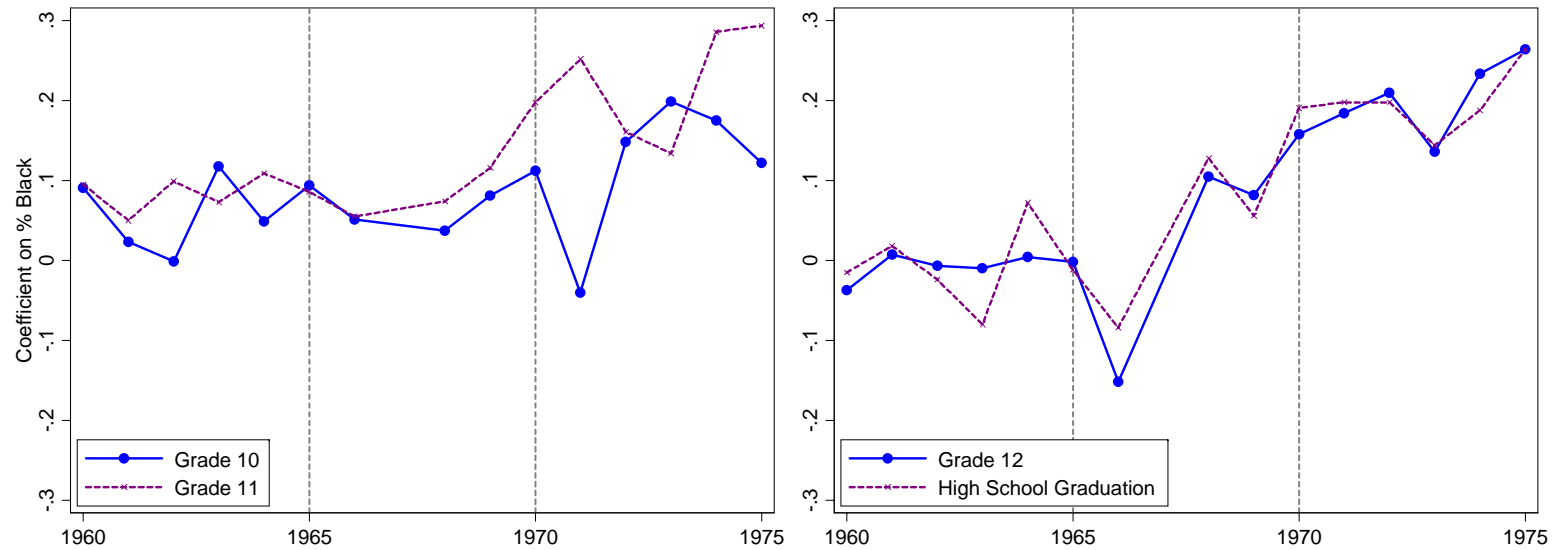
Notes: Author's calculations. Each point represents the coefficient on *1960%black* from a regression of the continuation or high school graduation rate on *1960%black*, controlling for average lower grade continuation rates (see text for further description).