NBER WORKING PAPER SERIES

EDUCATIONAL ACHIEVEMENT IN SEGREGATED SCHOOL SYSTEMS: THE EFFECTS OF "SEPARATE-BUT-EQUAL"

Robert A. Margo

Working Paper No. 1620

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
May 1985

Assistant Professor of Economics; and Faculty Research Fellow, National Bureau of Economic Research. I am grateful to Jere Behrman, Stanley Engerman, Claudia Goldin, David Gray, Janice Madden, Alan Mathios, Robert Pollak, Paul Taubman, and especially Anita Summers for helpful discussions. All errors are my own. This research was supported by the University of Pennsylvania. The research reported here is part of the NBER's research program in Development of the American Economy. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

NBER Working Paper #1620
May 1985

Educational Achievement in Segregated School Systems: The Effects of "Separate-But-Equal"

ABSTRACT

Educational achievement in segregated school systems was considerably lower in the black schools than in the white schools. Economic historians have argued that the racial achievement gap reflected the discriminatory funding of the black schools. This paper assesses counterfactually the historical effects of a "separate-but-equal" policy of educational finance. Using cross-sectional data from 1930 and 1940, I estimate race-specific educational production functions. Eliminating race differences in inputs supplied by school boards explains 40-50 percent of the racial achievement gap, depending on how achievement is measured. The remainder appears to reflect the impact of family background on achievement, of which the most important effect was adult black illiteracy, a legacy of slavery and educational backwardness in the late 19th century. The paper also shows how school boards' marginal valuation of black achievement can be recovered from the production function estimates. Compared to preferences that would have led them to voluntarily practice equality, Southern school boards judged black achievement to be worth roughly half the value they placed on white achievement.

Robert A. Margo
Department of Economics
University of Pennsylvania
3718 Locust Walk
Philadlephia, PA 19103
(215): 898-6777

I.

The historical indictment of segregated schools enjoys a widespread consensus. No matter how the nominal attributes of school systems are measured, few would question that black children in the South received educations inferior to their white counterparts during the segregation era.[1] Less clear is how these differences in the quality of schooling were translated into the equally large racial gaps in achievement levels. Numerous studies, some dating from the early 20th century, attest to the superior performance by white children on standardized tests, age-in-grade distributions, and other measures of educational achievement. But can these differences be traced to the discriminatory funding of the black schools, or are other factors primarily responsible?

The point of departure for this study is a recent paper by James Smith (1984) analyzing the role of human capital in the historical evolution of black-white income differences. Blacks emerged from slavery overwhelmingly illiterate. Literacy rates among black children rose over time, however, as each successive cohort remained in school until later ages. In 1890, for example, 39.8 percent of black children aged 10-14 were unable to read or write; by 1930, illiterates numbered only 5.3% of the same age group.

In contrast, the racial gap in incomes narrowed at a much slower pace, in part because race differences in mean educational attainment remained relatively large until recent decades.[2] But

Smith (p. 692) also conjectured that high rates of adult black illiteracy, "which [serve] as a crude proxy for family background, may indicate why advances in the relative market earnings of blacks were initially so slow." Smith did not elaborate further on the intergenerational effects of family background, but one possible conduit was the schools. The positive effects of parental schooling and income on the educational achievement of children are well documented in modern studies of educational production (Hanushek, 1972; Summers and Wolfe, 1977) Given the low relative incomes and schooling levels of black parents in the early 20th century South, a policy of "equal educational opportunity," narrowly defined to include only inputs supplied by school boards, may have had only a small impact on the racial gap in educational achievement.

This paper presents econometric evidence that strengthens the traditional indictment of segregated schools, but also provides for a significant historical role for family background effects in educational production. Using data from Alabama for 1930 and 1940, I estimate county-level, race-specific educational production functions. The production function paramaters are then used to simulate the historical effects of a "separate-but-equal" policy of educational finance. Depending on the measure of achievement, eliminating race differences in the inputs supplied by Alabama school boards accounts for 40-50 percent of the racial gap in educational output. On this evidence, then, the effects of educational discrimination in segregated school systems were far from trivial, but they also were not large

enough to fully account for the racial achievement gap.

The county-level data are inadequate for addressing the separate impacts of adult illiteracy and educational discrimination on achievement, however, and a higher level of aggregation--state-level data--is required. Cross-sectional regressions for 1930 also reveal significant effects of educational discrimination on child literacy rates (ages 10-14), thus providing some additional support for Robert Higgs' (1984, p. 8) contention that "the attainment of [black] literacy was slower than it would have been in a non-discriminatory system." But children of illiterate parents were at a marked disadvantage compared to the offspring of literates. Holding constant other factors, the elasticity of child literacy with respect to adult literacy was close to one for both races. Black children had fewer years of schooling before age 10 if their parents were illiterate, and regardless of race, children of illiterate parents attended poorer quality schools.

The production function estimates also shed light on the racial attitudes and behavior of Southern school boards. Recent work in labor economics stresses the interactions among parental preferences, child "endowments", and the allocation of resources within households toward investment in human capital [Behrman, Pollak, and Taubman, 1982] Similar issues arise in considering the allocation of resources in segregated school systems. One cannot conclude <u>a priori</u> that school boards valued black achievement less if they devoted fewer dollars to black students, if the productivity of school board inputs were lower in the

black schools. Section V of the paper shows how these relative valuations can be recovered from the production function estimates. Alabama school boards ca. 1930-40 appear to have judged black literacy to be worth far less than white literacy, roughly half the relative valuation that would have led to them to practice racial equality in allocating school board budgets. Shifts in racial attitudes of school boards appear to explain the changing racial gap in school board supplied inputs during the 1930s.

II.

Since their inception, state boards of education in the South, like their counterparts elsewhere in the country, have issued annual reports. Although their level of detail varies greatly, the reports constitute an important and underutilized data source. The Alabama reports for 1930 and 1940 are particularly valuable. In addition to detailed, race-specific county-level information on the characteristics of segregated school systems, they also contain race-specific figures on literacy rates, ages 7-20. Similar data are generally unavailable for other Southern states, except as state averages for a somewhat different age group (e.g. ages 10-14, 15-19).

Modern studies of educational production typically measure achievment by standardized test scores or the change in test

scores over a well-defined time period, and pupil-specific data are preferred to school or district averages [Summers and Wolfe, 1977]. Although race-specific studies of test scores exist for the early 20th century [Bond, 1934, pp. 331-357] the results are highly aggregated, limited to a small number of school districts, and not directly comparable to modern studies. More to the point, the micro-data necessary for such an analysis do not exist in any readily accesible form. This paper treats the county as the unit of observation (the lowest level of aggregation available in the published data) and uses county averages as dependent and independent variables.

Three race-specific proxies for achievement are examined in this paper. The first, LQ1, is the literacy rate of children and young adults, ages 7-20. This variable is not specific to the public schools, but the bias is probably small.[3] The second and third are, respectively, the ratio of second to first graders (LQ2) and the share of second through six graders in total elementary school enrollment (LQ3).[4] According to Finis Welch [1973, p. 59]:

> In examining the data of the Negro schools, the most striking dimension is the extraordinarily high ratio of first to second graders. If all students complete at least the second grade, and if there is no growth in total enrollment ... then the ratio of enrollment of first to second graders is the time required to complete the second. Since the second grade cannot be completed in less than one year, we can assume that on average a Negro stu-

dent took at least two years to complete the first grade between 1920 and 1940.

Under the assumptions stated by Welch, LQ2 is the first grade promotion rate, or the inverse of the first grade retention ratio. Although these assumptions appear to have been violated in practice (see the discussion in Section III), it is nevertheless clear that high values of LQ2 (and LQ3) are consistent with high levels of achievement and low values with low levels of achievement [Welch, 1973, p. 59].

The educational production function literature suggests three types of inputs: student time, inputs supplied by the school board, and family background. Student time is proxied by the average days attended per pupil enrolled in the elementary grades (LDAYS).[5] Estimates of days attended for first graders, or a more cumulative measure, such as years of prior schooling, are not available at the county level. Inputs supplied by the county board are proxied by three variables: teacher salaries per pupil enrolled in the elementary grades (LPPED); the value of the school capital stock per pupil (LVCPP); and the proportion of one-teacher schools (P1TS). School capital was presumably valued at historical cost; the estimates exclude privately-owned buildings used for school purposes, which was particularly common in the black schools. For these reasons, the measurement error in LVCPP is likely to be considerable, and caution should be exercised in interpreting the coefficients of this variable. LPPED and LVCPP are deflated to 1930 dollars using the implicit price deflator for state and local government expenditures

[U.S. Department of Commerce, 1975, p. 198].

Regressions are also reported in which LDAYS and LPPED are divided into two components. The components of LDAYS are the average daily attendance rate (LATTR), and the average number of days schools were open (LLT). The components of LPPED are the average daily teacher salary (LDS), and the teacher-pupil ratio (LCS). LDS is a proxy for teacher quality: analysis of teacher salaries in the early 20th century South reveals significant positive associations between the daily wage and teachers' human capital characteristics, regardless of race [Margo, 1984]. All of the school board inputs should be positively related to the three achivement proxies, excpt PlTS, which should be negatively related.

The number of family background that could potentially be entered in the regressions is limited. Adult illiteracy, for example, could not be included because county-level data for 1930 and 1940 are unavailable.6 The principal family background variable is race, since the regressions are estimated separately by race. An attempt was made, however, to construct race-specific measures of per capita income. Actual income data are available only with the 1950 census, and any algorithm for constructing estimates for earlier years is necessarily crude. The estimates employed in this paper are based on weights derived from the 1950 census breakdown for Alabama of race-specific incomes by urban, rural-farm, and rural-non-farm status, adjusted for family size, and applied to the 1930 and 1940 population distributions within counties.[7] Because of the potential for

measurement error, the income coefficients reported in this paper are probably biased towards zero.

The limitations of the data are numerous. The aggregate nature of the inputs obscures their heterogeneity within counties. The current value of school board inputs may be a poor proxy for the actual quality of schooling if educational change is rapid, or if inter-county migration of school-age children is high. For both reasons, the coefficients of school board inputs and student time may be biased towards zero.[8] On the other hand, the omission of family background variables other than race and income may bias the school board input coefficients upwards if the left-out variables are positively correlated with both school board inputs and achievement.[9] Without detailed pupil-specific data and a much richer list of inputs and family background variables, it is impossible to determine the relative magnitude of these biases.

Table 1 exhibits the race-specific arithmetic sample means by decade. For the purposes of the regression analysis, all of the independent variables (except P1TS) and LQ2 are measured in logs, and LQ1 and LQ3 are expressed in logit form. The figures in brackets are the sample means of the transformed variables.

Educational outputs and inputs in the white schools exceeded their respective levels in the black schools in both years. In 1930, for example, the white literacy rate exceeded the black literacy rate by 16 percentage points, and white children could apparently complete the first grade in only 63 percent of the time required by the average black child. In both years the

racial gap in per pupil expenditures and the school capital stock were much larger than the racial gap in the length of the school year or class sizes.

Achievement and inputs rose regardless of race during the Depression. The rise in the white first grade promotion rate is especially marked, and may be biased upwards (see Section III). The mean race differences in literacy, school term lengths and daily teacher salaries fell over the decade, while the racial gap in the per pupil value of the school capital stock increased. Perhaps the most important change in the black schools was the increase in mean days attended in the elementary grades. Assuming he attended the additional days each years, a black pupil age 12 in school continuously since age 6 would be about a grade further along in 1940 than in 1930.[10]

III.

The regression results are shown in Tables 3 through 5. The regressions were estimated separately for each race, pooling the data across decades to increase sample size, and including year dummies for 1940.[11]

Days attended was positively related to the three achievement proxies regardless of race, but the coefficients were statistically significant only in the LQ1 and LQ2 (white) regressions. As pointed out in Section II, LDAYS may be a poor proxy for the student time input, since it is not a cumulative

measure of school attendance. Decomposition of LDAYS in LATTR and LLT demonstrates that the length of the school year was a highly significant determinant of achievement, as Welch [1973, p. 58] conjectured. Within the observed sample range, however, variation in attendance rates were generally insignificant.

Achievement was positively and significantly related to expenditures on teacher salaries regardless of race. Decomposition of LPPED into LDS and LCS shows that both variables generally had similar effects on achievement. Evidently the quality of teaching staffs and class sizes--factors often stressed by school superintendents and educational historians--were important determinants of achievement among children of both races.

The impact of the school capital stock proxies on achievement is unclear. Among black students, the per pupil value of the school capital stock exhibited a significant positive effect on literacy and the share of elementary students beyond the first grade, but was insignificantly (though positively) related to the first grade promotion rate. In the white regressions, increases in LVCPP significantly raised the first grade promotion rate and the share of elementary students beyond the first grade but had no effect on child literacy. In none of the regressions did an increase in the proportion of one-teacher schools significantly reduce achivement, although the coefficient was the correct sign (negative) in 10 of 12 cases. Welch (1973, p. 59) suggested that "discipline would have consumed a significant proportion of instructional time and

energy" in one-teacher schools, but it may be that the mixing of students from different grades benefitted younger children, whose performance is chiefly recorded in the achievement proxies considered in this paper.

Although the per capita income elasticities are positive as expected, they are generally insignificant, except in the literacy regressions. The lack of significance of income in the LQ2 and LQ3 regressions is puzzling, but may simply reflect the crudeness of the procedure used to generate the income estimates rather than the absence of an underlying relationship. The positive and significant effect of per capita income on child literacy may, in part, be capturing the intergenerational impact of adult illiteracy on achievement (see Section IV).

What was the effect of educational discrimination on the racial achievement gap in Alabama? Answering this question requires a definition of "separate-but-equal". For the purposes of this paper I define "equality" to be a reduction in the racial gap in school board inputs to zero in any particular year.[12] Given this definition the percentage of the (mean) achievement gap that is "explained" by the (mean) race differences in school board inputs simulates the counterfactual impact of a "separate-but-equal" policy of educational finance. These percentages are shown in Table 6, along with the percentages of the race-specific changes in achievement over the 1930s that are accounted for by race-specific changes in school board inputs. All calculations are based on the regressions with LDAYS and LPPED; the conclusions are unaffected if the regressions with LLT, LDS, and

LCS are used. The across-race figures outside the brackets are based on the white regression coefficients, and the figures in brackets are based on the black coefficients.[13]

Recent historical work on teacher salaries [Margo, 1984; see also Butler, 1983] demonstrates that 75-85 percent of the racial gap in daily teacher wages in the early 20th century South cannot be explained by race differences in teachers' human capital characteristics or local labor market variables. Assuming that this unexplained wedge represents wage discrimination against black teachers, it would be incorrect to raise the salary scale in the black schools to the white level when measuring the impact of educational discrimination on student achievement. The early 20th century wage data may yield inappropriate conclusions for the 1930s, however, and I arbitrarily assume that 50 percent of the racial salary gap in Alabama was a discriminatory wedge. To the extent that this figure is too small, the effects of "separate-but-equal" shown in Table 6 are biased upwards.

Regardless of how it is measured, the racial achievement gap would have been narrowed by a considerable amount if "separate-but-equal" had been enforced. The historical relevance of this conclusion can be gauged by considering the case of child literacy. In 1930, 77 percent of Alabama's black children (ages 7-20) were literate; under equality, black literacy would have risen to 88 percent, the level recorded in 1940.

In the absence of left-out variables and other specification or measurement errors that change over time, the across-race percentages should be similar in both years, and should also be

comparable to the across-decade percentages (within race).[14] This statement is approximately true for the black percentages but not the white percentages. The discrepancies are especially large in the LQ2 and LQ3 calculations, particularly for whites. This suggests that a significant fraction of the improved achievement over the 1930s cannot be explained by changes in the inputs included in the regressions, an interpretation also indicated by the highly significant, and relatively large decadal dummies.[15] Some of the rise over time in the white first grade promotion rate, however, may be spurious. Evidence for North Carolina from 1930 suggests that first grade promotion rates estimated from contemporaneous first and second grade enrollments (i.e. Welch's procedure) are biased upwards relative to the true promotion rate as the estimated rate approaches unity. Adjusting the Alabama white promotion rates for the probable margin of error implied by the North Carolina data, however, still leaves most of the differences in the white percentages unexplained.[16] In light of this finding, the black percentages provide a better indication of the relative impact of educational discrimination on the racial achievement gap.

The upshot of this discussion is that somewhat less than half of the racial achievement gap in Alabama ca. 1930-40 can be explained by race differences in school board inputs. While the effects of educational discrimination thus appear to have been considerable, the majority of the racial achievement gap remains unaccounted for. Although it would be wrong to attribute the residual entirely to the effects of family background (some part,

for example, is due to race differences in attendance rates and unmeasured school board inputs) such an interpretation is clearly suggestive.[17] The next section examines the impact of one such family background variable--adult illiteracy--on achievement, through an analysis of state-level data on child literacy rates.

IV

This section uses state-level data for 1930 to explore the relationship between child and adult illiteracy, a linkage that could not be examined in the county-level regressions due to a lack of data on adult illiteracy. The sample consists of 17 states (plus Washington, D.C.) for which race-specific data on school board inputs could be obtained.

The dependent variable is the logit transformation of the race-specific literacy rate, ages 10-14. The student time input is proxied by an estimate of the average years of schooling potentially received between the ages of 6 to 9, adjusted for differences across states in school term lengths (LAYRS). This indicator of student time improves upon days attended, since it captures cumulative exposure to schooling before achievement (literacy) was measured.[18] In addition, the available state-level data on days attended pertain to public school students at all levels, and may be a poor measure of student effort in the acquisition of basic literacy. School board inputs are expenditures on teacher salaries per pupil (LEXPP), and the per pupil value of the school capital stock (LPP), both in 1930

dollars. LAYRS, LEXPP, and LPP are measured in logs. Adult illiteracy is captured by LILLA, the log of the adult illiteracy rate, ages 35 and up. The regression results are shown in Table seven.

The effect of years of schooling on child literacy is positive as expected, and in view of the small sample size, should be judged significant, especially for blacks. Expenditures per pupil also exhibits significant positive coefficients, although the magnitude of its impact appears to have been less than years of schooling for both races. The per pupil value of the school capital stock is insignificant in every case, and fails to display consistently positive coefficients. As in the county-level regressions, the interpretation of this variable is questionable, and measurement error may be a serious problem.

Adult illiteracy had a highly significant negative effect on child literacy regardless of race. The coefficients imply only a slight amount of regression towards the mean, ceteris paribus: evalutated at the sample mean probabilities, the elasticities of child literacy with respect to adult illiteracy are -0.85 for whites and -0.94 for blacks. Controlling for adult illiteracy substantially reduces the impact of years of schooling on black child literacy, but has little effect on the white coefficient. On the other hand, including adult illiteracy decreases the effect of per pupil expenditures on child literacy to a much greater degree among whites than blacks. Using the formula for specification error bias (Theil, 1971, p. 548), the elasticities of LAYRS and LEXPP with respect to adult illiteracy can be

calculated (see Table 8). Evidently children of illiterate parents, especially whites, attended poorer quality schools, and among blacks, adult illiteracy significantly reduced years of schooling prior to age ten.

Following the same procedure as in the county-level case, approximately one-third of the mean racial literacy gap can be explained by race differences in school board inputs, somewhat less than in Alabama alone. On the other hand, were there no race differences in adult illiteracy, the regression coefficients imply that the racial achievement gap would have been eliminated entirely.[19] The constant terms, which are analagous to total factor productivity effects, are the source of this ambiguity. Since there is no good historical reason to believe that total factor productivity was **higher** in the black schools (indeed, there are good reasons to believe the opposite--see Section V) a strong possibility is that the census literacy rates for black children may be biased upwards relative to whites.[20] If such a bias were large enough to equalize the constant terms across the regressions, the percentage of the racial achievement gap accounted for race differences in adult illiteracy would fall to 60 percent.

In sum, the regressions strongly suggest that an intergenerational linkage between adult and child literacy existed in the early 20th century South.[21] Adult illiteracy influenced achievement directly by lowering the productivity of school board inputs. But the indirect effects were also substantial: adult illiteracy reduced family income (Smith, 1984)

and poverty affected achievement indirectly by reducing the quantity (and presumably the quality) of school board inputs, and by lowering the student time input, particularly among blacks.

V.

The evidence that Southern school boards allocated fewer resources to black students is overwhelming. On such evidence one cannot conclude, however, that school officials necessarily valued black achievement less than white achievement. This section shows how the relative (marginal) valuation of black schooling can be recovered from the production function estimates.

The model of school board behavior I consider is similar in spirit to recent models of the allocation of resources within families [Behrman, Pollak, and Taubman, 1982]. The school board allocates its budget to maximize a social welfare function $V(n_w h_w$ $n_b h_b)$ where n_i and h_i are, respectivly, race-specific enrollment and achievment, i=w,b. Educational achievement is a function of school board inputs, family background, and student time; the latter two inputs are supressed in the following analysis. The school board budget is assumed to be exogenously determined.

For the case of a single school board input (s_i) the board's maximization problem may be written:

$$\underset{s_w, s_b}{\text{Max}} \quad V(n_w h_w(s_w), n_b h_b(s_b))$$

$$\text{s.t.} \quad n_w p_w s_w + n_b p_b s_b = z$$

where p_i is the race-specific input price, and z is the school board's budget.

The first-order conditions are:

$$MV(b)/MV(w) = MP(w)/MP(b) \times p_b/p_w$$

where MV(i) and MP(i) are, respectively, the race-specific marginal valuation of achievement, and the marginal product of the school board input. The school board allocates its budget so that at the optimum, the relative marginal valuation of black achivement equals the white/black ratio of marginal products, multiplied by the black/white ratio of input prices.[22]

Suppose that $p_w = p_b$. Even if the school board were to follow a "separate-but-equal" policy, MP(w)>MP(b) because of race differences in family background and the student time input. If, however, $s_w > s_b$ by a sufficiently large amount, then MP(w)<MP(b) and black achievement will be valued less than white achievement. Thus in the absence of race differences in the price of school board inputs, a necessary, but not sufficient condition for the board to value white above black achievement is $s_w > s_b$. The existence of wage discrimination in the teacher market, however, strongly suggests that $p_b < p_w$. In this case the white/black ratio of actual marginal products is an upper bound on the relative value placed on black achievement.

The empirical application of this model proceeds in three

stages. I first calculate the white/black ratio of marginal products assuming that "separate-but-equal" holds; call this ratio r(e). I next calculate the white/black ratio of marginal products at the actual s_w and s_b; call this ratio r(a). The final step is to calculate r(a)/r(e): this ratio measures the extent to which actual school board preferences deviate from a hypothetical set of preferences that would have led school boards to choose a "separate-but-equal" policy. The closer is r(a)/r(b) to zero, the more racist are the attitudes of the school board. Furthermore, to the extent that r(e) was rising over time, and r(a)/r(e) was constant or rising, it follows that the relative valuation of black achievement was increasing as well.[23]

Table 9 displays some illustrative calculations of the relative valuation of black literacy by Alabama school boards based on this approach, for two school board inputs: class sizes and school term lengths.[24] Several aspects of Table 9 merit comment. First, the figures do little to change the view that Southern school boards undervalued black achievement. On average, the acquisition of literacy among black children ca. 1930-40 was worth only half the value attached to white literacy by Alabama school boards, compared to the hypothetical case of "separate-but-equal". Second, had the school boards followed a "separate-but-equal" policy, the marginal product of school board inputs would have been higher in the white schools than the black schools, as indicated above. Furthermore, the relative efficiency of the white schools apparently increased (e.g. from 1.28 to 1.56) during the Depression. The racial gap in child

literacy, however, was larger in 1930 than in 1940. Under the usual production function assumptions, the greater the initial racial achievement gap, the relatively more productive would school board inputs have been if employed in the black schools. As the racial achievement gap narrowed, the importance of other factors in educational production, such as family background, loomed larger, and the relative efficiency of the white schools increased.

Third, the white/black ratio of actual marginal products rose over the decade. Since part of this rise reflects the increased relative efficiency of the white schools, school boards must have valued black achievement higher in 1940 than in 1930. Such a shift in preferences is clearly suggested by the sharp rise in the black/white ratio of school term lengths (0.77 to 0.95), but not by the apparent constancy of the black/white ratio of class sizes. The failure of the latter to rise, however, may be due to the increase in elementary enrollment in the black schools over the decade (see footnote 14); elsewhere [Margo, 1982b] I have shown that teacher-pupil ratios in the black schools were negatively related to enrollment growth, at least in the short run. In sum, shifts in school board preferences appear to explain the changing racial gap in school board inputs in Alabama during the 1930s.

VI.

This paper has presented an econometric analysis of

educational achievement in segregated school systems. Historians have long argued that Southern school officials greatly discriminated against black children, and that educational achievement in the black schools would have been higher had "separate but equal" been reality instead of myth. The evidence in this paper provides support for this conclusion, but also shows that family background, particularly adult illiteracy, was a critical determinant of educational achievement. Without rewriting history, black children could not avoid this particular legacy of slavery, a legacy that dominated the labor market experience of their parents until recent decades.

The paper also shows how the racial attitudes of school officials--in particular, their relative valuation of black literacy--can be recovered from the educational production function coefficients. Compared to preferences that would have led them to voluntarily practice equality, Alabama school boards valued black literacy at roughly half the value attached to white literacy, somewhat higher in 1940 than in 1930. The 1940s witnessed a war, massive black migration out of the South and to urban areas, rising black incomes and schooling levels among black parents, and a quantum leap in black protest and court activity eventually culminating in Brown, and a pronounced narrowing in the racial gap in school board inputs (Freeman, 1972). The linkages between these various events, school board preferences and behavior, and educational achievement are important topics for future reseach.

FOOTNOTES

1. There is a large literature on historical aspects of racial discrimination in segregated school systems. See, for example, Bond [1934, 1939]; Harlan [1958], Welch [1973], Freeman [1972], Kousser [1980], and Margo [1982].

2. The mean race difference in educational attainment was more than three years (for males) as late as the 1916-1920 birth cohort; see Smith (1984, Table 4, p. 688).

3. Although precise figures are unavailable, private school enrollment was less than 15% of public school enrollment during the 1930s. Furthermore, the vast majority of private school students were enrolled in the upper level elementary grades and in high school.

4. Elementary grades (according to Alabama school law ca. 1930-1940) are grades one through six.

5. In the literacy and LQ3 regressions it would be desirable to proxy student time by the average days attended per elementary school age child. Unfortunately, county-level data on the proportion of children of elementary school age (e.g. ages 6-14) in school are unavailable for both years (but see footnote 14).

6. Prior to 1920, the census reported county-level data on adult

illiteracy for males ages 21 and over. In 1920 and 1930, the only data reported at the county level pertain to illiterates ages 10 and over.

7. Specifically, the weights are: white urban, 3.89; white rural non-farm, 1.58; white rural farm, 1.00; black urban, 1.65; black rural non-farm, 0.671; black rural farm, 0.350. An alternative procedure is to apply race-specific income weights to the occupation distributions reported in the 1930 and 1940 censuses. Unfortunately, the 1960 census is the earliest source providing sufficient detail to construct such weights (for Alabama).

8. A downward bias would also arise if, as argued by Bond (1934, p. 349), the average ability of children in school fell as the proportion enrolled increased, and if the proportion enrolled rose with increases in school quality.

9. This problem is akin to the familiar simultaneity bias potentially present in any production function study. Suppose, for the sake of argument, that an increase in parental schooling raised the efficiency of school board inputs, but parental schooling was unobserved by the econometrician. To the extent that better educated parents demand more school board inputs, the resulting increase in achievement will be assigned to school board inputs, although some part is clearly due to the effects of superior family background (i.e. parental schooling). Since the major purpose of this paper is to establish the historical

presence of family background effects in segregated schools, an upper bound measure of the impact of school board inputs on achievement is desirable. Furthermore, to the extent that unmeasured inputs, including family background, change over time, an informal specification test is to compare the relative importance of school board inputs in accounting for cross-sectional race differences in achievement versus within-race changes in achievement over time (see the text, pg.12).

10. The increase in mean days attended per black pupil was 28 days (see Table 2). Therefore, a black child entering the first grade in the late 1930s and attending continuously for six years would, on average, receive 6 x 28 days= 168 days more schooling than a child entering first grade in the late 1920s. Since the average length of the black school year in 1940 was 140 days, the child would be 168/140=1.2 years further along, or approximately one grade.

11. Ordinary least squares was used (and to estimate the state-level regressions; see Section IV). The substantive results of the paper are not affected if the data are weighted in the manner suggested by Theil (1971, p. 636).

12. This is not the only definition of "separate-but-equal" but it is a plausible one historically. Alternatively, one could define "equality" in terms of outcomes. Let d(a) be the actual race difference in school board inputs and d(e) the difference

between the level of inputs required in the black schools to insure achievement equal to the white level, and the actual level of black inputs. The impact of educational discrimination is then measured by the ratio r(e)=d(a)/d(e). To see this, suppose that only school board inputs matter; then d(e)=1 by definition and r(e)=1. As the relative importance of school board inputs diminishes with respect to family background, d(e) becomes larger, and r(e) approaches zero.

13. Let dQ be the mean race difference in achievement. Then the importance of educational discrimination is measured by $B_w dX/dQ$ or $B_b dX/dQ$, where B is the vector of race-specific regression coefficients and dX is the vector of mean race differences in school board inputs. School board inputs are: LLT, LEXPPD, LVCPP, and P1TS. The coefficient of LDAYS is used to measure the impact of school term lengths; this follows from the decomposition LDAYS = LATTR + LLT (all variables in logs).

14. This statement follows directly from the linear specification of the regressions.

15. As pointed out in footnote 5, county-level data on the proportion of the elementary school age population in school are unavailable for both years. State-level data on the proportion enrolled ages 6-14 show an increase for blacks over the decade from 74.8 percent to 83.1 percent; the corresponding figures for whites are 86.7 percent and 88.8 percent. The white enrollment

figures mask, however, considerable reallocation of enrollment across elementary grades and into high school. Accounting for these composition changes in the white regressions and enrollment growth in the black regressions would substantially reduce the magnitude of the decadal dummies in the LQ2 and LQ3 regressions. It should also be noted that the decadal dummies in the LQ2 and LQ3 regressions are not independent. To see this, suppose that p, the promotion rate, does not vary across elementary grades (1-6). Then $LQ3=(\sum_{i=1}^{5} p^i)/(1+\sum_{i=1}^{5} p^i)$ by definition, and $d(LQ3)/dp>0$.

16. County-level data are available for North Carolina in 1930 on first grade enrollments, and the number of first graders actually promoted to the second grade (State Superintendent of Public Instruction, State of North Carolina, 1930). Let LQ2(e) represent the estimated promotion rate (second graders/first graders) and LQ1(e) the true promotion rate. The following regressions were estimated on the North Carolina data:

Blacks: $LQ2(t)= -0.18 + 0.71\ LQ2(e)$ $R^2=0.10$

(1.93) (3.17)

Whites: $LQ2(t)= -0.36 + 0.54\ LQ2(e)$ $R^2=0.30$

(7.89) (6.26)

(Absolute value of t-statistics are shown in parentheses) Assuming these regressions can be applied to the Alabama data, the increase in the mean white promotion rate (see Table 2) is overstated by 18 percentage points. For blacks the degree of

upward bias is smaller (4 percentage points). Allowing for this bias would approximately double the within-race white LQ2 percentage (from 7.2% to 14.1%) and increase the within-race black LQ2 percentage from 33.3% to 43.2% (see Table 6), but would not change the substantive results. These adjustments should be viewed with considerable caution, however, as there is no evidence that the North Carolina LQ2(t) regressions can be applied to the Alabama data in this manner.

17. As Table 2 makes clear, however, mean race differences in average daily attendance rates were very small. Adjusting LDAYS to take account of mean race differences in enrollment rates (ages 6-14; see footnote 14) would explain between 2-10 percent of race differences in achievement, depending on the year and equation used.

18. LAYRS was constructed by summing the state-level race and age-specific probabilities of school enrollment in 1930 from ages 6 to 9, and multiplying by LT/180, where LT is the race-specific length of the school year in 1930.

19. Using the white adult illiteracy coefficient, closing the racial gap in adult illiteracy explains 107.5 percent of the racial gap in child literacy; using the black coefficient, the percentage explained is 121 percent.

20. Cohort-specific literacy rates among blacks in the early

20th century show increases in literacy as the cohort ages in excess of what might be expected on the basis of differential mortality or adult education; see Smith (1984, p. 687, footnote 6). According to Smith (1984, p. 687), "educational inflation" reflects the "exaggeration of schooling accomplishments as education norms in society rise," a point recognized rather earlier in U.S. Department of Commerce (1918, p. 403). The possibility of upward bias in black schooling levels also applies to the educational attainment data in the 1940 census; see Margo (1985). It is interesting that similar race differences are apparent in the constant terms in the Alabama LQ1 and LQ2 regressions (see Tables 3 and 4); if the same explanation applies, the LQ1 and LQ2 percentages in Table 6 are biased upwards.

21. For an analysis of similar linkages in the 19th century South, see Soltow and Stevens (1981, pp. 184-188).

22. A similar model is presented in graphical form in Clotfelter (1979, p. 381). Note that if school boards value the future earnings of children rather than achievement directly, the first-order condition is:

$$MV(b)/MV(w) = e(w)/e(b) \times MP(w)/MP(b) \times p_b/p_w$$

where e(i) is the race-specific returns to schooling. In this case MP(w)/MP(b) is no longer an upper bound on MV(b)/MV(w),

assuming that $p_b < p_w$.

23. These conclusions assume that p_b/p_w remains unchanged in comparing actual school board behavior to the "separate-but-equal" case. Furthermore, if p_b/p_w were falling over time, then a rise in r(a)/r(e) could be attributed to changes in the demand for school board inputs in the black schools in response to changes in relative input prices. Conversely, a fall in r(a)/r(e) might be due to a rise in p_b/p_w. In the Alabama case, however, the black/white ratio of daily teacher salaries rose 6% during the 1930s (see Table 2), suggesting a roughly constant or slightly rising p_b/p_w, and r(a)/r(e) was rising over time (see Table 9).

24. The formula for calculating the race-specific marginal products is:

$$dL_i/dx_{ij} = B_{ij}(L_i(1-L_i))/x_{ij} \qquad i=w,b$$

where L_i is the literacy rate, x_{ij} is the jth school board input, and the B's are the logit coefficients. The derivation of the formula is based on the logisitic probability function, and the fact that $dL_i/d(\ln x_{ij}) = (dL_i/dx_{ij}) \times (1/x_{ij})$ [recall that school board inputs are entered into the regressions in logs] All calculations of actual marginal products are made at the

sample means. In the "separate-but-equal" calculations L_i is the predicted value of black literacy at the sample means of the white school board inputs.

Table 1

VARIABLE DEFINITIONS: ALABAMA REGRESSIONS

LQ1	Literacy rate, ages 7-20
LQ2	Second grade enrollment/first grade enrollment
LQ3	Enrollment, grades two-six/enrollment grades one-six
LDAYS	Days attended per pupil enrolled, elementary grades
LATTR	Average attendance rate, elementary grades
LLT	Length of school year in days, elementary grades
LEXPPD	Expenditures on teacher salaries per day, elementary grades
LDS	Daily teacher salary, elementary grades
LCS	Teacher-pupil ratio, elementary grades
LVCPP	Value of school capital stock, per pupil enrolled
P1TS	Percentage of 1-teacher schools
LINC	Estimated per capita income

SOURCE: School Data: State Superintendent of Public Instruction, State of Alabama [1930, 1940]; LINC, constructed from information in U.S. Department of Commerce [1932, 1943, 1952], see text.

Table 2

SAMPLE MEANS: ALABAMA REGRESSIONS

Variable	1930			1940		
	White	Black	Diff	White	Black	Diff
LQ1	0.93	0.77	0.16	0.95	0.88	0.07
	[2.74]	[1.29]	[1.45]	[3.31]	[2.07]	[1.24]
LQ2	0.57	0.36	0.21	0.90	0.50	0.40
	[-0.59]	[-1.05]	[0.46]	[-0.10]	[-0.72]	[0.62]
LQ3	0.72	0.57	0.15	0.81	0.67	0.14
	[0.96]	[0.28]	[0.68]	[1.47]	[0.73]	[0.74]
LDAYS	112	86	26	123	114	9
	[4.70]	[4.43]	[0.27]	[4.80]	[4.73]	[0.07]
LPPED	0.12	0.05	0.07	0.15	0.07	0.08
	[-2.18]	[-2.99]	[0.81]	[-1.93]	[-2.72]	[0.79]
LVCPP	1.07	0.20	0.87	1.25	0.22	1.03
	[-0.13]	[-1.82]	[1.69]	[0.14]	[-1.83]	[1.97]
P1TS	0.32	0.61	-0.29	0.20	0.54	-0.34
LATTR	0.74	0.73	0.01	0.83	0.81	0.02
	[-0.31]	[-0.31]	[0.00]	[-0.19]	[-0.21]	[0.02]
LLT	151	117	34	148	140	8
	[5.01]	[4.74]	[0.27]	[4.99]	[4.94]	[0.05]
LDS	4.35	2.31	2.04	4.62	2.67	1.95
	[1.45]	[0.81]	[0.64]	[1.52]	[0.96]	[0.56]
LCS	0.027	0.023	0.004	0.032	0.027	0.005
	[-3.63]	[-3.80]	[0.17]	[-3.45]	[-3.67]	[0.22]
LINC	1.62	0.60	1.02	1.67	0.67	1.00
	[0.43]	[0.57]	[1.00]	[0.47]	[-0.48]	[0.95]

NOTES: Figures outside brackets are arithmetic sample means; figures in brackets are sample means of the transformed variables (see text).

Table 3

REGRESSION OF CHILD LITERACY RATES: ALABAMA, 1930-1940

Variable	White	White	Black	Black
Constant	-1.29	-4.42	-0.75	-1.39
	(0.48)	(0.96)	(0.52)	(0.81)
LDAYS	1.07		0.90	
	(2.21)		(3.33)	
LATTR		0.22		0.64
		(0.33)		(1.25)
LLT		1.94		0.97
		(2.29)		(3.32)
LPPED	0.58		0.49	
	(2.04)		(3.39)	
LDS		0.33		0.55
		(0.98)		(2.71)
LCS		0.89		0.46
		(2.63)		(2.36)
LVCPP	-0.04	-0.08	0.15	0.14
	(0.34)	(0.61)	(1.97)	(1.92)
P1TS	-0.08	-0.19	-0.05	-0.04
	(0.23)	(0.51)	(0.19)	(0.16)
LINC	0.63	0.68	0.29	0.26
	(2.96)	(2.89)	(2.01)	(1.76)
YR=40	0.30	0.37	0.37	0.38
	(2.56)	(2.82)	(3.49)	(3.50)
N	134	134	129	129
R^2	0.45	0.47	0.58	0.58

NOTES: Dependent variable is the logit of the literacy rate, ages 7-20. Source: see Table 1.

Table 4

REGRESSION OF FIRST GRADE PROMOTION RATE:
ALABAMA SCHOOLS, 1930-40

Variable	White	White	Black	Black
Constant	-2.48	-3.35	-0.84	-1.10
	(3.71)	(2.89)	(1.22)	(1.35)
LDAYS	0.47		0.14	
	(3.88)		(1.08)	
LATTR		0.32		0.23
		(1.98)		(0.96)
LLT		0.66		0.13
		(3.11)		(0.92)
LPPED	0.16		0.23	
	(2.26)		(3.37)	
LDS		0.14		0.30
		(1.68)		(3.16)
LCS		0.19		0.17
		(2.22)		(1.79)
LVCPP	0.07	0.06	0.03	0.03
	(2.07)	(1.85)	(0.85)	(0.92)
P1TS	0.07	0.06	-0.07	-0.03
	(0.72)	(0.61)	(0.56)	(0.23)
LINC	0.02	0.02	0.06	0.05
	(0.43)	(0.30)	(0.83)	(0.65)
YR=40	0.40	0.42	0.23	0.22
	(13.69)	(12.55)	(4.52)	(4.31)
N	134	134	129	129
R2	0.81	0.81	0.44	0.44

NOTES: Dependent variable is log (second grade enrollment/first grade enrollment). Absolute value of t-statistics in parentheses.
Source: see Table 1.

Table 5

REGRESSIONS OF 2ND-6TH GRADE ENROLLMENT SHARE, ELEMENTARY GRADES: ALABAMA, 1930-1940

Variable	White	White	Black	Black
Constant	0.88	3.33	0.32	0.18
	(0.91)	(2.09)	(0.47)	(0.22)
LDAYS	0.13		0.21	
	(0.74)		(1.66)	
LATTR		-0.44		0.04
		(1.97)		(0.18)
LLT		1.00		0.25
		(3.41)		(1.82)
LPPED	0.23		0.24	
	(2.30)		(3.61)	
LDS		0.21		0.23
		(1.84)		(2.46)
LCS		0.30		0.27
		(2.61)		(2.93)
LVCPP	0.14	0.11	0.07	0.06
	(2.98)	(2.51)	(1.92)	(1.82)
PITS	-0.01	-0.03	-0.14	-0.16
	(0.11)	(0.24)	(1.20)	(1.30)
LINC	0.03	0.02	0.04	0.03
	(0.33)	(0.30)	(0.60)	(0.50)
Year=1940	0.40	0.48	0.33	0.33
	(9.53)	(10.48)	(6.68)	(6.69)
N	134	134	129	129
R2	0.67	0.70	0.61	0.61

NOTES: Dependent variable is the logit of LQ3. Absolute value of t-statistics in parentheses. Source: see Table 1.

Table 6

THE EFFECTS OF "SEPARATE-BUT-EQUAL"

Across-Race:	1930	1940
LQ1:	36.5% [51.8]	23.5% [48.6]
LQ2:	65.2 [48.2]	35.5 [33.0]
LQ3:	56.7 [49.0]	54.1 [42.7]
Mean:	52.8 [49.7]	37.7 [41.4]
Within-Race, Across-Decade:		
LQ1:	21.5	40.3
LQ2:	7.2 {14.1}	28.7 {43.1}
LQ3:	18.4	25.8

NOTES: Figures give percentage of mean racial achievement gap explained by mean race difference in school board inputs; outside brackets, based on white coefficients; inside brackets, based on black coefficients. All figures are % x 100. Figures in {} adjust for upward bias in first grade promotion rate, see text.

Table 7

STATE-LEVEL REGRESSIONS:
CHILD LITERACY (AGES 10-14), 1930

Variable	White	White	Black	Black	WM	BM
Constant	-1.97	-1.74	-0.36	-0.44		
	(1.19)	(1.54)	(0.90)	(1.34)		
LAYRS	1.07	1.09	2.25	1.20	1.11	0.89
	(0.63)	(0.95)	(2.59)	(1.53)		
LEXPP	1.60	0.73	0.48	0.34	3.88	2.99
	(2.73)	(1.60)	(2.23)	(1.89)		
LPP	-0.14	-0.03	0.11	0.13	4.68	3.52
	(0.52)	(0.17)	(0.86)	(1.26)		
LILLA		0.86		0.97	-3.00	-1.40
		(4.10)		(2.94)		
Dep. var.--mean					4.72	3.44
N=18						
R^2	0.50	0.76	0.86	0.91		

NOTE: Dependent variable is the logit of the literacy rate, ages 10-14. LAYRS: estimated years of exposure to schooling, ages 6-9; LEXPP: expenditures on teacher salaries, per school age child; LPP: value of school capital stock, per school age child; LILLA: adult illiteracy rate, ages 35+. WM: white sample means; BM: black sample means. All independent variables are measured in logs. Mean child illiteracy rate: whites, 12/1000; blacks, 44/1000. Mean adult illiteracy rate: whites, 60/1000; blacks, 270/1000. Ordinary least squares was used (see footnote 11).
SOURCES: Dependent variable, LAYRS, LILLA: U.S. Department of Commerce [1932]; LEXPP, LPP: Tuskegee Institute [1930].

Table 8

ELASTICITIES OF YEARS OF SCHOOLING (AGES 6-9) AND PER PUPIL EXPENDITURES WITH RESPECT TO ADULT ILLITERACY: U.S. SOUTH, 1930

Variable	Black	White
LEXPP	-0.14	-1.02
LAYRS	-1.08	0.02

NOTE: Figures are calculated using formula for specification error bias: $b_e = b_t + a*c$, where b_e is the estimated coefficient of the variable if LILLA is excluded, b_t is the "true" coefficient (i.e. when LILLA is included), a is the coefficient of LILLA, and c is the elasticity of the variable with respect to LILLA. Source, see Table 7.

Table 9

THE RELATIVE VALUATION OF BLACK LITERACY

	LT	CS
MP(w)/MP(b):		
(1) Actual:		
1930:	0.57	0.60
1940:	0.85	0.73
(2) Separate-But-Equal:		
1930:	1.28	1.24
1940:	1.56	1.47
(1)/(2):		
1930:	0.45	0.48
1940:	0.54	0.50
Black/White Input Ratios:		
1930:	0.77	0.85
1940:	0.95	0.85

NOTES: Figures are % x 100. LT: Length of the school year; CS: teacher-pupil ratio. MP(w): Marginal product of school board input, white schools; MP(b): Marginal product of school board input, black schools. All calculations are performed at the sample means, see text.

REFERENCES

Behrman, J., Pollak, R. and P. Taubman [1982] "Parental Preferences and Provision for Progeny," Journal of Political Economy, 90, 52-74.

Bond, H.M. [1934] Education of the Negro in the American Social Order. New York: Prentice-Hall.

Bond, H.M. [1939] Negro Education in Alabama: A Study in Cotton and Steel. Washington, D.C.: Associated Publishers.

Butler, R. [1983] "Direct Estimates of the Demand for Race and Sex Discrimination," Southern Economic Journal, 49, 975-990.

Clotfelter, C. [1979] "School Desegregation as Urban Public Policy," in P. Mieszkowski and M. Straszheim, eds. Current Issues in Urban Economics, Baltimore: Johns Hopkins University Press.

Freeman, R. [1972] "Black-White Income Differences: Why Did They Last So Long?" mimeo, University of Chicago.

Hanushek, R. [1972] Education and Race. Boston: Lexington.

Harlan, L. [1958] Separate and Unequal: Public School Campaigns and Racism in the Southern Seaboard States, 1901-1915. Chapel Hill: University of North Carolina Press.

Higgs, R. [1984] "Discrimination in the Marketplace" (interview) Manhattan Report on Economic Policy, 4, 7-9.

Kousser, J.M. [1980] "Progressivism-For Middle Class Whites Only: North Carolina Education, 1880-1910," Journal of Southern History, 46, 169-194.

Margo, R.A. [1982] "Disfranchisement, School Finance, and the Economics of Segregated Schools in the United States South, 1890-1910," doctoral dissertation, Harvard University.

Margo, R.A. [1984] "'Teacher Salaries in Black and White': The South in 1910," Explorations in Economic History, 21, 306-326.

Margo, R.A. [1985] "Race, Educational Attainment, and the 1940 Census: A Cautionary Note," in preparation.

Smith, J. [1984] "Race and Human Capital," American Economic Review, 74, 685-698.

Soltow, L., and E. Stevens [1981] The Rise of Literacy and the Common School in the United States. Chicago: University of Chicago Press.

Summers, A., and B. Wolfe [1977] "Do Schools Make a Difference?," American Economic Review, 67, 639-52.

State Superintendent of Public Instruction, State of Alabama [1930, 1940] Annual Report. Montgomery: State Printer.

State Superintendent of Public Instruction, State of North Carolina [1930] Biennial Report. Raleigh: State Printer.

Theil, H. [1971] Principles of Econometrics. New York: Wiley.

Tuskegee Institute [1930] Negro Year Book: Tuskegee, Alabama: Negro Year Book Publishing Company.

U.S. Department of Commerce [1918] Negro Population, 1790-1915. Washington, D.C.: Government Printing Office.

U.S. Department of Commerce [1932] Fifteenth Census of the

United States: 1930, Population, Volume III, Part One. Washington, D.C.: Government Printing Office.

U.S. Department of Commerce [1943] Sixteenth Census of the United States: 1940, Population, Volume II, Characteristics of the Population, Part One. Washington, D.C.: Government Printing Office.

U.S. Department of Commerce [1952] Census of Population: 1950, Volume II, Characteristics of the Population, Part Two, Alabama. Washington, D.C.: Government Printing Office.

U.S. Department of Commerce [1975] Historical Statistics of the United States: Colonial Times to 1970. Washington, D.C.: Government Printing Office.

Welch, F. [1973] "Education and Racial Discrimination," in O. Ashenfelter and A. Rees (eds.) Discrimination in Labor Markets. Princeton: Princeton University Press.