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COGNITIVE OUTCOMES IN PUBLIC AND PRIVATE SCHOOLS*

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Three types of analysis are carried out in this paper and provide strong evidence that there is, in vocabulary and mathematics, higher achievement for comparable students in Catholic and other-private schools than in public; the results are less consistent in reading. The last portion of the analysis shows the elements of school policy that can account for these differences—account for them by showing that achievement is just as high in the public sector when the policies and the resulting student behavior are like those in the Catholic or other-private schools.

There are a number of specific issues which provide grounds for the argument that attendance at private schools should be facilitated, as well as a number which provide grounds for the argument that attendance at private schools should be restricted. Some of these, such as the relative rights of the parents and of the state in control over the child, are wholly in the realm of values; others have a factual component, and it is these for which social research can be valuable. In the report, "Public and Private Schools" (Coleman, Hoffer and Kilgore, 1981), a number of these issues, on both sides of the debate, were identified. In this paper we will briefly discuss the results relating to several of these issues and then discuss one of them at length. First, though, it is important to identify what the major issues appear to be.

On each side of the debate there appears to be one principal issue that can be addressed with empirical data. On the side of restricting attendance at private schools, the principal argument is that private schools bring about social separation which can lead to divisiveness: for example, separation of the upper economic classes from the lower (perhaps the earliest argument against private schools, and in England it is still the one most frequently

made), separation of different religious groups (the argument that has historically been used in the U.S.) and separation of racial groups (the argument that is most often made currently in the U.S.).

The principal issue addressable by empirical data on the other side of the debate is that private schools provide better education than that provided by public schools. The argument as made by individual parents is an argument about particular schools and particular children: A private school available to them gives better outcomes for their children than does the local public school to which their children would be assigned. But if the argument holds in a sufficient number of cases, and if parents are good judges of the question, then the argument follows that education for American children in general will be improved by facilitating greater enrollment in private schools. On the other hand, if public schools in general do as well or better with comparable students than do private schools, such facilitation will not improve education for American children.

This argument can refer to several specific outcomes of education. One is achievement in the basic cognitive skills. Another is in the area of moral development, ranging from escape from the influence of gangs and drug pushers to the inculcation of religious moral values. Still another is in post-high school activity, in particular college attendance—or going to a more preferred college.

In this paper we examine in detail the evidence for only one of these principal issues: the question of whether private schools bring about—for comparable students—higher achievement in basic cognitive skills. The results of this analysis have implications not only—or perhaps not even primarily—for the public school-private school policy question, but also for the functioning of schools in all sectors. But, before we examine this evidence, we will briefly describe the data base and review some results on other issues.

* This paper was originally prepared for presentation at the AERA Annual Meeting April 1981 at Los Angeles, California. It reports on research carried out over the past two years at the National Opinion Research Center at the University of Chicago under a contract from the National Center for Education Statistics (NCES). The study, one of four commissioned by NCES, analyzed data from the first (1980) wave of a longitudinal survey, "High School and Beyond." The project addressed a number of policy-related issues as well as some more fundamental academic issues in education. Address correspondence to the authors at the National Opinion Research Center, 6030 Ellis Avenue, Chicago, Illinois 60637.

THE DATA

The data used in the "Public and Private Schools" report and thus this paper, are from the first (1980) wave of the National Center for Education Statistics (NCES) study, "High School and Beyond," a longitudinal study of U.S. high school seniors and sophomores. This study was conducted for NCES by the National Opinion Research Center at the University of Chicago.

A detailed report on sample design and sampling errors, "High School and Beyond: Sample Design Report," is available, so the sample will be described only briefly here. The sample was a two-stage stratified probability sample with schools within a stratum drawn with a probability proportional to their size. Once a school was selected, up to 36 sophomores and 36 seniors were drawn randomly from the students enrolled in each selected school.

Several special strata were included in the sample design. Schools in these special strata were selected with probabilities higher than those for schools in regular strata to allow for special study of certain types of schools or students. The following kinds of schools were oversampled:

- Public schools with high proportions of Hispanic (Cuban, Puerto Rican and Mexican) students.
- Catholic schools with high proportions of minority group students.
- Public alternative schools.
- Private schools with high proportions of National Merit Scholarship finalists.

Substitutions were made for noncooperating schools in those strata where it was possible. Out of 1,122 possible schools, students at 1,015 schools and school administrators from 988 schools filled out questionnaires.

In many schools the actual number of seniors and sophomores was less than the target number for several reasons. First, in some schools fewer than 36 sophomores or 36 seniors were enrolled. This reduced the number of eligible students from 73,080 (72 students in each of 1,015 schools) to 69,662. Second, 8,278 students were absent on the survey date. Third, 1,982 students, or in some cases their parents, declined to participate, exercising their right in a voluntary survey. Substitutions were not made for noncooperating students. Finally, 1,132 cases were deleted because they contained very incomplete information. Thus, data are available for 30,030 sophomores and 28,240 seniors. This represents a completion rate of 84 percent: 58,270 out of the 69,662 eligible students. In addition to the students in the regular sample, data were

collected from friends and twins of participating students.

Weights, which are used in all the analyses reported here, were calculated to reflect differential probabilities of sample selection and to adjust for nonresponse. Use of appropriate weights yields estimates for high school sophomores and seniors in the United States and separate estimates for schools or students classified in various ways, such as by geographical region or school type.

Information of several sorts was obtained in the survey. Students completed questionnaires of about one hour in length and took a battery of tests prepared by the Educational Testing Service with a total testing time of about one and one-half hours. School officials completed questionnaires covering items of information about the schools. Finally, teachers gave their perceptions of specified characteristics of students in the sample whom they had in class, to provide information beyond the students' own reports about themselves. Many of the items in the questionnaires as well as the entire test battery for seniors replicate the items used in NCES's study of the 1972 senior cohort.

Details on coding procedures, relevant descriptive statistics and regression coefficients will be available in the revised publication of the report (Coleman, Hoffer and Kilgore, 1982).

A Brief Review of Some Results

When considering how much the private schools contribute to the separation of children of different races, of different income levels and different religions, there are two components to the question. One is between-sector segregation and the other is between-school segregation *within* a sector. For example, if private schools enrolled only a few black children, but they were distributed evenly across all private schools, then the between-sector racial segregation would be great, while the between-school segregation within the private sector would be small or non-existent. Or if at the other extreme, private schools enrolled students of each religious group in exactly the same proportions as do the public schools, but every private school had students of only a single religious group, then the between-sector segregation would be zero, but the between-school segregation within the private sector would be complete.

Obviously, the private sector's contribution to segregation along the lines of income, religion or race depends not on one or the other of these components, but rather on the combination of the two taken together. One useful way to assess the combined effects of

between-sector segregation and between-school segregation within the private sector—and thereby to estimate the overall contribution of private schools to segregation in U.S. high schools—is to compare the average amount of segregation for all U.S. secondary schools to that found in the public sector alone. If there were no private schools and their students were reabsorbed into the public sector in exactly the same way current public school students are distributed among schools, then the degree of segregation in all schools would be that of the public schools. Thus, the difference between the degree of segregation for all secondary schools and that found in public schools can be seen as the contribution of the private sector to segregation along the various dimensions.

As shown in Tables 1 and 2, the results for segregation by race and ethnicity, income and religion are rather different. We discuss here only race and religion. In terms of between-sector segregation of racial groups, the data show that only about one-half as high a proportion of blacks are in the Catholic sector as in the public, and about one-quarter as high a proportion are in the non-Catholic private schools (referred to here as “other-private” schools). But the between-school segregation within the private sector is much less than that in the public sector (seen by comparing columns 2 and 3 in Table 2). The impact that these two countervailing segregation patterns have on racial segregation in American secondary schools can be seen by comparing the overall racial segregation (column 1) with the racial segregation found in the public sector (column 2). In the case of racial segregation, this impact is negligible—indicating that the much lower level of segregation within the private sector has an integrative effect that just counterbalances the segregative effect of the smaller proportions of blacks in private schools.¹

For religion, which in this analysis is restricted to Catholic religious background versus all others,² the matter is quite different. In the public sector, about 30 percent of the students are from Catholic backgrounds, compared to 65 percent in the private sector (in the Catholic schools themselves, about 90 percent

Table 1. Proportions of Students in U.S. High Schools and Separate Sectors from Different Subpopulations

	U.S. Total	Private			
		Public	Total	Catholic	Other Private
Blacks	.13	.14	.05	.06	.03
Hispanics	.07	.07	.06	.07	.04
Income above \$20,000	.43	.41	.60	.58	.63
Catholics	.34	.31	.66	.91	.17

are from Catholic backgrounds and in other private schools, 17 percent). But the separation of Catholics and non-Catholics in the private sector is much higher than that in the public sector—as might be expected, since most students in the private sector are in a religiously sponsored school. Again, comparing the total segregation (column 1) with religious segregation within the public sector (column 2) we can assess the effects: In contrast to the case of racial separation, the private schools do contribute to religious separation of secondary school students.

Two outcomes of education deserve brief mention: post-high school plans and affective outcomes. Using the students’ responses to the question: “How far in school do you think you will get?”, we are able to compare the educational plans across sectors. About 25 percent more of the students in Catholic and other-private schools expect to finish college or go beyond than are found in the public sector. When family background characteristics were taken into account, the differences between the sectors were reduced, very sharply for other private schools and less so for Catholic schools. Both this, and evidence from retrospective questions which show greater self-reported increases in the proportion of students planning to attend college, indicate that Catholic schools, and other-private schools to a lesser degree, more often lead to plans for high levels of post-secondary education than

Table 2. Between-School Segregation for U.S. High Schools and Within Separate Sectors

	U.S. Total	Private			
		Public	Total	Catholic	Other Private
Black-White	.49	.49	.29	.31	.21
Hispanic-Anglo	.30	.30	.34	.25	.55
Low-High Income	.23	.21	.16	.18	.14
Catholics-Non-Catholics	.30	.22	.63	.11	.28

¹ Subsequent analysis shows that these findings hold at a regional level, except in the case of the South, where enrollment patterns in the private sector do contribute to racial segregation. It should be noted however that public schools in the South continue to be the least segregated of any region in the country.

² No other religious group was sufficiently represented in the private sector sample to permit analysis of other religious groups.

do public schools.³ While private school students generally plan to attain higher levels of education, for seniors planning to take a full-time job immediately after high school, slightly *more* of those in public schools had a job already lined up than did those in the Catholic schools, and those in the other-private schools were least likely, by about 10 percent, to have a job lined up.

Only suggestive evidence was obtained with regard to affective outcomes. For two sets of items, one set related to self-esteem and the other to fate control, sophomores in public, Catholic and other-private schools showed about the same levels of self-esteem and fate control. In all three sectors, the seniors showed higher levels of both. But in both, the senior-sophomore difference was greater in the other-private schools than in either the public or Catholic schools. The possibility that this does represent greater growth in the other-private schools is reinforced by an additional comparison between two sets of "high-performance" schools, public and private.⁴ Here too, the private schools (which were nearly all non-Catholic) showed a greater senior-sophomore difference than did the public schools on both affective dimensions. Two differences in the functioning of the other-private schools on the one hand, and the public

and Catholic schools on the other, may be worth mentioning because of their possible relation to these affective differences: First, the student-teacher ratio in both Catholic and public schools is over twice that in the other-private schools (and slightly higher in the Catholic schools than in the public). And second, in the Catholic and public schools, participation of seniors in extra-curricular activities was at the same level or below that of sophomores, while in the other-private schools the participation of seniors was higher.

COGNITIVE OUTCOMES IN PUBLIC AND PRIVATE SCHOOLS

Of the battery of tests given sophomores and seniors, three tests had subsets of items that were identical for both grades: eight items in reading, eight items in vocabulary and eighteen items in mathematics. Scores on these subtests are reported in Table 3.

The table shows, as might be expected, that students in Catholic and other private schools score better on these achievement tests than do students from public schools. The table shows that in both types of high performance schools the averages are higher than in any of the other sectors, and that the average scores for the high performance private schools (which are generally small, homogeneous and highly selective) are higher than the high performance public schools (which are generally large, comprehensive, upper-middle class suburban schools—the "elite" public schools in their respective metropolitan areas).

Comparison of the public, Catholic and other-private sectors shows that the private sector sophomores are about at the level of the public sector seniors (less in reading, more in mathematics). The public-private differences at the sophomore level are one-third to one-half of a standard deviation. The differences at the senior level seem about the same. The question, of course, is what these differences mean.

As with any non-experimental comparisons, that is, in any comparisons where there is non-random assignment to treatments, there are two possible explanations for differences. One is that the treatments have had different effects; the other is that there are no effects, and instead the differences are due to initial selection into the treatments. This is important to reiterate because selection of schools by parents, and in some cases of students by schools, means that non-random selection is of potentially great importance in accounting for these differences.

For this reason, we attempted three different

³ Subsequent analyses using more elaborate controls for family background differences have led to revisions of these conclusions. The two analyses mentioned in the text above employed controls for family income, mother's and father's educations, and race and ethnicity. The subsequent analyses introduced the additional controls for the variables listed on page 69. With these additional controls, the public sophomore background standardized differences between private and public school students on the educational plans variable ("How far in school do you think you will get?") still show that the reductions from the uncontrolled differences are greatest for the other private school students and smallest for Catholic school students. When background standardized sophomore-to-senior differences are compared between sectors, though, the subsequent analyses indicate that growth is lowest in the Catholic schools. These findings suggest, then, that Catholic high schools do not generate higher levels of planned attainment from the sophomore to senior years. When the additional background variables are introduced into the equations modeling retrospective accounts of when plans for college were first formulated, the results again show that little effect on growth appears attributable to Catholic high schools.

⁴ This includes 11 public schools selected from the sample for having the highest proportion of graduating seniors as National Merit Semi-Finalists, and 12 private schools selected from the universe of private schools by the same criterion.

Table 3. Mean Scores and Standard Deviations for Items that are Identical for Seniors and Sophomores in Public and Private Schools: Spring 1980

Subtest	Major Sectors								High Performance Schools			
	U.S. Total		Public		Catholic		Other Private		Public		Private	
	Grade		Grade		Grade		Grade		Grade		Grade	
	10	12	10	12	10	12	10	12	10	12	10	12
Means:												
Reading (8) ^a	3.67	4.54	3.60	4.48	4.34	5.00	4.32	5.34	4.85	5.77	6.06	6.71
Vocabulary (8)	3.78	4.58	3.69	4.48	4.59	5.35	4.78	5.56	5.11	6.24	6.65	7.22
Mathematics (18)	9.56	10.80	9.40	10.63	11.05	12.10	11.28	12.74	12.53	13.76	15.09	16.38
Standard Deviations:												
Reading	2.01	2.10	2.00	2.10	1.92	1.96	2.05	2.04	2.12	1.94	1.49	1.18
Vocabulary	1.90	1.97	1.88	1.97	1.84	1.74	2.00	1.94	1.86	1.65	1.24	.97
Mathematics	4.04	4.24	4.04	4.24	3.56	3.82	4.17	4.14	3.80	3.62	2.33	1.70

^a Numbers in parentheses refer to total number of items on subtests.

strategies in attempting to discover what part, if any, of the achievement differences between schools shown in Table 3 is due to differences in the “educational treatments” provided by schools in the three sectors. The first approach is a variant of a standard statistical technique, controlling differences in student input in an attempt to statistically control for the initial selection. This, of course, is always subject to the objection that not *all* the input differences have been controlled for, leaving some of those differences masquerading as effects of the treatments. To reduce this problem, possibly at the cost of attributing to selection of some treatment effects, we also included statistical controls on some variables that, while most would argue are largely initial differences, might also have been affected by the treatments, that is, by the schools. Listed below are the set of variables used as statistical controls that are clearly prior to and unaffected by the school, along with those others which are at least partly prior, but possibly also affected by the school.

Clearly prior

- Family income
- Mother’s education
- Father’s education
- Race
- Hispanic/non-Hispanic
- Number of siblings
- Number of rooms in the home
- Both parents present
- Mother’s working before child was in elementary school
- Mother’s working when child was in elementary school

Not clearly prior

- Encyclopedia or reference books in home
- More than 50 books in home

- Typewriter in home
- Owns pocket calculator
- Frequency of talking with mother or father about personal experiences
- Mother thinks student should go to college after high school
- Father thinks student should go to college after high school

In this first analysis, the three achievement subtests were regressed by sector and grade on the 17 background variables listed above. Table 4 shows, for students with the same measured background characteristics, the additional increments on the sophomore scores in reading, vocabulary and mathematical subtests that may be attributable to being in the Catholic or other-private sector.

The increments in achievement were estimated for each grade within the public and private sectors by taking differences of standardized achievement estimates. The standardized estimates of achievement (\hat{Y}) were calculated as follows:⁵

$$\hat{Y}_{ij} = a_{ij} + \sum_{k=1}^{17} b_{ijk} X_k + b_{ij}D_{ij}(1)$$

⁵ Separate regressions for public and private school sectors at each grade were done, rather than using a single regression equation with dummy variables for sectors, to allow for different effects of background characteristics in different sectors. The Catholic and other-private sectors were combined for a single regression, because of the smaller numbers of cases in these sectors. A dummy variable for the other private sector was included in the equation. The estimated increment at the sophomore level due to the Catholic sector is obtained by first calculating the predicted test scores for public and Catholic sophomores with background characteristics standardized to that of the average public school sophomore, and then finding the difference between the

Table 4. Estimated Increments to Test Scores in Public and Private Schools with Family Background Controlled: Spring, 1980^a (Standard error of difference in parentheses)

	Reading	Vocabulary	Mathematics
Public school sophomores	3.60	3.69	9.40
Standardized sophomore increments for:			
Catholic schools	0.32 (.048) ^b	0.36 (.045)	0.58 (.091)
Other-private schools	0.14 (.064)	0.33 (.060)	0.56 (.121)
Senior increment in public schools	0.73 (.018)	0.63 (.018)	0.88 (.037)
Raw increments (from Table 3)			
Sophomore increments for:			
Catholic schools	0.74	0.90	1.65
Other-private schools	0.72	1.09	1.88
Senior increment in public schools	0.88	0.79	1.23

^a Family background refers to 17 subjective and objective background characteristics which are listed in the text. Relevant regression coefficients and sector means are given in the appendix to Coleman et al. (1982).
^b Numbers in parentheses are standard errors of sector differences in predicted achievement. The standard error is calculated by taking the square root of the sum of variances of the predicted means (estimated by standardization of each of the sector-grade specific regression equations to the average background of public sophomores), $\sqrt{\text{var}(\hat{Y}_{\text{public}}) + \text{var}(\hat{Y}_{\text{private}})}$. The variances are estimated by pre-multiplying the variance-covariance matrix of the regression coefficients, $V(b)$ by the transpose of the public sophomore background mean vector, X' , and post-multiplying this product by the vector of public sophomore background means; that is,

$$\text{var}(\hat{Y}) = X'V(b)X.$$

See Draper and Smith (1966) for a discussion of estimating variances of point estimates such as these. Regression equations were estimated using frequency-weighted pairwise deletion. In the variances calculated here, estimates were readjusted to reflect the sample size, which in this case is taken to be the number of students in a given grade and sector who had completed the respective test.. Given the two-stage probability sampling design used in "High School and Beyond," one may want to know about possible design effects. The method for calculating standard errors described above assumes a simple random sample and follows from the work of Kish and Frankel (1974) showing that the design effect for sampling designs such as those used in "High School and Beyond" approaches unity for complex statistics (such as regression coefficients). More recently, we have thought it important to verify this finding for the specific estimates made in this table. Following the Balanced Repeated Replication method for empirically deriving sample variances—developed at the U.S. Bureau of Census—we calculated empirical variances for the private sector. Four of six estimates of design effects for the Catholic increment approach unity and the other two effects (sophomore vocabulary and senior reading) were close to two (2.071 and 2.118, respectively). For the other private sector, design effects were uniformly found to be greater than two, with four of the six between the values of 2.9 and 3.4 (these four were sophomore vocabulary and mathematics, senior reading and vocabulary).

where \hat{Y}_{ij} is the standardized score for the i^{th} grade in sector j , a_{ij} is the intercept and b_{ijk} are the coefficients for the background variables in that sector and grade. \bar{X}_k is the mean for the public school sophomores on the k^{th} background characteristic and D_{ij} , the sector increment. The increments shown in Table 4 are the differences of each \hat{Y}_{ij} from the public school sophomore mean achievement for each

subtest. Estimates of \hat{Y}_{ij} for the other private sector were obtained by adding the dummy coefficient (D_{ij}) for that sector onto the estimate for the Catholic sector, since a single equation was used for the private sector. The last three rows of the table show the raw differences between sophomores in the three sectors, and between sophomores and seniors in the public sector. Thus the comparisons of rows 2 and 3 with rows 5 and 6 of Table 4 show how much of the differences between public and private school sophomore achievement are accounted for by the selection into private schools as reflected by the 17 background characteristics. The results indicate that between three-fifths and two-thirds of the raw differences between Catholic and public schools are accounted for by these selection differences, and between two-thirds and four-

Catholic sector and the public sector. The increment for the other private sector is found by adding to this the value of the other private dummy variable. Regression coefficients, standard errors of slopes and coefficients of determination for each of the equations used in this article are included in the appendix to Coleman et al. (1982). All the regression analyses reported in this article were done with pairwise deletion of cases.

Table 5. Estimated Sophomore-Senior Gains in Test Scores and Learning Rates, with Corrections for Dropouts Missing From Senior Distribution

Item	Public			Catholic			Other-Private		
	10	12	Est. Gain	10	12	Est. Gain	10	12	Est. Gain
1) Estimated gains ^a									
Reading	3.57	4.05	0.47	4.33	4.81	0.47	4.30	5.11	0.81
Vocabulary	3.68	4.09	0.41	4.58	5.19	0.61	4.73	5.35	0.62
Mathematics	9.39	9.77	0.38	11.04	11.73	0.68	11.28	12.26	0.98
2) Estimated learning rate ^b									
Reading		.06			.07			.12	
Vocabulary		.05			.10			.10	
Mathematics		.02			.05			.08	

^a Numbers are rounded to two decimals independently so that some rounded “estimated gains” differ from the difference between rounded sophomore and senior scores.

^b Learning rate refers to estimated proportion of items learned in a given year from those items not known.

fifths of the raw differences between other private and public schools are similarly accounted for. This leaves, however, substantial differences remaining: from a low of one-fifth of the initial difference to a high of about four-fifths of the initial difference. Comparison with the background-controlled senior increment (that is, a two-year increment) on line 4 of the table shows that this is from something over a grade level difference in vocabulary and mathematics (for both the private sectors) to something less than a grade level in reading.

This analysis suggests, then, that although more than one-half of the raw differences between public and private schools are due to initial differences in the 17 background characteristics, substantial differences remain unexplained by these selection factors and may be attributable to “treatment” differences in the schools. The objection of course remains that perhaps an unmeasured factor affects both selection into the school and the achievement level.

The second mode of analysis uses a different way of separating out the selection effects. The survey covered sophomores and seniors in each school, and with the subtests of identical items, it is possible to compare senior scores with sophomore scores. This controls for differences in the input level of achievement (or rather, the sophomore levels of achievement) in examining the senior levels of achievement. It does not depend on background controls which are always subject to the possible objection mentioned earlier. It has, however, another defect: If achievement growth is correlated with initial achievement levels in the same treatment setting, then a higher level in the sophomore year would mean a higher level in the senior year, even if there were no treatment differences.

Although this is a statistical problem (again possibly producing a bias toward the private schools), it is a different one than in the pre-

ceding analysis, so that it will give another estimate of the differences between sectors. There is, however, a problem that creates another possible source of error: The sophomore and senior classes are not the same students, but two different cohorts, and there is selection between sophomore and senior years due to dropouts. Different dropout rates for different sectors, or different correlations of dropout with achievement in different sectors, would lead to differential distortions in the apparent sophomore-senior growth.

The dropout rates from sophomore to senior year (which is the period during which most dropout occurs in high school) is very different in the public and private sectors. According to our estimates (which may be slightly high) this is 24 percent over that period in the public schools, 12 percent in the Catholic schools and 13 percent in the other private schools. If we make the assumption that the dropouts in each sector came equally from each point in the lower one-half of the distribution of test scores, and that if they had remained in school they would maintain their same place in the distribution, then it is possible to calculate what *would be* the test scores of seniors if there had been no dropouts between sophomore and senior year. Obviously, this will bring the apparent growth rate in the public schools down more than that in the private sectors.

The estimated gains from sophomore to senior year, adjusted for dropouts, in the three sectors is given in Table 5. In addition, in the bottom three rows estimated yearly learning rates (based on the average number of items learned and the number remaining to be learned⁶) are shown for each sector in each of the three tests.

⁶ The equation for this is learning rate = $-t^{-1} \log (P_1/P_0)$, where p_0 is the probability of not knowing an item as a sophomore, and p_1 is the probability of not knowing it as a senior.

The results show that the estimated learning rate in reading in the Catholic schools is only slightly above that in the public schools, but that in all other cases, the estimated rates in the private sectors from sophomore to senior are at least twice those in the public sector. In contrast to the estimates of private-public differences based on sophomore scores shown in Table 4, here the other-private school gains appear larger than those in the Catholic schools. Both methods agree, however, in showing that both private sectors are above the public, and both agree in suggesting that there are less public-private differences in reading than in the other two areas of skills.

A variant upon the method of assessing differential gain is shown by another analysis, in which the estimated sophomore-to-senior growth is calculated not by correcting for dropouts, but by standardizing the senior achievements in each of the private sectors on the 17 background characteristics, to obtain an estimated achievement for a student like the average public-school sophomore. Then an estimated growth for this "standard sophomore" is obtained by comparison with the analogous sophomore scores in the two private sectors. This estimated growth is compared with that shown in line 4 of Table 4. The results are shown in Table 6.

This table shows slightly *less* gain in reading and mathematics in the Catholic schools than in the public schools and somewhat more in each area in the other private schools. The size of these other-private extra gains is, taken over all tests, about one-quarter of the background-standardized sophomore-senior gain in the public schools, or about an extra one-half a year.

⁷ One of these analyses involves the same kind of approach as that on which Tables 4 and 6 are based, but with only one overall equation for sophomores and one for seniors, with the private sectors entered as dummy variables. The regression coefficients for the dummy variables have the same interpretation as lines 2 and 3 in Table 4, and if interaction terms between each of the two dummy variables and each background variable were included, the values should in principle be the same. Without the interaction terms, this analysis (reported below) is inferior to the one reported in Tables 4 and 6, since one is assuming that the family background variables have the same effect for all students. The coefficients for sophomores and seniors are given below (standard errors are in parentheses):

		Reading	Vocabulary	Mathematics
Sophomore:	Catholic	.26 (.05)	.41 (.04)	.46 (.09)
	Other-Private	.02 (.06)	.31 (.06)	.22 (.12)
Senior:	Catholic	.13 (.05)	.46 (.04)	.46 (.10)
	Other-Private	.22 (.07)	.33 (.06)	.51 (.13)

These extra private-school gains, around zero for the Catholic schools and about one-half a grade level in the other private schools, are considerably lower than those estimated in Table 5, suggesting that the dropout correction may have been too great. Other analyses⁷ taken together with the analyses shown in Tables 4, 5 and 6, suggests the following general conclusions, based both on the initial sophomore levels and the estimated gains from sophomore to senior years:

(a) There is higher achievement and greater sophomore-senior growth in both the Catholic and other-private sectors than in the public sector in vocabulary and mathematics. The differences are substantial, on the order of magnitude of one grade level.

(b) Reading achievement in the other-private schools appears only slightly above that in the public schools for comparable students, but the sophomore-senior growth appears considerably greater. The reverse pattern appears for Catholic schools: greater sophomore achievement, but no more, and perhaps less, growth in reading achievement from sophomore to senior than in the public schools. These inconsistencies suggest only very small private-school effects in reading.

It is useful to note that the National Assessment of Education Progress reports, in comparing 17-year-olds in public and private schools in reading achievement, show that there are initial differences in favor of private

These show (except for two cases) greater coefficients for seniors than sophomores and least effects of the private sector in reading. While there is consistency in these results, statistical significance is not strong: For each test, using a standard t-test for the significance of the differences between the coefficients of sectors at each grade level, the only significant difference is between coefficients in the sophomore and senior years for reading in the other-private sector.

The reason for the differences between these results and those of Tables 4 and 6 is that the estimated effects of family background are different in the private sectors than in the public. Here the private school effects are estimated in the presence of background effects that are averages weighted heavily in favor of the public schools, which constitute 91 percent of the school population. This difference is especially important in the case of the Catholic schools, where the effects of family background are much smaller than in the public or other private sectors.

Table 6. Estimated Sophomore-to-Senior Achievement Growth in Catholic and other Private Schools Beyond that in Public Schools for Student with Average Background^a: Spring 1980
(Standard error of difference in parentheses)

	Reading	Vocabulary	Mathematics
Catholic	-0.07 (.072)	0.19 (.066)	0.01 (.136)
Other-private	0.27 (.095)	0.17 (.087)	0.17 (.180)

^a Estimates are obtained from separate regressions for sophomores and seniors in each sector, obtaining predicted achievement in each sector and grade standardized to mean public school sophomore background characteristics for 17 objective and subjective characteristics. "Extra growth" is obtained by comparing these standardized achievements between grades and then across sectors. Standard errors for the differences between Catholic and other private sophomore-to-senior growth and public sophomore-to-senior growth are calculated by taking the square root of the sum of variances of the sophomore-to-senior differences for the sectors under comparison. The variances of the sophomore-to-senior differences are obtained by the method described in the footnote to Table 4. Regression coefficients, standard errors of the slopes and R²s are given in the appendix to Coleman et al. (1982).

schools, but that these nearly vanish when controlled statistically on family background (NAEP, 1981). This is reasonably consistent with our results. (NAEP did not separate Catholic school students, who constitute about two-thirds of the private school total, from the other private school students.)

WHAT MAKES THE DIFFERENCES?

The third method for studying the differential effects of public and private schools takes a completely different tack. It asks: What are the measured ways in which public, Catholic and other-private schools are especially different, after student background differences are statistically controlled, and what difference do these factors make for achievement, wholly within the public sector or alternatively within the private sector? If we find that certain characteristics on which Catholic and other-private schools are higher are associated with higher achievement *within* a sector, where family background characteristics of students are statistically controlled, then this does two things:

(a) It provides a strong reinforcement to the inference that the average Catholic or other-private school does bring about higher achievement for comparable students than does the average public high school;

(b) It shows just what things about a school—whether in the public sector or the private sector—make a difference in cognitive outcomes. This, of course, does not show everything that makes a difference, but only those on which public and private schools characteristically differ.

If, on the other hand, we find that those measured factors on which Catholic and other-private schools differ from public schools when student background is controlled are *not* associated with achievement within a sector when student background is controlled, this implies two things:

(a) First, it shows that these factors are not themselves important for achievement;

(b) Second, it throws doubts on the inference that public-private differences in achievement are due to effects of the school rather than selection of students, by implying that if there are such effects, they must be through other unmeasured factors that differentiate public and private schools.

This analysis is especially important in the test for private school effects. It makes the public-private differences that remain after student background is controlled less subject to the alternative interpretation that additional selection effects remain and are responsible for these differences. For that interpretation would depend upon selection effects operating (over and above the 17 background factors which are controlled) for the school factors themselves, *within* each of the sectors. This becomes a much more tenuous hypothesis to maintain than the original selection-into-private-school hypothesis.

The factors on which both Catholic and other-private schools differ most sharply from the public schools, among those measured in the research, are discipline and student behavior. Some of this is due to differences in student input. For example, the average difference between Catholic school and public school sophomores in the amount of homework is the difference between 5.56 hours per week in the Catholic schools and 3.75 in the public schools. For Catholic school sophomores, like the average public school sophomore on the background characteristics discussed earlier, the 5.56 hours is reduced to 4.92. This leaves a difference of 1.17 hours per week which can be attributed to something about school organization or school policy. Similar background-controlled differences between Catholic and public high schools and between other private and public high schools can be calculated for other variables. The results of such calculations are shown in Table 7 for five types of variables: coursework taken by the student, homework, absenteeism,

Table 7. Differences between Private and Public Schools in Student Behavior and School Climate, Standardized to Family Background Characteristics of Public Sophomore Students: Spring 1980^a
(Standard error of difference in parentheses)

Item	Catholic Minus Public		Other-Private Minus Public	
	Sophomore	Senior	Sophomore	Senior
a. <i>Coursework completed by students</i>				
Proportion taking honors in English	-.02 (.011)	.01 (.013)	-.018 (.014)	.08 (.017)
Proportion taking honors Mathematics	.02 (.011)	.02 (.012)	.06 (.015)	-.03 (.017)
Average number of advanced mathematics courses	DNA	.71 (.034)	DNA	.34 (.045)
b. <i>Homework completed by students</i>				
Average number of hours per week	1.17 (.092)	0.78 (.100)	1.31 (.123)	1.27 (.133)
c. <i>Attendance by individual students</i>				
Absent from school	-.43 (.028)	-.39 (.033)	-.06 (.037)	-.16 (.043)
Cut class now and then	-.20 (.009)	-.21 (.013)	-.04 (.013)	-.08 (.017)
d. <i>Disciplinary climate as perceived by students^b</i>				
Teacher interest	.39 (.008)	.40 (.009)	.49 (.011)	.51 (.012)
Fairness of discipline	.17 (.008)	.18 (.007)	.09 (.009)	.12 (.010)
Effectiveness/strictness of discipline	.59 (.008)	.59 (.008)	.31 (.010)	.31 (.011)
e. <i>Student behavior in school as perceived by sophomores^c</i>				
Absenteeism	.65 (.007)	.66 (.008)	.55 (.010)	.56 (.010)
Cutting class	.79 (.010)	.80 (.011)	.54 (.014)	.53 (.014)
Students fighting each other	.39 (.007)	.38 (.007)	.55 (.009)	.56 (.010)
Students threatening teachers	.17 (.002)	.16 (.002)	.18 (.003)	.17 (.003)

^a Family background characteristics controlled are the 17 used in Table 4. The numbers in the table are obtained by first multiplying public school sophomore background means by regression coefficients from the regression of the variable in question on family background to obtain the expected level of the variable in question for that population, using regressions carried out on private school sophomores, private school seniors and public school seniors, then subtracting the public school value from the private school value.

^b Climate variables aggregated to school level.

^c Behavior variables to school level; a high value implies that students perceived this as happening rarely or never.

school disciplinary climate, and student behavior in the school. The last two of these are fundamentally different from the first three, for they characterize the school as a unit, rather than the student. They are least susceptible to the alternative selection hypothesis, which for them must become especially tortured.

As the table shows, there remain substantial differences in most of these variables in the direction of a more orderly school and more academic demands in the private sector.

With these differences as a starting point, the question can be asked, based on a regression of achievement on these school variables (controlling on student background) just how much difference in achievement these differences in

school characteristics make *within* any sector. In effect, if we ask that question for the public sector, we ask what would be the difference in achievement between the average student in the public sector and a student whose own coursework, study habits and absenteeism were like that of a student who was in one of the private sectors but whose background characteristics were like the average public school sophomore—and whose school had a disciplinary climate and student behavior environment like that of the school in the Catholic or other private school attended by such a student. Or to put it more simply, we ask about achievement differences within the public sector associated with the behavioral and

school differences that remain between private and public schools when student backgrounds are controlled (see Table 8).

Comparing the last two lines for sophomores and seniors shows that in four out of six comparisons among sophomores, and in three out of six among seniors, the predicted achievement for the public high school student in a school with these characteristics is *higher* than that in the Catholic or other-private sectors. It appears that these *are* school factors through which the average private school brings about greater achievement than does the average public school.

Looking at the five different areas, the one that seems to make the most difference is what we have called "student behavior." This is not the student's *own* behavior but the behavior of students in the school as a whole, with his own (i.e., homework and attendance) controlled. The effect is especially strong for sophomores, but this is probably due to the fact that most of the variables making up that behavior are perceptions on the part of sophomore students about their school—and those perceptions will be most accurate for their grade. The student's own homework and attendance make some difference (and it should be remembered that these are only the differences in homework and attendance that can be attributed to school policy), with homework generally making more difference. Policy-related differences in so-

called honors courses make little difference, and in fact inspection of Table 7 shows that there are few sector differences in these policies; but the policy-related difference in frequency of taking advanced mathematics courses (which is present only for mathematics in the senior year) makes a great deal of difference.

The one set of variables that makes little difference or is even slightly negative is the school "disciplinary climate." That seems at first peculiar; but once we recognize that disciplinary climate affects student behavior, then we can see that it may certainly have an effect, but *through* these variables. A further analysis not reported here (Table 6.3.6 in the original report) shows that this is indeed the case. The apparent absence of an effect of disciplinary climate on achievement is merely the absence of a *direct* effect; it does have an effect on student behavior which in turn affects achievement.

It is important to recognize that all the analysis just discussed (Table 8) is within public schools, examining how these differences in school policy affect the achievement of public school students. The results indicate that the policy differences affect public school achievement just as they do private school achievement. It would be possible to do a similar analysis within the private sector, showing how achievement is *reduced* by policy

Table 8. Achievement Differences between Private and Public Schools Due to Various Areas of School Functioning, for Students with Family Backgrounds Like that of the Average Sophomore in Public Schools^a: Spring 1980

	Catholic			Other-Private		
	Reading	Vocabulary	Mathematics	Reading	Vocabulary	Mathematics
Sophomores						
Coursework	-.02	-.02	.05	-.06	-.06	-.13
Homework	.06	.04	.13	.06	.04	.15
Attendance	.04	.03	.15	.01	.01	.02
Disciplinary climate	-.03	-.08	-.18	.06	-.01	.12
Student behavior	.33	.12	.47	.33	.19	.57
Total accounted for	.38	.10	.63	.40	.17	.75
Overall (from Table 4)	.32	.36	.58	.14	.33	.56
Seniors						
Coursework	.01	.01	1.09	-.06	-.06	.48
Homework	.04	.03	.02	.07	.05	.03
Attendance	.02	.00	.04	.01	.00	.01
Disciplinary climate	.01	.00	.02	.10	.07	.01
Student behavior	.20	.01	.26	.18	.11	.40
Total accounted for	.28	.05	1.42	.30	.17	.95
Overall (from Tables 4 & 6)	.24	.56	.60	.40	.51	.74

^a The standard errors of the differences for Table 8 are not presented because of the particular problems involved in estimating var(Y). The method outlined in the footnote to Table 4 assumes fixed values for X, the vector of background means. In Table 8 this assumption is not appropriate, since the values for the school functioning variables (obtained from the equations represented in Table 7) are random variates.

changes that would bring these variables—for comparable students—down to the level found in the average public student.

CONCLUSION

The three types of analysis carried out in this paper provide strong evidence that there is, in vocabulary and mathematics, higher achievement for comparable students in Catholic and other-private schools than in public; the results are less consistent in reading. The last portion of the analysis shows the elements of school policy that can account for these differences—and can account for them by showing that achievement is just as high in the public sector when the policies and the resulting student behavior are like those in the Catholic or other-private schools. The first question that arises is what is it that prevents the public schools from instituting such policies, from being similar to private schools in these respects and thus—according to our analysis—bringing about equal or higher levels of achievement? Public schools once demanded and got higher levels of homework, better attendance, minimal frequency of cutting classes, and generally better student behavior than is now the case. Why are they not able to do so now? Or more to the point, what is dif-

ferent about those that *are* able to do so—for some do—and those that are not? It would be sad to have to conclude that the constraints placed on public education are so harmful to academic achievement that a movement to the private sector is necessary for such achievement to flourish. Some parents have arrived at such a conclusion in their own local situation; it remains to be seen whether changes will come about in the public sector.

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