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School Effects and Costs for Private and Public Schools in the Dominican Republic

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This study suggests that both elite and non-elite private schools are more effective — and more cost-effective — than public schools.

Using statistical methods to adjust for a bias in selectivity, Jimenez, Lockheed, Luna, and Paqueo analyzed the relative effectiveness and cost-effectiveness of public schools and two types of private schools — elite and non-elite — in the Dominican Republic.

Controlling for selection, they found that students in eighth grade mathematics achieve more in both types of private school than they do in public schools — and achieve more in elite than in non-elite schools.

Differences in teachers' backgrounds and teaching practices account for some of this difference in achievement — but differences in the students' peer background characteristics are substantially more important.

Both types of private school appear to be more cost-effective than public schools.

This paper is a product of the Education and Employment Division, Population and Human Resources Department. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Cynthia Cristobal, room S6-214, extension 33640 (38 pages with tables).

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Table of Contents

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SCHOOL EFFECTS AND COSTS FOR PRIVATE AND PUBLIC SCHOOLS IN THE DOMINICAN REPUBLIC

Do private school students learn more than their public school counterparts? Is it more or less expensive to educate students in private schools? The answers to these questions were addressed initially in the United States, where a debate was sparked by the Coleman, Hoffer and Kilgore (1982) report, which concluded that private (Catholic) schools were more effective than public schools in helping students acquire cognitive skills. Recently the issue has been addressed in the international setting, with the evidence for other countries summarized in a paper by Jimenez, Lockheed and Paqueo (1989).

The debate over the above questions is fueled by controversies over methodology, interpretation and data. The most important methodological issue is the difficulty of attributing the differences in the cognitive abilities of students in public versus private schools to school inputs alone, since a variety of non-school factors such as socioeconomic background, innate ability and individual motivation also affect achievement. These non-school factors also affect school choices by families. For example, were children from privileged backgrounds to attend only private schools, it would be hard to infer how they would do in public schools. Thus, unless non-school factors are controlled for appropriately, estimates of school effects will be contaminated by what has become known as "selectivity bias."

This paper contributes to the literature in four important ways. First, it addresses the difficult methodological questions that have arisen in other studies. Enrollment in a public or private school is a choice made by the students and parents. If this choice is systematically correlated with personal characteristics, there may be sample selection bias. In this study we use some recent methodological advances to model and correct statistically for this bias. Second, the paper extends the empirical evidence for developing countries by analyzing data from a survey, modeled after the International Association for the Evaluation of Educational Achievement (IEA) Second Mathematics Study, carried out in the Dominican Republic (Luna and Gonzalez 1986). Third, we differentiate between two types of private schools, which we compare with urban public schools. In contrast, most earlier studies failed to distinguish different types of private schools. In some cases, they treated all private schools similarly, while in other cases they examined only particular types of private schools, for example, Catholic ones (Bryk and Lee 1988). Fourth, we use independently gathered data to compare the unit costs of public and private schools before reaching conclusions regarding the relative efficiency (as opposed to the relative productivity) of public and private schools.

The next section of this paper outlines the basic conceptual model. It is followed by sections on the data, school effects, relative costs, and conclusions.

THE BASIC CONCEPTUAL MODEL

Would a secondary school student, randomly selected from the general student population, do better in a public or private school? In the absence of experimental data, it is possible to obtain a reliable answer from a cross-section comparison of the performance of public and private school students on standardized tests -- if we control for student background, motivation and innate ability.

In the Dominican Republic there are two main types of private schools: those authorized by the Ministry of Education to give examinations without the supervision of a public high school (F-type schools) and those not authorized to give such examinations unless so supervised (O-type schools). Although both F-type and O-type private schools must register with the Ministry of Education and meet the same requirements for facilities, personnel and curriculum, there are other differences between them. The F-type private schools are generally regarded as higher status, and are generally more expensive; most (77%) have a religious affiliation. By comparison, only 31% of the O-type private schools have a religious affiliation.

A standard method for estimating the effects of school type on achievement is to postulate the following reduced form model--the "ith" student's achievement score (A) in the three types of schools as a function of observed background variables (X) and unobserved variables (e):[1/]

1/ Alternatively, equations (1a-c) can be estimated as one equation, with a dummy variable for private and public types of schools. However, statistical (F-) tests lead us to reject the hypothesis that the coefficients of all the other variables are equivalent in different types of schools. The results are available from the authors.

(1a) $A_{if} = b_f X_{if} + e_{if}$,

(1b) $A_{io} = b_o X_{io} + e_{io}$,

(1c) $A_{ig} = b_g X_{ig} + e_{ig}$.

If the effects attributable to the unobserved variables, e, are randomly and normally distributed, ordinary least squares regression techniques can be used to estimate the parameters of the equations (1a-c). Private/public comparisons can then be made using this information. For example, for a student with the characteristics of the average public school student, the difference in the achievement score if he/she were to attend an F-type private school would be[2/]

(2) Effect $= (b_f - b_g) X_g$.

A critical problem arises if the observed public and private subsamples are basically incomparable because of selection bias. This situation would arise if students from a certain background systematically

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[2/] This conclusion can be shown easily. Subtract the estimated equation (1b) from (1a). Then, add and subtract bfX_g on the right-hand side of the resulting equation. The resulting difference can be expressed as:

$$\text{Difference} = b_f (X_f - X_g) + (b_f - b_g) X_g,$$

where the first term is interpreted as the endowment effect (i.e., the difference in scores attributable to the differences in characteristics) and the second term is the school effect shown in equation (2) above.

chose one type of school over another. For example, if privileged students chose only private schools, no privileged students would be enrolled in public schools. Thus, it might be misleading to use equation (1c) to infer how privileged private school students would do in public schools. Statistically, this situation means that the error terms e are no longer normally distributed, and OLS should not be used to estimate the above equations.

To correct for sample selection when parents choose among the three alternatives, we use a variant of Heckman's two-step technique. The first step in this methodology is to estimate what determines the choice of type of school. We assume that schools are ranked by status in the following descending order: F-type, O-type and public. Individuals will choose an educational plan, including the type of school, that will maximize the child's economic well-being, net of private costs. The solution to this bias problem is the following choice equation for the "ith" child (Cox and Jimenez 1987):

$$(4) \qquad I_i^* = k\, Y_i + w_i,$$

where I_i^* is an unobserved variable that characterizes the propensity of a household to choose a certain type of school. Since it is unobserved, we use the indicator variable

$$
\begin{aligned}
I_i &= 2 && \text{if } I_i^* > c \\
I_i &= 1 && \text{if } o < I_i^* < c, \text{ and} \\
I_i &= 0 && \text{if } I_i^* < o,
\end{aligned}
$$

where o and c are unobserved cutoff points for status (2 = F-type, 1 = O-type,
0 = public), Y indicates the explanatory variables, and w is a random error term. Under suitable assumptions,[3/] equation (4) can be estimated as an ordered probit model.

The second step is to use the results of the first step to correct for the selection bias in (3a) and (3c). With selection, the expected values of A_i are conditional on the choice of public and private sector. That is, the error terms e_i are correlated with w_i. The expected value of e_i will no longer be equal to zero and the estimated parameters in (1a-b) will suffer from an omitted variable bias if OLS is applied. Under appropriate distributional assumptions,[4/] the first step probit equation can be used to generate selection terms. Including those terms in the expanded regressions equations (1a-c) enables us to treat the selection bias as an omitted variables problem. The selection terms (called lambdas, by convention) times their OLS coefficients can then be interpreted as the direction and magnitude of the selection bias in each of the public and private school achievement equations. The estimation of (1a-c) with the inclusion of the lambda by OLS is consistent (unbiased) because, in theory, the equations hold constant for the probability of being selected in one subsample or another.

3/ Details are available from the authors.

4/ Details are available from the authors.

THE DATA

The Sample

Since both types of private schools in the sample are located exclusively in urban areas, we compare them to urban public schools only. This paper analyzes data from 2,472 students in 76 schools out of the national sample of students and schools included in the 1982-83 study of mathematics achievement in the Dominican Republic (Luna and Gonzalez 1986). The sampling frame for the original study stratified schools by type (three types of public schools and two types of private schools) and by location (five types of urban and three types of rural settings); a random sample of schools from each cell in the frame was drawn, and, within each school, one or two classrooms were sampled.

At both the beginning and end of the school year, students were administered an IEA mathematics test and completed detailed background questionnaires. Teachers completed several instruments at the pretest, the posttest and during the school year, including a background questionnaire and a general classroom process questionnaire, and provided information about teaching practices and the characteristics of their randomly selected "target" class. A school administrator provided data about the school at the time of the original data collection; we obtained additional data on costs and enrollment in conjunction with the preparation of this paper.

Dependent Variables

A mathematics test similar to that developed by IEA, covering arithmetic, algebra, geometry, statistics and measurement, was administered to students at the beginning (pretest) and end (posttest) of the school year. All students were administered a "core" test of 40 items (27 items from the IEA core test and 13 other IEA items) and one of four "rotated" tests. This paper analyzes data from the core test.

Independent Variables

The independent variables analyzed in this paper include fixed student socioeconomic background variables, characteristics of students that changed over the course of the year, school characteristics, teacher characteristics and practices, and peer characteristics.

Fixed Student Characteristics. The basic background information about each student included: gender; age in months; type of material used in the construction of the student's residence, an indicator of socioeconomic status ([a] block, brick or cement or [b] other e.g., mud brick); highest maternal education (years completed); maternal occupation ([a] full-time worker or [b] part-time or not employed outside the home); and paternal occupation ([a] white-collar, [b] blue-collar, [c] agricultural or [d] unclassified; in the analyses used in this paper, "blue-collar" serves as the comparator group). The actual data set included a wide variety of variables related to the social class background of students, but the analyses revealed considerable collinearity among them. Therefore we chose those that provided the greatest information without excessive collinearity.

Changing Student Characteristics. Two variables were identified that could affect achievement but had little effect on the choice of public or private schools. The first was commuting time, or the length of time it took a student to reach school ([a] less than 15 minutes, [b] about 30 minutes, [c] more than 45 minutes or [d] no response). The second was days absent in the past month ([a] never absent, [b] less than 3 days absent, [c] less than 5 days absent, [d] 5 or more days absent and [e] no response).

School Characteristics. Four school characteristics were examined: type of school, ([a] F-type private schools, authorized to administer national examinations, [b] O-type private schools, not authorized to administer examinations, and [c] public schools); student/teacher ratio; average tuition of F-type schools in the region in which the school was located; and average tuition of O-type schools in the region in which the school was located.

Teacher and Classroom Characteristics. Three teacher characteristics were analyzed: teacher education, or the number of years of formal education attained by the teacher; teacher experience, or the number of years teaching either grade eight or the second year at the middle level of the Reformed Program; and the total number of class periods per week the teacher spent teaching at another school (an indicator of teacher involvement). Two teaching practices were analyzed: the amount of time, in minutes, spent on routine administration, and the amount of time, in minutes, spent establishing and maintaining class order and getting students' attention during teaching periods. Two classroom quality variables were also included: the length of the mathematics period, in minutes, and the percentage of students who had mathematics textbooks.

Peer Characteristics. Peer group characteristics were indicated by four class averages: pretest score; average years of maternal education; proportion of students having fathers with white-collar occupations; and percentage of students who were female.

Comparison of School Types

Table 1 presents the means and standard deviations of the variables related to student characteristics by type of school. Students in both types of private schools in the Dominican Republic came from distinctly more advantaged backgrounds than did their public school counterparts. This finding is not surprising given that private schools charge fees and public schools do not. On average, the private school students had more educated mothers, were more likely to have a father in a white-collar occupation, and were more likely to live in a "block" house than were the students attending urban public schools.

Table 2 presents the means and standard deviations of the school variables by type of school. There were differences among the types of schools, but they were not consistently correlated with the status of the school. Private F-type schools appeared to be the most advantaged, with the most educated and experienced teachers, the highest proportion of students with textbooks, and the longest average periods of instruction. However, teachers in F-type schools also spent more time establishing order in their classrooms, on indication that they spent less time on instruction; they were also more likely to teach additional classes in other schools, a pattern that suggests they needed to supplement their salaries.

Table 1: Mean Student Characteristics by Type of School (Standard Deviation in parentheses)

Variable	School Type: Public (N=1,619)	Private-O (N=402)	Private-F (N=453)
Student posttest score	10.26	11.25	14.34
	(3.46)	(3.86)	(6.16)
Student pretest score	8.39	9.39	11.81
	(3.17)	(3.18)	(5.20)
Mother's education in years	6.26	8.06	11.15
	(3.92)	(3.90)	(4.19)
Student's age in months	183.66	174.56	164.16
	(22.18)	(19.61)	(13.39)
Residence built of cement	0.51	0.69	0.85
blocks or brick	(0.50)	(0.46)	(0.36)
Female	0.58	0.55	0.55
	(0.49)	(0.50)	(0.50)
Full-time working mother	0.16	0.24	0.31
	(0.37)	(0.43)	(0.46)
Father's occupation			
White-collar	0.29	0.49	0.73
	(0.46)	(0.50)	(0.44)
Blue-collar	0.40	0.33	0.11
	(0.49)	(0.47)	(0.31)
Agriculture worker	0.22	0.08	0.10
	(0.42)	(0.26)	(0.30)
Unclassified	0.08	0.10	0.06
	(0.27)	(0.30)	(0.23)
Student commutes to school			
Less than 15 minutes	0.63	0.73	0.73
	(0.48)	(0.44)	(0.45)
About 30 minutes	0.28	0.22	0.22
	(0.45)	(0.42)	(0.42)
More than 45 minutes	0.09	0.04	0.04
	(0.29)	(0.20)	(0.20)
No response	0.01	0.00	0.01
	(0.09)	(0.05)	(0.09)
Days absent from school last month			
Never	0.57	0.60	0.61
	(0.50)	(0.49)	(0.49)
Fewer than 3 days	0.27	0.25	0.27
	(0.44)	(0.43)	(0.44)
Fewer than 5 days	0.08	0.08	0.06
	(0.28)	(0.27)	(0.23)
More than 5 days	0.07	0.07	0.06
	(0.25)	(0.25)	(0.24)
No response	0.01	0.01	0.01
	(0.11)	(0.11)	(0.08)

Table 2: Mean School and Peer Group Characteristics
(Standard Deviation in parentheses)

Variable	School Type		
	Public (N=1,619)	Private-O (N=402)	Private-F (N=453)
Teacher's education in years	13.70 (1.64)	13.01 (1.00)	14.01 (1.64)
Teacher's/grade 8 mathematics experience in years	6.49 (5.01)	4.36 (4.72)	10.47 (5.84)
Number of class periods taught elsewhere	6.20 (9.66)	10.87 (9.99)	13.83 (11.68)
Length of mathematics period in minutes	43.80 (4.13)	43.09 (2.97)	45.30 (5.19)
Minutes spent on routine administration	22.54 (14.47)	19.41 (15.19)	21.79 (12.82)
Minutes spent establishing order in the class	19.20 (17.98)	7.12 (8.61)	23.07 (17.27)
Percentage of students with textbook	17.50 (23.06)	55.97 (38.57)	62.75 (43.67)
Student/teacher ratio	31.03 (9.01)	30.78 (9.04)	30.60 (16.44)
Class average pretest score	8.27 (1.15)	9.35 (0.88)	11.84 (3.61)
Class average mother's education in years	6.23 (1.25)	8.11 (1.35)	11.22 (1.92)
Proportion of students having fathers with white-collar occupation	0.28 (0.10)	0.46 (0.16)	0.69 (0.20)
Percentage of female students in class	42.74 (8.25)	35.24 (10.87)	42.52 (9.82)

The differences between the private O-type and public schools were irregular. The public schools had more educated and experienced teachers than did the private O-type schools, and their teachers were less likely to seek additional employment. However, the private O-type schools had a higher proportion of students with textbooks, and teachers in the O-type schools spent less time establishing order or on administration. There were virtually no differences in the mean teacher/student ratios or in the average duration of a class period.

THE EFFECT OF BACKGROUND ON ACHIEVEMENT IN PUBLIC AND PRIVATE SCHOOLS

According to Table 1, the average posttest scores of the students in the private O-type schools was one point (about 10%) greater than the average for students in the public schools for an effect size of .29; the average score for private F-type students was over four points (about 40%) greater, for an effect size of 1.18. The gain in learning over the eighth grade, as measured by the difference between the pre- and posttest scores, was virtually the same in the public and O-type schools: 1.87 points, or one-half of a standard deviation. However, the gain by the F-type students -- 2.53 points -- was .66 points (three-fourths of a standard deviation) greater than the gain by the public school students.

Because the students in the public schools differed from those in both types of private schools, these gross differences in achievement should not be used to conclude that one type of school was more or less effective than the other. The previous comparisons between students in the three types of schools (Table 1) showed that private school students--particularly those attending F-type schools--came from more advantaged backgrounds as compared with public school students. They had more educated mothers, lived in better houses, tended to have a full-time working mother, and had fathers with white-collar occupations. Since both types of private schools charged tuition and the public schools did not, these differences in socioeconomic status are not surprising.

Much research indicates that background variables are positively correlated with level of achievement. Therefore it is necessary to adjust for differences in student background, although that correction is not in itself sufficient. If the impact of background on achievement increases or remains constant over time, then correcting for background would tend to lessen the private school advantage in terms of gain over the eighth grade. Only if the impact of background <u>diminishes</u> over time would correcting for background strengthen the private school advantage. In either case, it is necessary to correct for differences in the sample selection as well.

As mentioned, we use an adaptation of a now-standard two-step methodology to correct for background variables in an unbiased way (see Heckman 1979 for the original article and Willis and Rosen 1979, Lee 1979, Jimenez and Kugler 1987, and Jimenez, Lockheed and Wattanawaha 1988 for applications to education). The first step is to estimate what determines the choice of type of school, ranked ordinally in order of status: F-type private schools, O-type private schools and public schools. We assume that parents and students choose a school whose status will maximize the child's lifetime earnings, net of tuition. The second step uses the results of the first step to correct for the selection bias in the achievement equations. (The details of the methodology are presented in the appendix.) The next two subsections discuss the results of the two steps.

What Determines the Choice of School Type?

The results of a regression of the choice of school type, as measured by an ordinal ranking of high (F-type), middle (O-type) and low (public) status schools, are presented in Table 3. Mother's education, the quality of the student's house (a proxy for wealth) and father's occupation (white-collar, agricultural and unclassified versus blue-collar) were all strongly positively correlated with choosing a higher status alternative. Older students who may have repeated one or more grades tended to choose lower status schools. Neither the mother's working status nor the student's gender significantly affected the choice of school type. The other group of variables that affect school type is the relative cost of attending that school. In this analysis, the comparator cost is that of public schools, which do not charge any tuition. For each observation, the cost of F- and O-type schools was calculated based on the average tuition charged by those schools in the sample stratum. While we assume there is no variation in the cost within any stratum, we expect considerable variation across the strata. For example, the schools in larger urban areas probably had to pay teachers higher salaries and therefore had to charge higher tuition. Because we do not have data on other private costs, we assume they were, while significant, roughly the same across the school types.

Table 3: Determinants of Public, Private O-type and Private F-type School Choice, Dominican Republic, 1982-83

Variables	Coefficient	Standard Error
Intercept	-1.59**	0.62
Mother's education	0.08***	0.01
Student's age	-0.014***	0.001
Block house	0.27***	0.06
Female	-0.03	0.06
Full-time working mother	0.01	0.07
Father's occupation:		
White-collar	0.57***	0.07
Agricultural	0.25**	0.09
Unclassified	0.20*	0.11
Average tuition of F-type (1987-88)	-0.002**	0.001
Average tuition of O-type (1987-88)	0.02***	0.01
Lambda	0.68***	0.04
Log likelihood	-1769.1	
N	2474	

Note: Dependent variable: public school=0, O-type private school=1, F-type private school=2.
*** p < .001, ** p < .01, * p < .05

The coefficient of the F-type tuition is negative and significant, as we expected. When the cost of attending an F-type school rises compared with public schools (holding the relative cost of O-type versus public schools constant), the demand for status falls. Students will then switch to lower status O-type schools or public schools.

The coefficient of the O-type tuition can be positive or negative. When the cost of attending an O-type school rises compared with public schools (holding the relative cost of F-type versus public schools constant), the demand for O-type schools falls. This displaced demand can be met by lower status public schools or higher status F-type schools. In our sample, the displaced demand was met predominantly by F-type schools. Thus, the coefficient of O-type tuition is positive.

What Is the Effect of Background on Achievement?

The estimated achievement equations for the private F-type, private O-type and public schools are presented in Table 4. Because standard F-tests reveal that the differences in the coefficients among the three types of schools are significant, we estimate the equations separately. The explanatory variables include the background variables used in the equation for choice of school type plus some variables that are not contemporaneous with school choice. The latter include the pretest score, actual commuting time to school and days absent from school. The two tuition variables included in the school choice equation -- average prices for the sample strata -- are excluded from the achievement equations because they should have little effect on individual performance once in school. Moreover, excluding them helps in identification of the system.

The coefficient of the pretest score can be interpreted as the lagged effect of previous background inputs on current-year achievement. This effect is twice as large for the high prestige F-type schools as for either the private O-type or public schools.

When father's occupation and other variables are held constant, mother's education is negatively related to achievement. This result is perhaps attributable to the fact that more highly educated mothers were apt to work part-time and were less available at home. Girls in the private F-type schools were not disadvantaged relative to boys, while in the public and private O-type schools they gained significantly less than did the boys. Commuting time and days absent have little impact on achievement.

The selection term in each of the achievement equations is lambda times its coefficient, where the latter is the ratio of the covariance between the error terms in the achievement and choice equations to the standard error of the choice equation. If this value is positive and significant, then the estimated expected value of achievement will be greater because of the selection effects. Thus, correcting for selection will lower the expected value for achievement. The converse would hold if the value is negative and significant. If the coefficient of lambda is not significantly different from zero, then the selection effects are not important.

In our sample, the selection effects are positive for the public schools and negative for both the O-type and F-type private schools. This result is somewhat surprising, since we initially thought that the background advantage of the private school students would lead to a positive selection bias. However, the strong price effects indicate that, by charging tuition, private schools were depriving themselves of bright, highly motivated but poor students who selected public schools. This effect appears to counterbalance background selection effect.

Table 4: Results of the Achievement Equation, Holding Student Characteristics Constant

Variables	School Type: Public	Private O	Private F
Intercept	10.50***	9.53***	10.10***
	(1.01)	(2.11)	(2.88)
Pretest score	0.41***	0.38***	0.81***
	(0.03)	(0.06)	(0.04)
Mother's education	-0.05	-0.20*	-0.14
	(0.03)	(0.09)	(0.09)
Age in months	-0.02***	0.01	0.01
	(0.01)	(0.02)	(0.02)
Block house	-0.04	-0.53	-1.03
	(0.19)	(0.53)	(0.65)
Female	-0.55***	-1.14***	0.22
	(0.16	(0.32)	(0.37)
Full-time working	0.16	1.01*	-0.07
mother	(0.22)	(0.42)	(0.43)
Father's occupation			
White-collar	-0.33	-1.13	-1.03
	(0.25)	(0.66)	(0.83)
Agricultural	-0.47*	-0.28	-0.43
	(0.21)	(0.73)	(0.79)
Unclassified	-0.35	-0.06	0.14
	(0.31)	(0.66)	(0.95)
Commuting time			
About 30 minutes	0.06	0.60	0.02
	(0.18)	(0.41)	(0.45)
More than 45 minutes	-0.51	-2.14*	-1.04
	(0.27)	(0.88)	(0.97)
No response	0.79	-2.19	2.19
	(0.93)	(3.43)	(2.09)
Days absent			
More than 5	0.02	0.22	-0.58
	(0.32)	(0.72)	(0.79)
Fewer than 5	-0.36	-0.06	1.11
	(0.29)	(0.64)	(0.80)
Fewer than 3	-0.01	0.53	-0.74
	(0.18)	(0.41)	(0.43)
No response	-2.46**	-0.76*	-2.27
	(0.77)	(1.54)	(2.32)
Lambda	-1.06	-2.52**	-3.86**
	(0.62)	(0.94)	(1.28)
N	1619	402	453
R^2	0.21	0.23	0.60

Note: The numbers are the regression coefficients; the standard errors are in parentheses.
*** $p < .001$, ** $p < .01$, * $p < .05$.

With Background Held Constant, What Is the Private School Effect?

The estimated differential in the achievement of public and private school students can be computed from the parameters presented in Table 3, to hold constant the effect of background. Because private and public school achievement differs in terms of intercept and slope, the comparison is affected by the values of other explanatory variables, as well as the coefficients in these equations. Thus, we compute the unconditional private school effect as follows: from the entire sample of private and public school students, consider a randomly chosen pupil with the average characteristics of a public school student (i.e., standardized according to the public school means). The unconditional effect measures the change in the student's test scores had that student gone to a private school. The same calculation can be performed standardizing at the F-type and O-type means to test the robustness of the results, which are presented in Table 5a.

Table 5a: Private School Effects on Grade 8 Mathematics Achievement, Dominican Republic, 1982-83, Holding Background Characteristics Constant and Controlling for Selection Bias (Two-Stage Correlation.)

Characteristics of the Randomly Chosen Student Set at Mean of:	Predicted Score			Differential	
	Public	O-Type	F-Type	O-Pub.	F-Pub.
Public school subsample	9.79	12.86	17.26	3.08	7.47
Private O-type subsample	10.31	12.67	17.41	2.36	7.10
Private F-type subsample	11.29	12.54	18.36	1.26	7.07

The results indicate that, with past achievement and socioeconomic background held constant, eighth grade students in the private schools who have the mean characteristics of a public school student have an unconditional advantage in test performance of about 3 points in the private O-type schools and 7 points in the private F-type schools. These results are largely invariant when computed using the O-type or F-type characteristics.

Had we used the biased coefficients of an OLS (without correcting for selection), we would have come up with qualitatively similar results. However, the magnitudes would have been different--only about a .3 point advantage for the private O-type schools and 1-2 points for the private F-type schools (Table 5b).

Table 5b: Private School Effects on Grade 8 Mathematics Achievement, Dominican Republic, 1982-83, Holding Background Characteristics Constant and Not Controlling for Selection Bias (OLS)

Characteristics of the Randomly Chosen Student Set at Mean of:	Predicted Score			Differential	
	Public	O-Type	F-Type	O-Pub.	F-Pub.
Public school subsample	10.26	10.35	10.24	.09	-.02
Private O-type subsample	10.99	11.25	11.66	.26	.67
Private F-type subsample	12.25	12.63	14.34	.38	2.10

THE NATURE OF THE PUBLIC-PRIVATE DIFFERENTIAL

The previous section showed that the private school students in the Dominican Republic scored higher on mathematics achievement tests at the end of the eighth grade than did their public school counterparts, after controlling for previous achievement, socioeconomic background and systematic selection by school type. The effect was larger for the higher status F-type schools. In terms of policy, the important question is why this difference exists. Is it possible to identify the characteristics of the private schools that most contribute the achievement effect? What do administrators and teachers do that is different? What are the peer group effects? These questions are answered in the next two subsections.

School, Classroom, Teacher and Teaching Practice Variables

Table 2 showed that there were substantial differences in the school, classroom, teacher qualification and practice variables among the various types of schools. These differences were not, however, consistently commensurate with the status of the school type.

Table 6 shows the results of adding these variables to the achievement equations for the various types of schools. With student background characteristics held constant, few of the school, classroom or teaching practice variables were statistically significant. In the F-type schools, the students of the more educated teachers scored about 1 point higher than did the students of less well-educated teachers for each additional year of teacher education. Further, the students of teachers who taught elsewhere scored about one-tenth of a point higher for each additional class period than did the students of teachers who taught fewer class periods elsewhere. The remaining teacher and teaching practice variables had no effect on student achievement. In the O-type schools, no teacher or teaching variable was associated with the differences in achievement. In the public

Table 6: Results of the Achievement Equation with Student and School Characteristics Held Constant

Variables	School Type: Public	Private O	Private F
Intercept	10.71*** (1.81)	7.08 (4.98)	-5.25 (7.19)
Pretest score	0.41*** (0.03)	0.39*** (0.06)	0.71*** (0.05)
Mother's education	-0.05 (0.04)	-0.23 (0.16)	-0.10 (0.13)
Age in months	-0.02** (0.01)	0.02 (0.03)	-0.01 (0.03)
Block house	-0.12 (0.19)	-0.63 (0.69)	-0.58 (0.78)
Female	-0.56*** (0.16)	-1.11** (0.35)	0.22 (0.40)
Full-time working mother	0.19 (0.22)	1.07* (0.42)	-0.19 (0.42)
Father's occupation			
White-collar	-0.37 (0.27)	-1.34 (1.10)	-0.66 (1.06)
Agricultural	-0.40 (0.22)	-0.34 (0.84)	-0.13 (0.86)
Unclassified	-0.41 (0.31)	-0.17 (0.73)	0.50 (0.98)
Commuting time			
About 30 minutes	0.02 (0.18)	0.49 (0.42)	-0.14 (0.46)
More than 45 minutes	-0.53 (0.27)	-2.37** (0.89)	-1.35 (0.94)
No response	0.77 (0.93)	-2.22 (3.43)	2.14 (2.03)
Days absent			
More than 5	-0.01 (0.32)	0.40 (0.72)	-0.50 (0.78)

(Table 6 continued)

Variables	School Type: Public	Private O	Private F
Fewer than 5	-0.38 (0.29)	0.02 (0.65)	0.87 (0.79)
Fewer than 3	0.01 (0.19)	0.63 (0.42)	-0.56 (0.43)
No response	-2.47** (0.77)	-0.84 (1.55)	-2.07 (2.29)
Student/teacher ratio	-0.01 (0.01)	0.01 (0.03)	0.05 (0.04)
Teacher's experience in years	0.001 (0.02)	0.03 (0.05)	-0.06 (0.06)
Teacher's education in years	0.004 (0.06)	0.02 (0.26)	1.13*** (0.34)
Class periods taught elsewhere	0.03** (0.01)	0.002 (0.03)	0.10** (0.04)
Length of mathematics period	-0.01 (0.02)	0.03 (0.10)	-0.03 (0.06)
Minutes on routine administration	-0.002 (0.01)	0.02 (0.02)	0.02 (0.02)
Minutes on establishing order	-0.002 (0.01)	-0.05 (0.03)	-0.004 (0.02)
Lambda	-1.22 (0.71)	-2.91 (1.91)	-2.25 (2.14)
N (students)	1619	402	453
Adjusted R^2	.20	.19	.60

Note: The numbers are regression coefficients; the standard errors are in parentheses.

*** $p < .001$, ** $p < .01$, * $p < .05$.

schools, only the number of class periods the teacher taught elsewhere had an effect on student achievement, and the effect again was positive.

After holding these variables constant, it would be expected that some of the private school advantage would disappear. After all, these differences in teacher characteristics and teaching practices may account for a portion of that advantage. The results in Table 7 indicate that this hypothesis is indeed the case, at least for the F-type schools: the private F-type advantage over public schools falls from 7 points to about 4-5 points. However, it does not disappear, the implication being that there are unmeasured practices, teacher characteristics or factors that motivate teacher performance that account for a residual impact. For the private O-type schools, holding these characteristics constant has virtually no impact on their advantage over public schools, which remains at about 2-3 points.

Table 7: Private School Effects After Holding Background, Teacher, and School Characteristics Constant, Dominican Republic, 1982-83.

Characteristics of the Randomly Chosen Student, Set at Mean of:	Predicted Score			Differential	
	Public	Private O-Type	Private F-Type	O-Pub.	F-Pub.
Public school subsample	9.72	12.76	14.32	3.04	4.60
Private O-type subsample	10.34	12.90	14.59	2.56	4.25
Private F-type subsample	11.32	12.08	16.69	0.76	5.37

Peer Group Effects

Because students interact with each other in school, the ability and backgrounds of fellow students could affect individual achievement. To account for this possibility, we add to the achievement equations three classroom-level peer variables: average pretest score, average years of education of students' mothers, and proportion of students whose fathers are white-collar. (Because of collinearity, these variables are added to those in Table 4; school and teacher variables are not included.) As shown in the tables of means, these classroom peer characteristics rise with the school's status.

Table 8 shows the effect on the results of adding these variables. The selection terms become insignificant, an indication that these peer group variables may be capturing their effect. This result is not surprising if students with similar backgrounds are led to select schools of similar status. (See Murnane 1985 for an earlier discussion of the peer group effects.) Thus, an important methodological result is that adding peer group variables may substitute for the more cumbersome techniques that correct for selection bias.

The effect of these variables on the private school effect is interesting as well. According to Table 9, adding the peer group effects to the achievement equations significantly diminishes the private school advantage. This result was found earlier for Thailand, using similar data (Jimenez, Lockheed and Wattanawaha 1987).

Table 8: Results of Achievement Equation with Student and Peer Group Characteristics Held Constant

Variable	School Type		
	Public	Private O	Private F
Intercept	6.64*** (1.25)	2.45 (3.30)	6.46* (3.26)
Pretest	0.36*** (0.03)	0.35*** (0.06)	0.67*** (0.05)
Mother's education	-0.03 (0.03)	-0.12 (0.09)	0.10 (0.11)
Age in months	-0.01* (0.01)	0.01 (0.02)	-0.04 (0.02)
Block house	-0.07 (0.19)	-0.16 (0.54)	-0.16 (0.69)
Female	-0.53** (0.15)	-1.18*** (0.35)	0.03 (0.37)
Full-time working mother	0.13 (0.21)	0.99* (0.42)	-0.18 (0.41)
Father's occupation			
White-collar	-0.27 (0.25)	-0.46 (0.71)	0.67 (0.95)
Agricultural	-0.18 (0.21)	0.12 (0.74)	0.37 (0.83)
Unclassified	-0.32 (0.30)	0.29 (0.68)	0.87 (0.98)
Commuting time			
About 30 min.	-0.02 (0.17)	0.50 (0.41)	-0.30 (0.44)
More than 45 min.	-0.63* (0.27)	-2.25* (0.87)	-1.75 (0.93)
No response	0.77 (0.91)	-2.24 (3.40)	1.39 (2.01)

Table 8 (cont.)

Variable	School Type Public	Private O	Private F
Days absent			
More than 5	0.26	0.22	-0.62
	(0.31)	(0.71)	(0.78)
Fewer than 5	-0.31	0.13	0.87
	(0.28)	(0.65)	(0.79)
Fewer than 3	0.05	0.58	-0.55
	(0.18)	(0.41)	(0.42)
No response	-2.31**	-0.85	-1.83
	(0.75)	(1.53)	(2.29)
Class average pretest score	0.45***	0.49	0.49***
	(0.08)	(0.25)	(0.11)
Class average mother's education	-0.12	0.20	-0.31
	(0.08)	(0.18)	(0.20)
Proportion of students having fathers with white-collar occs.	4.11***	0.14	2.41
	(0.96)	(1.55)	(1.71)
Percentage of female students	-0.01	0.01	-0.01
	(0.01)	(0.02)	(0.02)
Lambda	-0.49	-1.25	1.18
	(0.64)	(1.03)	(1.68)
N (students)	1619	402	453
Adjusted R^2	0.23	0.20	0.61

Note: The numbers are regression coefficients; the standard errors are in parentheses.
*** $p < .001$, ** $p < .01$, * $p < .05$.

Table 9. Private School Effects after Holding Background and Peer Group Characteristics Constant, Dominican Republic, 1982-83

Characteristics of the Randomly Chosen Student Set at Mean of:	Predicted score			Differential	
	Public	Private O-Type	Private F-Type	O-Pub.	F-Pub.
Public school subsample	10.04	10.97	8.12	0.93	-1.92
Private O-type subsample	11.56	11.95	9.95	0.39	-1.60
Private F-type subsample	14.05	14.23	13.12	0.18	-0.93

RELATIVE COST OF PRIVATE AND PUBLIC SCHOOLS

Two questions are now explored: what is the relative cost-effectiveness of the three types of schools, and what is the value added by private schools?

Our cost data are admittedly incomplete. When the information on school background was originally gathered in 1982-83, financial material was not included. Although we returned to the sample schools in 1987-88, we were able to obtain only very limited information on costs. Nevertheless, the data on salaries for teaching and non-teaching staff, which often accounts for as much as 90-95% of recurrent costs in education, do give useful indications.[5/]

Two types of evidence are presented to address the issue of relative cost-effectiveness. One relies on actual but partial data on unit costs, i.e., salary expenditures per student among the schools (Table 10). The other

[5/] UNESCO data for the Dominican Republic show that teacher emoluments accounted for 95% of public general secondary education expenditures in 1983.

(Table 11) compares roughly estimated full unit costs relative to predicted mathematics achievement scores, assuming that the tuition and fees reflected the long-run average cost per student year of private education. For public schools, two estimates of the average cost per student year are presented, calculated using an assumed ratio of non-salary to total expenditures to take into account capital costs (e.g., buildings, library and equipment) and other

Table 10: Comparative Cost Data by Type of School

Variable	Public	Private	
		O-Type	F-Type
Expenditure per student			
Teacher salaries (RD$/month)	15.90	9.71	16.77
Non-teaching staff salaries (RD$/month)	6.99	3.36	7.20
Total	22.89	13.07	23.97
Average annual salary			
Teachers (RD$/year)	444.30	237.10	447.80
Non-teaching staff (RD$/year)	421.50	309.40	728.00
Non-teacher salaries as % of all salaries	30.55	25.69	30.04
Tuition and fees (RD$/year)	None	209.20	472.40
Government grant per student (RD$/month)	-	0.80	0.72

expenses. In our opinion this ratio is at least 15%. The level of mathematics achievement used to divide the average cost per student is the predicted posttest score, with costs and background characteristics held constant and controlling for selection bias. For this analysis, background characteristics are set equal to their mean values for public school students.

O-type Private Schools. On average, O-type private schools are much more cost-effective than public schools. That is, their per-student salary expenditures are 43% lower than those of the public schools, but mathematics achievement is 31% higher. This conclusion, which is confirmed by the data in Table 11, is robust; the table shows that the ratio of the full unit cost to predicted mathematics posttest score is lower by at least 50.6% at the O-type private schools as compared with the public schools. Moreover, the advantage of the private O-type schools over the public schools may be underestimated inasmuch as our cost estimate includes economic profit.

One reason why the private O-type schools are more cost-effective than the public schools is that they hire teachers at a lower cost. The average expenditures per teacher at the private O-type schools are close to 47% less than at the public schools. Another reason may be that the private schools are closed less often for public holidays, etc.

F-type Private Schools. With regard to the F-type schools, the conclusions are less clearcut. However, they are probably more cost-effective than the public schools. They spend 4.7% more per student than the public schools spend on salaries, but their advantage in terms of the predicted cognitive achievement of children is 76.3% more. In terms of the estimated full cost per predicted mathematics posttest score in Table 11, the private F-type schools also appear to be more cost-effective than do the public schools.

Table 11: Cost Per Predicted Points on Posttest Mathematics Test and Effect Size, by School Type, with Background Characteristics Held Constant and Selection Bias Controlled for

	Predicted Posttest Score [a]	Effect Size [b]	Cost per Student [c]	Cost per Point on Math Test	Cost per Standard Deviation Unit
Public 15%	9.79	-	323	33.0	-
5%	9.79	-	289	29.5	-
Private O-type	12.86	.89	209	16.3	234.8
Private F-type	17.26	2.16	472	27.4	218.5

a/ From Table 5a.

b/ Effect size is defined as the difference between the predicted private school mathematics score and the predicted public school mathematics score divided by the standard deviation of the public school scores; the measure is the standard deviation unit.

c/ Tuition and other fees reflect the long-run average cost per student in the private schools. For the public schools, the following formula is used: $C = X/(1 - N)$ where C = cost per student, X = salary expenditure per student and N = non-salary cost as a proportion of total cost.

F-type Versus O-type Private Schools. In comparison with the private O-type schools, the private F-type schools have a 70% higher cost to achievement ratio. A major reason for this higher ratio is much larger expenditures for salaries; private F-type schools spend 83.5% more per student for salaries than do the private O-type schools. The additional cost is associated with mathematics achievement scores that are 34.2% higher at the

F-type private schools than at the O-type private schools, other things being equal.[6]

The apparent advantage of the private O-type schools over the private F-type schools in terms of cost-effectiveness is, however, dependent on the metric of achievement. When the costs per point on the mathematics test are compared, the private O-type schools appear substantially more cost-effective than do the private F-type schools (as well as more cost-effective than the public schools). When the score advantage of both types of private schools is converted to standard deviation units, or effect sizes, the comparative advantage of the O-type private schools is reduced: students in the O-type private schools score less than one standard deviation higher than do students in the public schools, while students in the F-type private schools score over two standard deviations higher. The cost per standard deviation of achievement in both types of private schools is roughly equivalent.

We now turn to the next question: what is the value added of private education? A fundamental contribution of private schooling is filling market demand not satisfied by the public education system. Moreover, from the point of view of public finance, the private school system is important because it allows children to have a higher level of learning achievement than would be

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[6] It is intriguing to note, however, that relative to the F-type schools, parents sending their children to the O-type schools are paying only slightly more for each unit of extra learning achievement (gained over and above their children's predicted scores in a public school setting). In this regard, parents sending their children to the O-type schools pay RD$68. On the other hand, those with children in the F-type schools pay slightly less RD$63. This finding indicates that profits are higher for the O-type than the F-type schools, a situation that is not surprising given the differences in religious affiliation.

expected from a public school without adding to the financial burden of the government. As public schools are normally geared to the average child, private schools in a pluralistic society offer alternatives for parents who want more for their children.

CONCLUSIONS

The paper uses data from the Dominican Republic to extend the evidence on the relative cost and effectiveness of public and private schools. It also increases our understanding of how improvements in effectiveness and economic efficiency are being achieved by exploiting the opportunities afforded by several unique characteristics of the data set -- unlike in previous studies, the Dominican Republic survey contains information on two types of private schools. Furthermore, useful (albeit limited) information on costs, tuition and other fees were obtained. This information enabled us to understand the market for education a little better and to confront some of the prevailing myths about private education with real evidence.

Several conclusions are worth highlighting here. First, selectivity bias is important, and failure to deal with it effectively can lead to misleading conclusions. For example, when selection bias is not controlled for the estimates suggest the effectiveness of private schools is negligible. Our study, however, reveals that the selectivity bias disappears when peer group characteristics are included in the regression equation. This finding, if generalized to other situations, may provide a credible approach to the problem of selectivity in cases where it is not feasible to apply the Heckman procedure.

Second, when non-school factors are held constant and selectivity bias is corrected for, the conclusion is that students on average learn more in private than in public schools, a finding that confirms similar findings from other countries. The learning gains in both the elite F-type private schools and O-type private schools are considerable. This is an interesting result in that, while education experts are reasonably sure about the effectiveness of elite private schools, many have belittled the effectiveness of so-called low quality private learning institutions such as the O-type schools.

Third, the private schools are more cost-effective than the public schools. The evidence is particularly robust for the O-type schools: compared with the public schools, the cost per unit of predicted learning is lower for the O-type schools by at least 50% when background factors are held constant and selection bias is controlled for. But F-type and O-type schools are equally cost-effective.

The findings of this study underline an obvious lesson that the discussions on education have tended to ignore too often: be sure not to compare apples and oranges when comparing schools. Elite schools may be expensive, but they may also be delivering more; cheap private schools may be low quality but parents get what they pay for; and, finally, public schools may be free privately but may be costly socially. Given this lesson, we strongly suggest that, in the future, policy-oriented comparative research on learning achievement should be linked with data on costs, educational fees, socioeconomic background and peer group characteristics.

The final conclusion to be highlighted involves the process by which private schools generate value added. The results here show that the private school business generates increased economic efficiency by taking advantage of market demands that are not satisfied by the public school system. Private schools target particular segments of consumers and adopt suitable educational approaches. In this regard, they take advantage of the peer group effects. This conclusion is especially true for the F-type schools, whose learning gains over public schools are totally dependent on those effects. The relative cost-effectiveness advantage of the O-type schools, on the other hand, is only partially dependent on them.

REFERENCES

Bryk, A.S. and V.E. Lee. (1988) "Curriculum Tracking As Mediating the Social Distribution of High School Achievement." Sociology of Education, 61 (2): 78-94.

Coleman, J., T. Hoffer and S. Kilgore (1982). High School Achievement: Public, Catholic and Private Schools Compared. New York: Basic.

Cox, D., and E. Jimenez. (1987) "Private-Public Differences in Secondary School Performance: The Role of Selection Effects in Colombia and Tanzania." Education and Training Department, World Bank. Washington, D.C. Processed.

Heckman, J.J. (1979). Sample Selection Bias as Specification Error. Econometrica, 47: 153-61.

Jimenez, E., and B. Kugler. (1987) "The Earnings Impact of Training Duration in a Developing Country." Journal of Human Resources, 22 (2): 228-247.

Jimenez, E., M.E. Lockheed and N. Wattanawaha. (1988) "The Relative Efficiency of Private and Public Schools: The Case of Thailand." World Bank Economic Review, 2 (2): 139-64.

Jimenez, E., M.E. Lockheed and V. Paqueo. (1988). "The Relative Efficiency of Public Schools in Developing Countries." Education and Training Department, World Bank, Washington, D.C. Working Paper WPS 72.

Lee, L. (1979) "Unionism and Wage Rates: A Simultaneous Equations Model with Qualitative and Limited Dependent Variables." International Economic Review, 19 (2) 415-33.

Luna, E., and S. Gonzalez. (1986) The Underdevelopment of Mathematics Achievement: Comparison of Public and Private Schools in the Dominican Republic. Santiago; Dominican Republic: Centro de Investigaciones (UCMM).

Murnane, R. (1985) "Comparisons of Public and Private Schools: Lessons from the Uproar." Journal of Human Resources, 20: 263-67.

Willis, R.J. and S. Rosen (1979) "Education and Self-Selection." Journal of Political Economy, 87: S7-S36.

Appendix

The probability density functions for each of the options are:

(A1) $\Pr(I_i = 2) = \Pr(c < kY_i + w_i) = \Phi[(kY_i - c)/\sigma_\omega]$

(A2) $\Pr(I_i = 1) = \Pr(o < kY_i + \omega_i < c) = \Phi[(c\ kY_i)/\sigma_\omega] - \Phi[-kY_i/\sigma_\omega]$

(A3) $\Pr(I_i = 0) = \Pr(kY_i + \omega_i < 0) = 1 - \Phi[kY_i/\sigma_\omega]$.

If the $\Phi[.]$'s are standard normal c.d.f.'s, the system (A1) to (A3) is an ordered probit model which can be estimated by maximum likelihood. This is the first step in the estimation procedure.

The second step can be derived by observing that the expected value of achievement is:

(A4) $E(A_{if}) = b_f X_{if} + E(e_{if} | I_i = 2)$

(A5) $E(A_{io}) = b_o X_{io} + E(e_{io} | I_i = 1)$

(A6) $E(A_{ig}) = b_g X_{ig} + E(e_{ig} | I_i = 0)$.

The OLS model assumes that the last terms in (A4) - (A6) are equal to zero, since a normal distribution is assumed. When the distribution is truncated normal, this is not the case. However, if we assume that the (e_{ij}, ω_i), j = f,o,g, are jointly distributed with mean zero, we can use OLS on (A4) to (A6) with the addition of an appropriate selection term. This can be seen by manipulating the last terms:

(A7) $E(e_{if} | I_i = 2) = E(e_{if} | \omega_i > c - kY_i)$

$$= \sigma_{fw} \{\phi c - kY_i)/[1 - \Phi(c - kY_i)]\} = \sigma_{fw}\lambda_f,$$

(A8) $E(_{io} | I_i = 1) = E(e_{io} | -kY_i < \omega_i < c - kY_i)$

$$= \sigma_{ow} \{[\phi\ -kY_i) - \phi(c - kY_i)]/[\Phi(c - kY_i) - \Phi(-kY_i)]\}$$

$$= \sigma_{ow} \lambda_o,$$

(A9) $E(e_{ig} | I_i = 0) = E(e_{ig} | \omega_i < -kY_i)$

$$= -\sigma_{gw} \{\phi(-kY_i)/\Phi(-kY_i)\} = -\sigma_{gw}\lambda_g,$$

where σ_{jw}, j = f,o,g, is the correlation coefficient between ω_i and the error term of the achievement equation and the lambdas are (Mills) ratios of the originate of the standard normal at I_i to the probability of being in the sample. These ratios are computed from the first stage probit equation.

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