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EFFECTS OF PROJECT HEAD START, SUMMER 1965:

A SECOND LOOK AT THE EQUALITY OF

ECONOMIC OPPORTUNITY STUDY

by

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ABSTRACT

Among the many goals of Head Start, intervention in the deprived child's life to help his emotional and social development and to improve his cognitive skills has been the subject of most of the evaluation studies undertaken so far. Although the present analysis deals with the same topic, we hope its special contribution lies in two areas:

(1) in the appraisal of the Head Start summer program's educational and motivational effects, based on a nationwide sample of almost 70,000 first grade pupils--more than 10 per cent of whom had been Head Start participants--which was drawn from schools throughout the country in the early fall of 1965.

(2) in the assessment of the power of ex-post facto statistical control techniques as a partial substitute for laboratory-type experimental control.

Our objective in (1) above was accomplished by determining the average effect on a child's score on a mental ability test and a teacher's rating of his motivation produced by his participation in Head Start, while simultaneously controlling for other factors, such as age and Kindergarten attendance, that may have affected the scores.

The results fail to indicate that children benefitted from the Head Start experience consistently and without qualifications. However, they do show that substantial and statistically significant gains were achieved by the average black participant and by the average participant in schools densely populated with black pupils. For example, the estimates for the nonverbal part of the mental ability test demonstrate that in the case of participants in all-black classes, the increase in the educational achievement levels due to participation in the Head Start summer program is about 65 per cent of that due to Kindergarten attendance alone.

Therefore, even if it is evident from our analysis that Head Start is not accomplishing the type of goals we are concerned with for the white child or for the child in predominantly white communities, the beneficial effects mentioned above should caution the decision-maker against terminating the program and, in certain environments, even against any revisions in the existing program.

EFFECTS OF PROJECT HEAD START, SUMMER 1965

A SECOND LOOK AT THE EQUALITY OF ECONOMIC OPPORTUNITY STUDY

I Purpose of the Investigation

Project Head Start was initiated in the summer of 1965 as a step in the direction of combatting the cycle of poverty at an early age. Its goals show a concern for the total environment of the deprived preschool child, brought about by the assumption that a child cannot function optimally if his health or welfare is impaired. This study is concerned with the evaluation of how the cognitive and behavioral goals of Head Start have been accomplished; i.e. with how exposure to Head Start modifies some of the underprivileged children's skills and attitudes which will be basic for their further success in school. We have therefore tried to answer the question: To what extent do children who attended Head Start for a summer session differ in educational and behavioral readiness from comparable children who did not attend?

To answer this basic question it is necessary to have, first, some measure of the child's educational and behavioral readiness, and second, an independent variable standing for the child's exposure to Head Start. Assuming we have a test on which the child's score improves as his readiness for school increases and a qualitative variable referring to the child's participation in Head Start, we will seek to answer the basic question by testing the null hypothesis: The child's test score does not change with participation in Head Start as compared with no participation, independent of age, Kindergarten attendance, and other characteristics which may affect the score.

II Sources and Evaluation of Data

Our attempt to isolate Head Start effects relies on a sample of pupils, some of them Head Start participants, who were attending first grade in schools throughout the country after summer 1965. The data used in the analysis were gathered as a part of the national survey of the public schools carried out by the U.S. Office of Education, as directed by the Civil Rights Act of 1964, during the first weeks of classes in the fall of 1965.[1]

For each child, the following measures were available:

(1) Scores on a test battery derived from the Cooperative Inter-American Tests of General Ability. Part I provides an index of language ability; in it the pupil is asked to identify pictures corresponding to words spoken to him. Parts II and III contain exercises of the nonverbal type.

(2) Responses by the first grade teacher to a questionnaire inquiring about the child's demographic and ethnic traits, the socioeconomic characteristics of his home and family, his own educational background; and an assessment made by the teacher of the pupil's motivation and behavior in relation to learning activities.

(3) Responses to a questionnaire submitted to the principal, dealing with school curricular and extracurricular activities, physical facilities, socioeconomic characteristics of the neighborhood, and with his own education and experience.

Data for each pupil were classified according to whether the school was in a metropolitan area (after the Census designation of Standard Metropolitan Statistical Area) or in a nonmetropolitan county. This allowed us to match the above measures with information about the characteristics of population, income, education, civilian labor force, etc., referring to either of the two administrative units.[2] Such information was added to complement the data on school and home environment.

From the description of the available measures, it is clear that there are no data allowing "before-after" comparisons in the group that experienced Head Start. We have consequently to rely upon an examination of differences in performance between pupils exposed to contrasting experiences: those who had participated in Project Head Start and those who had not. If Head Start had been operated in an experimental manner, the association between the "treatment" (the exposure to Head Start) and any other characteristics of the pupils and schools would be zero. For example, there would be no correlation in the sample between attendance to Head Start and any measure of socioeconomic status.[3] But, as no experimental control groups were established and no randomization was involved in the selection process, we cannot test our null hypothesis simply by comparing the scores of Head Start participants against those of nonparticipants.

The lack of experimentality is present at two levels:

(i) at the community level, the Head Start program was introduced as the result of circumstances in the control of forces within the community itself. In this way, the organization of a Head Start center in one neighborhood rather than the other may have been due to greater initiative, social acceptability or political leverage on the part of that neighborhood, and not entirely to greater need. The implications for our analysis are that we cannot think of all children who took Head Start as coming from the same population as far as communities are concerned. If a controlled experiment had been set up, a list of eligible communities would have been put together on the basis of similar population characteristics, and Program Head Start would have been assigned to all of them; or, in the case of lack of sufficient resources, to some of them in a random fashion.

(ii) at the individual level, children within the category of economic poverty were admitted to Head Start through a combination of voluntary enrollment and wider recruitment measures to bring in the more reluctant families within the poor communities. However, not every Head Start participant had to be "poor" as long as the program was primarily reaching the poor within the neighborhood.[4] We have relied on this circumstance to conduct our ex-post facto analysis. Such analysis is

obviously constrained by the amount of relevant information contained in the body of data that is being analyzed. If one wishes to isolate the differential effect of Head Start program—as compared with no program—on poor children, and if *all* poor children had Head Start, no amount of statistical sophistication would be able to extract directly relevant evidence. Therefore, the fact that the program was not perfectly allocated to the poor (whatever our definition of poor) is crucial to our attempt to ferret out the appropriate comparisons.

The present study will accordingly proceed in three stages:

(a) The first stage will deal with an effort to overcome the problems presented by the lack of experimentality at level (i) above. The fact that communities were chosen for a Head Start program in neither a systematic nor a random manner implies that we cannot assume that they share certain characteristics (like educational facilities, percentage of poor families, per capita income, etc.) which are relevant when comparing pupils' performances among different communities. We attempt to correct for the selection bias by using average pupils, school and city or county variables.

(b) The second stage will deal with overcoming the problems presented by the lack of experimentality at level (ii) above. It was indicated above that comparing the performance of participants with that of non-participants by contrasting scores of the former against the latter would obviously be inadequate for the very reasons that led to the launching of a preschool program for deprived children in the first place. We attempt to correct for this selection bias by using individual pupil's variables.

(c) The third stage will deal with the evaluation of the effects of Head Start.

III First Stage

One way to compensate for the lack of an experimental control at this level is to devise a method by which we can measure the degree of similarity (or dissimilarity) of communities in those aspects which concern their likelihood of having a Head Start program; that is, we want to assign to each community a probability of belonging to the group of communities which would fall into the "Head Start-eligible" category. In view of the measures that are available to us, it seems reasonable to equate school with community, as here community has a connotation of neighborhood rather than of administrative unit. We will assign such probabilities or scores on the basis of relatively objective criteria like the average attributes of pupils and the characteristics of schools and of counties or Standard Metropolitan Statistical Areas (SMSA's) where schools are located.

Our aim in doing this is to attach these scores to the units (i.e., the individual pupils) in the second and third stages of our analysis, as a sort of control for this type of variation between communities--variation in the likelihood of being a "Head Start-eligible" school unit. Thus, two pupils with the same score would be considered as coming from communities with the same likelihood of being a "Head Start-eligible" community.

We can think of the problem in the following way. Let us assume that all the schools can be grouped into either of two populations:

(1) "Head Start-eligible" schools - Population P_1

(2) "Non-Head Start-eligible" schools - Population P_2

Then, given a set of measurements or explanatory variables on a school considered as a random observation, we would like to find a function of these explanatory variables whose higher values are associated with a greater likelihood of P_1 and whose lower values are associated with a greater likelihood of P_2. One such function follows from the statistical discrimination approach. In this approach, a dichotomous choice is defined for a certain population by identifying each member with one of two mutually exclusive responses, which in turn correspond to two separate populations. We intend to assign probabilities to the discriminant function in order to indicate the change in likelihood referred to above.

The computational method for arriving at the discriminant function is identical to that for estimating the linear regression between one variable (the dependent variable) and a set of explanatory variables, in the case where the dependent variable can only be 1 or 0, according to whether the explanatory variables come from P_1 or P_2, respectively.[5]

Our sample from Population P_1 consists of those schools in communities where Head Start was available; however, due to anonymity requirements we have no way of matching a list of schools surveyed with a list of communities where Head Start was offered. In view of this problem, Coleman[6] used the proportion of Head Start participants within a school as an indicator of the availability of the program, a procedure which we also followed. Considering that the usual size of first grade classes ranges from 25 to 40 pupils, and that the presence of two or more Head Start participants in each class indicates that Head Start was available in the area, we call a school "Head Start-eligible" if there are five per cent or more Head Start participants in first grade. After coding and editing the raw data on tapes and matching the different measures, we had a final list of 116 factors or explanatory variables for a sample of 1,144 schools. The next step was to run a number of regressions with the purpose of screening the statistically significant factors from the original 116 factors. Table 1 displays the sample means and standard deviations, the regression coefficients and their standard errors for the significant explanatory variables. In some cases, one explanatory variable comprises two or more dummy variables;[7] then, if at least one of the dummy variables in a block is significant, the whole block is included in the final regression.

In order to read Table 1, we must keep in mind that those variables appearing in the regression with positive (negative) coefficients exhibit a direct (inverse) linear relationship with an index of the likelihood of a school being "Head Start-eligible" in our sample. Thus, schools where the percentage of first grade pupils born in Mexico or Puerto Rico is higher are less likely to be members of Population P_1, while those with larger average size of first grade pupils' households are more likely to be members of P_1.

TABLE 1

FIRST STAGE REGRESSIONS -- SAMPLE STATISTICS, REGRESSION COEFFICIENTS AND THEIR STANDARD ERRORS[a]

Dependent Variable	Mean	St. Dev.	Coefficient[b]	St. Dev.
School is "Head Start-eligible"	.33	.47		
Independent or Explanatory Variable				
I. Average Pupils' Characteristics (First Grade)				
Country of birth (Standard is % born in U.S. or Canada)				
Mexico or Puerto Rico	.27	1.28	- .0200	.0102*
Other or unknown	6.90	14.44	- .0004	.0010
Average number of persons in households	6.09	1.06	.0330	.0154*
% speaking language different from English at home	4.98	13.45	.0026	.0010**
Fathers' professions (Standard is % unskilled workers)				
Officials, managers, owners or professionals	10.88	13.33	.0007	.0012
Technicians, salesmen or skilled workers	17.51	15.62	- .0010	.0011
Semi-skilled, service or protective workers	19.84	15.83	.0020	.0009*
Farmers or farm workers	11.05	20.55	- .0014	.0009
Unknown	19.76	20.25	.0033	.0010**
Percentage with mother present at home	93.37	14.99	.0025	.0011*
Percentage who are repeating first grade	12.12	11.89	.0036	.0011**
Percentage who usually come to school on time	91.93	13.74	.0021	.0010*
Average nonverbal test (Part II) right score	10.45	2.94	- .0280	.0053**

Table 1 continued

II. School Characteristics				
Kindergarten (Standard is none in school)				
Free	.39	.49	- .2494	.0388**
Tuition fees	.02	.15	- .0152	.0795
Number of days school was in session (64/65)	179.29	3.52	.0169	.0040**
Speech therapist (Standard is none in school)				
Four or more days a week	.01	.11	.3338	.0107**
Less than four days a week	.46	.50	.0087	.0324
Tracking (Standard is none in school)				
Of all students	.29	.45	.0638	.0272*
Of highest achieving students only	.03	.18	.1246	.0666
Of lowest achieving students only	.04	.19	- .0470	.0637
Principal's age	46.42	9.98	.0027	.0012*
Number of credits taken by principal beyond highest degree	14.08	12.79	.0038	.0011**
Principal's annual salary (dollars)	8,942.31	3,398.14	- .000011	.000004*
All pupils in particular area attend school	.55	.50	.0502	.0261*
Nonwhites in school (Standard is school has always been entirely nonwhite)				
No nonwhites in school	.29	.45	- .0897	.0354*
Nonwhites have entered within last 3 years	.13	.33	- .0810	.0446
Nonwhites have entered more than 3 years ago	.35	.48	- .0279	.0380
III. City or County Characteristics				
Region (Standard is South)				
New England and Mid-Atlantic	.19	.39	- .0492	.0507
Great Lakes	.12	.32	- .1077	.0568
Great Plains, Far West and Rocky Mountains	.20	.40	.0266	.0521

Table 1 continued

Percentage of urban residence	55.26	33.13	- .0002	.00008**
Percentage nonwhite (Standard is over 20)				
Less or equal to 5	.17	.38	.0415	.0429
Greater than 5, less or equal to 10	.17	.38	.0933	.0435**
Greater than 10, less or equal to 20	.26	.44	.0827	.0379*
Median income of families (dollars)	4,743.04	1,658.27	- .00004	.00002*
Percentage male in civilian labor force	67.89	4.65	.0068	.0037
Percentage in white collar occupations	36.02	9.75	.0102	.0027**
Percentage of owner-occupied units	61.09	10.14	.0031	.0014*
Retail sales / payroll	106.02	35.20	- .0013	.0005**
Percentage of food stores	21.72	6.92	.0065	.0026*
Constant term			-3.8864	.7710**

(a) The R^2 for the regression was .3081 and the standard error of estimate was .3973.

(b) One and two asterisks denote significance at the five per cent and one per cent level respectively.

Most of the discriminating factors in Group I produced coefficients with plausible signs; still some comments are necessary. The negative sign for "Percentage pupils born in Mexico or Puerto Rico" as opposed to the positive (and more likely) sign for "Percentage speaking language different from English at home" is probably reflecting the fact that the most recent inmigrants tend to live in less structured communities, and are less aware of the opportunities available in terms of Federal programs; this sounds especially true of the migrant workers, a high percentage of whom are Mexican.

In Group II, the signs of the coefficients for the block of dummy variables referring to the availability of a Kindergarten program in the school indicate that those neighborhoods where there is no Kindergarten are either more eager or more likely (or both) to get a Head Start program; the majority of them are in nonmetropolitan areas, especially in the nonmetropolitan South. The next block of dummy variables has at first glance puzzling signs on its coefficients: schools with speech therapists are more likely to be "Head Start-eligible" schools than those without. Any program for exceptional children is costly and requires professional staff which the smaller or poorer school systems are not expected to be able to provide. However, with increased Federal aid to education, more schools have been attempting to provide services which fit some of these needs. Also, since large proportions of ethnic minority groups are in the lower socioeconomic levels, one might expect proportionately more of the minority group children to need special attention to overcome educational disadvantages. With respect to "Tracking," Coleman's data[8] for elementary schools reveal that proportionately more minority group pupils than white pupils are enrolled in schools which carry some sort of grouping of children according to ability or achievement; the positive signs for these coefficients seem therefore credible. Moreover, by assuming quite plausibly that the experience and drive (approximated by age and post-graduate training, respectively) of the school's principal has an important part in obtaining a Head Start program for his school, the corresponding coefficients show the expected signs. All of the above seems to be indicating that the more progressive and aggressive

schools in the more deprived areas may be seeking out Head Start. However, the coefficients of the variables "Nonwhites in school" and "Percentage nonwhite" point to the need for a qualification of this statement: it is apparently the black schools which are pursuing such policy.

Advancing to the third and last group of independent variables--those referring to characteristics of the city or county where the school is located--the signs of their coefficients go mostly in an interpretable direction. According to an unpublished analysis for 1963 by the Census Bureau of the President's Task Force on the War on Poverty, 70 per cent of the poverty in America was in rural areas and small cities with populations under 50,000. Only 30 per cent of all poor families were concentrated in large cities.[9] Data collected by the Survey Research Center of the University of Michigan in 1960 show that the central cities of the twelve largest SMSA's in the U. S. contained only 11 per cent of all poor families.[10] Poverty-linked characteristics like inadequate educational opportunities and deficient medical care make the less urbanized areas a likely target for Head Start programs and thus justify the negative coefficient of "Percentage of urban residence." The presence of "Percentage of owner-occupied units" with a positive coefficient is reinforcing the above argument. On a U.S. basis, such percentage is highest in rural areas (71.2 per cent) and within rural areas, it is higher for farm (73.8 per cent) than for nonfarm units (70.3 per cent). The lowest percentage is found inside central cities in metropolitan areas (47.4 per cent).[11] Another interpretation for the sign of this variable runs along the same lines of our explanation for the negative sign of "Percentage pupils born in Mexico or Puerto Rico" (explanation above). We would consequently expect that a more stable community (here we would take "Percentage of owner-occupied units" as a proxy for stability) would be more likely to get Head Start established. From the positive coefficient of "Percentage in white collar occupations" it can be inferred that a larger proportion of white collar workers corresponds to the greater initiative and "know-how" necessary to bring Head Start into the community.

By using the discrimination approach we have tried to develop a quantitative picture of the characteristics which differentiate "Head Start-eligible" from "Non-Head Start-eligible" schools. We will thus account for the lack of randomness in the *selection* of communities where Head Start was offered when we come to the stage of evaluation of Head Start effects. To do this we have dichotomized the variable "Percentage Head Start participants in first grade" in the way previously described as a means of constructing the variable "School is Head Start-eligible" which is our dependent variable in Table 1. As part of this first stage we also tried a more conventional regression approach in which the problem is viewed as if not just two but many populations exist. Here the variable "Percentage Head Start participants in first grade" has been taken as a continuum, and we have estimated statistically its linear relationship to the group of variables relating to average pupils, school and city/county characteristics. An explanatory variable in such a relationship may be anticipated to affect both the probability of being a "Head Start-eligible" school (i.e., the probability of selection) and the proportions of Head Start participants in a school. In this way another aspect would be added to the comparison between similar schools, by capturing some of the factors which explain differences in such proportion. These factors may in their turn reflect the impact of variables which were not measured, such as the extent of the recruitment effort on the part of Head Start officials, the distribution of income in the neighborhood, and the support given to the program by local government officials.[12]

Table 2 displays the sample means and standard deviations, and the regression coefficients with their standard errors for the explanatory variables selected by using, as before, the criterion of statistical significance. These results should be read as indicating that those variables appearing in the regression with positive (negative) coefficients exhibit a direct (inverse) linear relationship with the proportion of Head Start participants in first grade in our sample.

In discussing Table 2 let us point out its similarity with Table 1 in terms of the variables screened by both regressions: most of the factors which are statistically significant in accounting for the

TABLE 2

FIRST STAGE REGRESSIONS--SAMPLE STATISTICS, REGRESSION COEFFICIENTS AND THEIR STANDARD ERRORS[a]

Dependent Variable	Mean	St. Dev.	Coefficient[b]	St. Dev.
Percentage Head Start participants in first grade	13.31	24.00		
Independent Variable				
I. Average Pupils' Characteristics (First Grade)				
Average age in years	6.07	.28	-11.8759	3.3781**
Average number of persons in households	6.09	1.06	1.6490	.8194*
Per cent speaking language other than English at home	4.98	13.45	.1675	.0486**
Per cent with well-constituted families	80.26	18.85	- .1918	.0503**
Fathers' professions (Standard is % unskilled workers)				
Officials, managers, owners or professionals	10.88	13.33	.1876	.0630**
Technicians, salesmen or skilled workers	17.51	15.62	.0611	.0548
Semi-skilled, service or protective workers	19.84	15.83	.1691	.0488**
Farmers or farm workers	11.05	20.55	.0002	.0435
Unknown	19.76	20.25	.0744	.0508
Percentage with mother present at home	93.37	14.99	.1738	.0564**
Percentage with car in the family	76.97	23.79	- .0938	.0414*
Percentage who attended summer program other than Head Start	46.75	38.40	- .0850	.0357*
Percentage who are repeating first grade	12.12	11.89	.1671	.0601**
Percentage who usually come to school on time	91.93	2.94	.1374	.0559*
Average nonverbal test (Part I) nonresponses	3.63	3.13	.7164	.3747
Average nonverbal test (Part II) right score	10.45	2.94	- .3877	.3961

Table 2 continued

Average nonverbal Test (Part II) wrong score	5.75	1.52	1.2779	.4982*
II. School Characteristics				
Percentage of rooms improvised for class instruction	27.26	17.67	.1154	.0356**
Kindergarten (Standard is none in school)				
Free	.39	.49	-9.3015	1.7459**
Tuition Fees	.02	.15	-4.3380	3.9825
School accreditation by state agency	.62	.48	2.9494	1.3069*
Number of grades in which standard achievement tests given	4.44	2.42	.6649	.2560**
Problem of racial or ethnic tensions (4 point scale)	.24	.54	-2.2335	1.1755
Percentage of white students (Standard is 0)				
Greater than 0, less or equal than 15	.08	.28	-9.2033	2.8096**
Greater than 15, less or equal to 75	.10	.30	-8.4506	2.7635**
Greater than 75, less or equal to 100	.54	.49	-9.5782	2. 107**
Nonwhites in school (Standard is school has always been entirely nonwhite)				
No nonwhites in school	.29	.45	-4.0975	1.5119**
Nonwhites entered within last 3 years	.13	.33	-1.5700	1.9810
III. City or County Characteristics				
Percentage of urban residence	55.26	33.13	- .1326	.3562**
Percentage nonwhite (Standard is greater than 20)				
Less or equal to 5	.17	.38	2.6799	2.1822
Greater than 5, less or equal to 10	.17	.38	6.9068	2.2489**
Greater than 10, less or equal to 20	.26	.44	6.1369	1.9125**
Percentage of families under $3,000	31.06	18.19	.1979	.0915*
Percentage who completed high school or more	35.46	10.92	.3356	.1145*

Table 2 continued

Percentage unemployed	5.68	2.61	.8151	.2836**
Percentage of owner-occupied units	61.09	10.14	.3103	.0694**
Retail sales / payroll	106.02	35.20	- .0761	.0249**
Percentage of food stores	21.72	6.92	.7915	.1308**
Constant term			-82.4801	45.6250

(a) The R^2 for the regression was .3534 and the standard error of estimate was 20.0711.

(b) One and two asterisks denote significance at the five per cent and one per cent level respectively.

establishment of a Head Start program in a community are also statistically significant in accounting for the proportion of first graders who participated in such programs within each school. This result is of course not surprising as the two dependent variables could be considered proxies for each other. Consequently, in commenting on the results of Table 2 we will restrict our remarks to those factors which were *not* present in Table 1.

The signs of the coefficients for the variables in Group I are reasonable. The negative sign for "Average age in years," given that the availability of Kindergarten is accounted for, can be interpreted as meaning that in districts where Kindergarten extends for more than one year or where there is nursery school and therefore children enter first grade at a later age, a lower participation in Head Start is likely. The coefficient for "Percentage of well-constituted families" is negative as expected. Such families include those in which either both real parents are present, or a combination of one real and one stepparent is present, the standard of comparison being the percentage of pupils in single-headed families. In our sample, the mean percentage of pupils in this category is 20 per cent; most of this is accounted for by female-headed families. Data for 1963[13] reveal that 26 per cent of all *poor* families (defined as those families with an income below $3,000) are female-headed families, while female-headed families constitute only 10 per cent of the total number of families in the U.S. The incidence of poverty among these families is even more pronounced among blacks: almost four of every five black female-headed families were in poverty compared to somewhat more than half of the white.[14] "Percentage of well-constituted families" is in effect playing the role of a proxy for socioeconomic status and its negative sign is an indication of how successful Head Start was in reaching the more deprived children. Another indication of socioeconomic status, "Percentage with car in the family," also has the expected negative sign.

In Group II, the block of dummy variables referring to availability of a Kindergarten program in the school shows up again very dominantly. All three dummy variables regarding the school racial composition are significant and have large coefficients. Their negative signs reflect

again the fact that blacks, because of their poorer backgrounds, are a logical target for Head Start programs, and that all-black communities are more easily saturated with it than others. Alternatively, these coefficients might be pointing out the use by some local officers of one discrimination method frequently used to evade the civil rights requirement of the program: refraining from using any white schools for Head Start, even where there are substantial numbers of eligible white children.[15]

In Group III, "Percentage of families under $3,000" and "Percentage unemployed" exhibit coefficients in the interpretable direction. Given the presence of these two variables, "Percentage who completed high school or more" is operating in the same way as "Percentage white collar workers" was in the previous formulation of Table 1. Controlling for the number of families in poverty, it is expected that those communities with a higher proportion of educated members will be more likely to establish and operate a wider reaching Head Start program.

Next we wish to compare the results of both formulations in order to see how much overlapping there is between them. From Table 1 we computed the discriminant score for each school in the sample, found by multiplying the value of each explanatory variable for that particular school times its regression coefficient, and adding all of these products together with the constant term. From Table 2 we computed the predicted value for the percentage of Head Start participants in each school of the sample, found in the same way. A cross-tabulation of the discriminant scores and the predicted values (Table 3) shows that they are not perfect substitutes for each other, and thus both formulations were carried over to further stages of the study.

In order to assign probabilities to the discriminant function, we separated the sample into groups having similar discriminant scores and then observed the proportion in each group belonging to Population P_1. Figure 1 presents the scatter diagram for these proportions and the non-negative S-shaped curve fitting them. This amounts to obtaining the probability that a school with a certain discriminant score is a "Head Start-eligible" school according to our definition.

TABLE 3

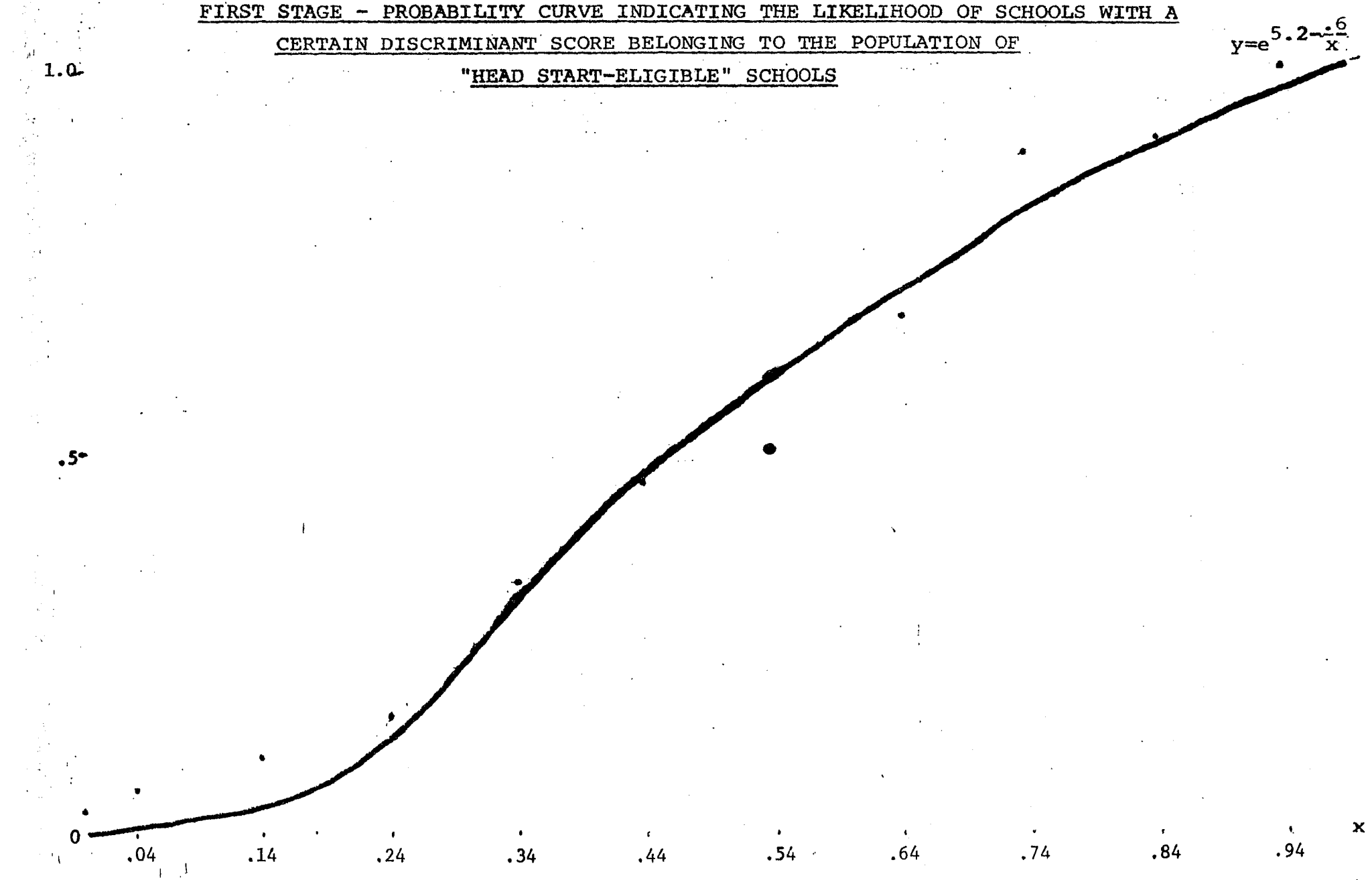
FIRST STAGE--CROSS-TABULATION OF DISCRIMINANT SCORES AND PREDICTED VALUES

SIMPLE FREQUENCY

"Predicted % HS Part." / "Prob. HS Sch."	-100.00-0.00	0.00-8.90	8.90-20.90	20.90-30.90	30.90-40.90	40.90-50.90	50.90-60.90	60.90-70.90	Total
-10.00-0.00	86	26	5	1	-	-	-	-	118
0.00-0.09	49	54	7	-	-	-	-	-	110
0.09-0.19	41	79	25	1	-	-	-	-	146
0.19-0.29	30	83	44	10	1	-	-	-	168
0.29-0.39	8	66	60	26	3	-	-	-	163
0.39-0.49	1	29	53	31	15	2	-	-	131
0.49-0.59	-	8	43	40	25	4	2	-	122
0.59-0.69	-	5	13	31	27	11	1	1	89
0.69-0.79	-	1	4	15	24	8	2	-	54
0.79-0.89	-	-	2	6	7	9	-	-	24
0.89-0.99	-	-	-	2	4	4	-	-	10
0.99-1.09	-	-	-	1	3	2	-	-	6
1.09-1.99	-	-	-	-	-	1	2	-	3
TOTAL	215	351	256	164	109	41	7	1	1,144

FIGURE 1

FIRST STAGE - PROBABILITY CURVE INDICATING THE LIKELIHOOD OF SCHOOLS WITH A CERTAIN DISCRIMINANT SCORE BELONGING TO THE POPULATION OF "HEAD START-ELIGIBLE" SCHOOLS



In the case of the continuous dependent variable, we separated the sample into groups having similar predicted values for the percentage of Head Start participants in each school and calculated the means of the dependent variable for each of these intervals. These points were also fitted by an S-shaped non-negative curve (Figure 2). Thus we obtained a continuous function relating the average percentage of participants to the explanatory variables via the predicted values.

Both modified functions, which we shall call "Predicted Head Start school" and "Predicted percentage Head Start participants," will be carried over to the second and third stages of our analysis.

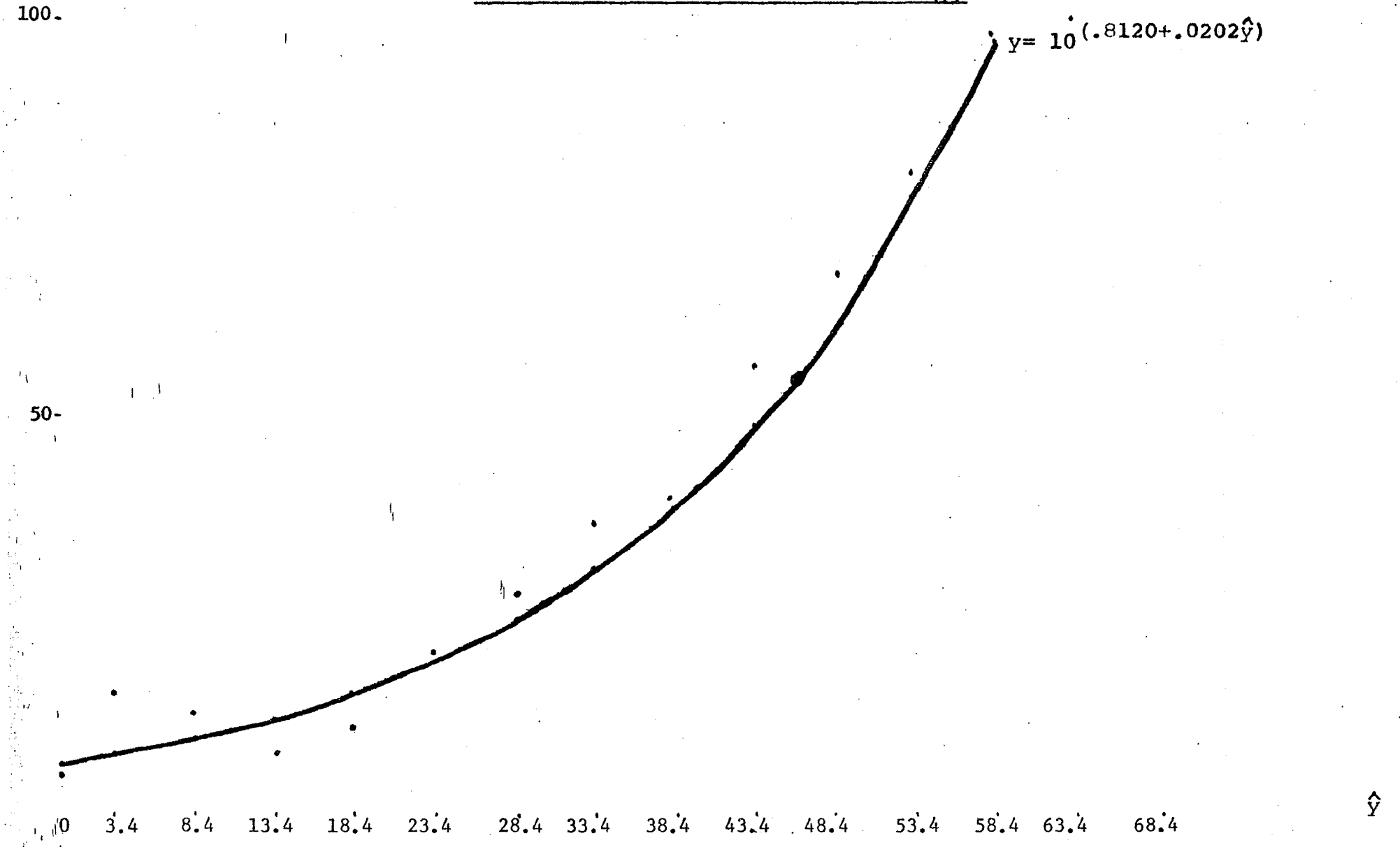
IV Second Stage

At this point we are in a position to control for the lack of randomness in the selection of communities which offered Head Start programs and for the factors which allowed some programs to achieve more out-reach than others. We have done this by achieving two measures of comparability of schools on such grounds.

It was stated above that within each community, participation in Head Start was not the result of a planned experiment. Controlling for socioeconomic variables such as parents' education and occupation is a step in the right direction. However, the present data suffer from various disadvantages in the area of socioeconomic status of the pupil's family. The nonresponse rates for mother's and father's education are about 50 per cent, so we decided to exclude these variables from the analysis. Father's occupation does not show such high nonresponse rates, but the question itself is poorly conceived, with dissimilar types of occupations lumped together (e.g., semi-skilled, clerical, service and protective workers constitute one category). There is no measure of income; the rest of the variables associated with socioeconomic characteristics deal with ownership of certain household items, some of which are so widespread in their use that they do not offer any discriminatory power at all. Hence, under these circumstances, controlling for the available socioeconomic variables would still mean that the group

FIGURE 2

FIRST STAGE - "AVERAGE PERCENTAGE OF HEAD START PARTICIPANTS" CURVE AS A FUNCTION OF THE PREDICTED VALUES ($\hat{y}$)



of Head Start participants and the group of nonparticipants would probably remain unmatched on several crucial characteristics. Two kinds of bias, each in the opposite direction, could very well arise. If the program has succeeded in reaching the neediest families, the bias is likely to work against differences favoring the group of participants; the remaining children would come from more advantaged situations, a fact not necessarily disclosed by the socioeconomic variables employed. On the other hand, in those situations in which the program has failed to make a special effort to reach the poorest families, the bias will probably operate in the opposite direction, since the families who do succeed in getting their children admitted to Head Start are likely to be more highly motivated, more enterprising and more knowledgeable about how to get things done in their community.

In view of these considerations, it is useful to screen those factors which account for participation in Head Start, before proceeding to the actual evaluation of Head Start effects. The same procedure used in the first stage to identify groups of "similar" schools is suitable here; i.e., we will seek to identify groups of children with comparable likelihood of having attended Head Start programs on the basis of multidimensional measurements on those children, obviously excluding all measurements on post-Head Start variables.

The pupils' data involved in this stage consist of 68,884 observations. The gain resulting from using the full set of observations at this point was not worth the cost of extra computing time involved, so we decided to take a 10 per cent systematic random sample of the tape.

We are now dealing with individual pupils who we assume can be grouped into either of two populations:

(1) "Head Start-eligible" pupils - Population Q_1

(2) "Non-Head Start-eligible" pupils - Population Q_2

As before, given a set of measurements or explanatory variables on a pupil taken as a random observation, we will arrive at a function of these explanatory variables whose higher values are associated with a greater likelihood of Q_1 and whose lower values are associated with a greater likelihood of Q_2. Computationally, we have a linear regression between

a dependent variable and a set of explanatory or independent variables, where the former can only be 1 or 0, according to whether the latter come from Q_1 or Q_2, respectively.[16]

Our initial list of 47 explanatory variables includes "Predicted Head Start school" and "Predicted percentage Head Start participants" introduced as a control for variations in school and community environment. Table 4 shows the sample means and standard deviations, and the regression coefficients with their standard errors, respectively, for the independent variables chosen for the final formulation on the criterion of statistical significance. From the table we can see that black children are more likely to have been participants than Caucasians; so are Mexican-Americans, children who speak a language other than English at home, pupils whose mother (or acting mother) is present, who did not attend Kindergarten and whose family gets a newspaper daily. On the other hand, children of age seven or older, coming from female-headed families, with telephone and vacuum cleaner at home, and who are repeating first grade are less likely to belong to Population Q_1. The variables in Group II refer mainly to the child's peer group background. Our control variables "Predicted percentage Head Start participants" and "Predicted Head Start school" show the expected signs, i.e., they are directly related to the likelihood of being a "Head Start-eligible" pupil.

In order to assign probabilities to the discriminant scores, we computed these from the coefficients in Table 4 following the same procedure outlined above. Next we grouped our sample of 6,885 pupils into groups having similar scores and observed the proportion in each group belonging to Population Q_1. Thus we obtained the probability that a pupil with a certain discriminant score is "Head Start-eligible" according to our definition.

Figure 3 shows the scatter diagram for the proportions and the non-negative S-shaped curve fitting them. We call this the "Predicted Head Start participant" curve and carry the variable on to our third and last stage.

TABLE 4

SECOND STAGE REGRESSIONS -- SAMPLE STATISTICS, REGRESSION COEFFICIENTS AND THEIR STANDARD ERRORS [a]

Dependent Variable [c]	Mean	Coefficient [b]	St. Dev.
Pupil is "Head Start-eligible"	.12		
I. First Grade Pupil's Demographic Characteristics [c]			
Age (Standard is 6 years old)			
5 years old or younger	.09	.0010	.0124
7 years old	.11	-.0672	.0140**
8 years old	.01	-.1619	.0371**
9 years old or older	.003	-.1722	.0651**
Race (Standard is Caucasian)			
Black	.37	.0722	.0101**
American Indian	.02	.0999	.0277**
Oriental	.005	.0550	.0506
Other than above	.02	-.0263	.0293
Mexican American	.02	.0621	.0273*
Family constitution (Standard is disorganized family)			
Well-constituted	.82	-.0281	.0152
Female-headed	.10	-.0593	.0184**
Pupil speaks language other than English at home	.05	.0651	.0183**
Father's type of profession (Standard is manual worker)			
White collar worker	.17	-.0120	.0107
Farm worker	.06	-.0626	.0173**
Mother present	.94	.0446	.0172**
Telephone at home	.64	-.0242	.0091**
Vacuum cleaner at home	.55	-.0227	.0095*

Table 4 continued

Daily newspaper at home	.61	.0249	.0084**
Pupil did not attend Kindergarten	.39	.0321	.0085**
Pupil attended nursery school	.09	.0351	.0130**
Pupil is repeating first grade	.12	-.0356	.0137**

II. First Grade Pupil's Environmental Characteristics	Mean	St. Dev.	Coefficient(b)	St. Dev.
Number of pupils in class	91.13	53.61	-.0002	.000
% pupils whose fathers are technicians or professionals	7.45	8.90	.0016	.0005**
% pupils whose fathers are farm owners or managers	2.22	6.29	.0014	.0006*
% pupils whose fathers are semi-skilled workers	20.84	13.18	.0008	.0003**
% pupils whose fathers are skilled workers or foremen	14.39	13.72	.0009	.0003**
% pupils whose fathers are farm workers	3.99	10.00	.0023	.0004**
Predicted percentage Head Start participants	14.73	11.90	.0057	.0004**
Predicted Head Start school	31.19	27.83	.0020	.0002**
Constant term			-.0908	.0200**

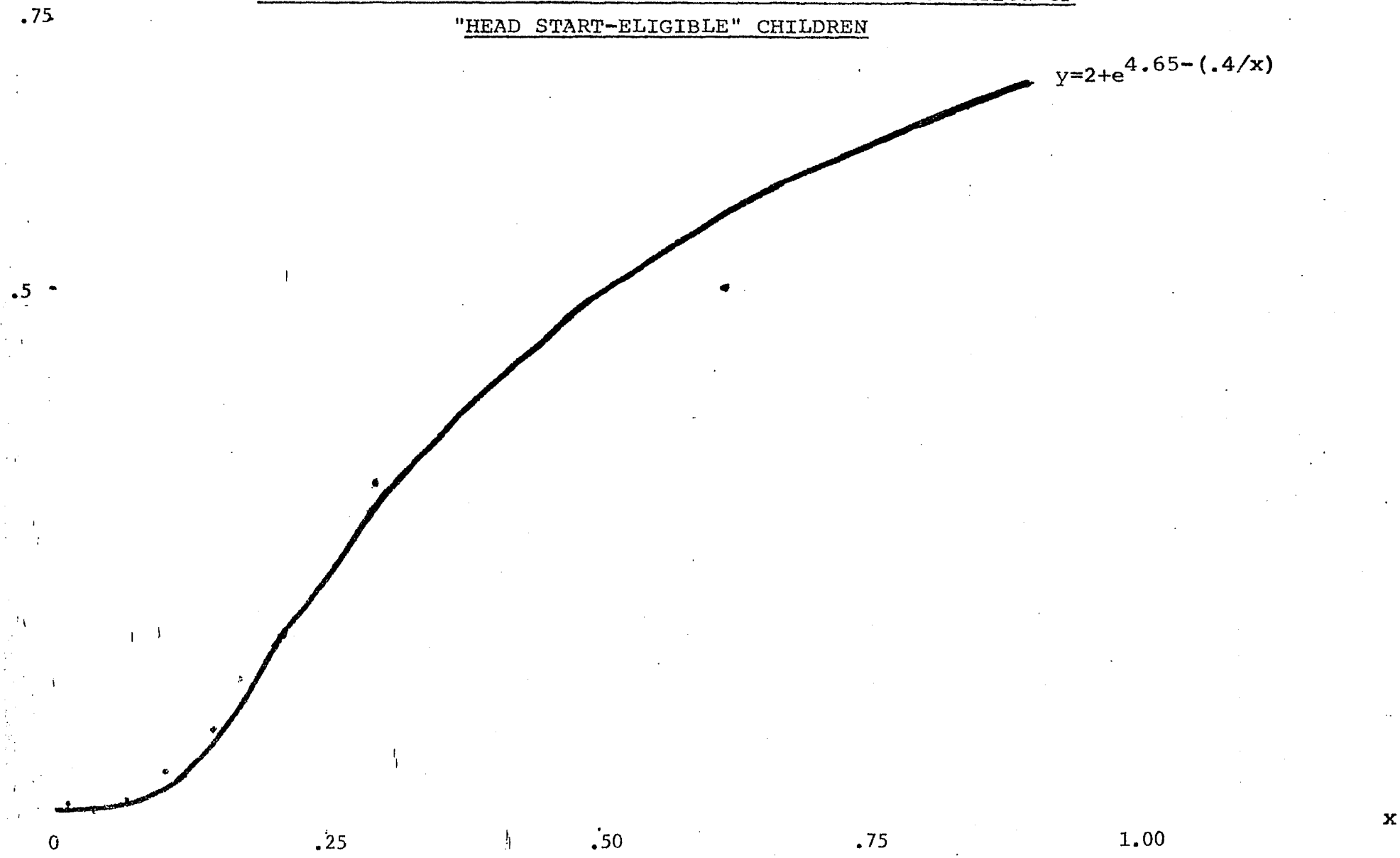
(a) The R^2 for the regression was .2074 and the standard error of estimate was .2917.

(b) One and two asterisks denote significance at the five per cent and one per cent level respectively.

(c) These variables are dummy variables in which the alternative would, in combination with the variable, represent a mutually exhaustive set.

FIGURE 3

SECOND STAGE - PROBABILITY CURVE INDICATING THE LIKELIHOOD OF CHILDREN WITH A CERTAIN DISCRIMINANT SCORE BELONGING TO THE POPULATION OF "HEAD START-ELIGIBLE" CHILDREN



V Third Stage

We are now ready to answer the basic question of the investigation posed in Section I above by testing the null hypothesis that Head Start did not have any effects on its participants. Our measures of the child's educational readiness were described in Section II above. As for our measures of behavioral readiness, they are derived from the answers given by the teacher to a number of questions on the pupil's behavior and motivation, which were most likely interpreted in different fashion by the different teachers involved, so that each of these variables measures differences in behavior and motivation as perceived by the teacher. We ran a number of exploratory regressions on these variables and on combinations of them; our explanatory variables appeared relevant only in the case of "Punctuality" and "Good speaking vocabulary," included in our results. It should be stressed that these verbal measures usually fail to measure access of the child to the adequate word, which is the linguist's definition for "Good speaking vocabulary." Rather, what teachers typically mean by it is that the pupil does not seem at a loss for words, seems to make apt choices, and seems to have variety in his choices. Given the binary nature of the response in our data, the distinction between "Good speaking vocabulary" or not probably follows along the lines of an "eager-reticent" distinction.[17]

We used a linear model to relate achievement to pupil participation in Head Start, as contrasted with participation in another summer program or in none, controlling at the same time for other variables which would affect the score. As a description of the learning process, such formulation leaves much to be desired. But despite its conceptual shortcomings, the model chosen does allow--via the regression coefficients--an estimate of the unique effect on educational motivation associated with attendance in a Head Start program and in any other summer program as compared with staying at home, and holding the other influences constant.

Our control variables are Kindergarten attendance, sex, age, race, percentage black pupils in class, and the variables constructed in the first and second stages. For each of the dependent variables we tried three formulations:

(1) General. Besides testing our null hypothesis, we explored several possible interaction effects of the Head Start program, to assess if Head Start is differentially effective on children of a certain age, sex, race, and on children with a certain percentage black pupils in the class. Appendix Table A-1 shows the regression coefficients and standard deviations of the independent variables and interaction terms for each of our dependent variables. When significant, interactions of sex (boy) and Head Start are negatively related to achievement or motivation, while interactions of Head Start and age six are positive, suggesting this is the optimal age for the "treatment" to take place. Interactions of Head Start and black, and Head Start and percentage black turned out to be significant most of the time; formulations (2) and (3) below deal with these characteristics in greater depth. As for our null hypothesis, the coefficients of "Attended Head Start" do not conform to a definite pattern.

(2) Independent variable "race" used as a classification device. Here we have effectively broken our sample into two subsamples on the basis of the pupil being black or not. Appendix Table A-2 displays the coefficients and their standard deviations obtained by regressing several measures of school readiness, for blacks and non-blacks, on the dummy variables "Attended Head Start" and "Attended other summer program," while controlling for Kindergarten attendance, sex, age, percentage of black pupils in class, the pupil's likelihood of having been a Head Start participant and the likelihood of his school having offered a Head Start program.[18] According to our results, the effect of Head Start is positive and significant for black children on all the measures of ability and motivation; we should therefore reject our null hypothesis when black participants are concerned. This conclusion cannot be upheld for non-blacks; we can see from Appendix Table A-2 that the effect is significant and negative for our objective measures, not significant for "Good speaking vocabulary" and significant and positive for "Punctuality." Coefficients for the control variables usually have the expected direction, with boys scoring lower than girls, and older children scoring higher than younger ones.

(3) Independent variable "Percentage black pupils in class" used as a classification device. This appears to us as the most interesting formulation. The percentage of black pupils in a school provides a fairly accurate indication of several aspects of a child's environment; thus, the possibility of relating the effect of Head Start to this dimension gives us a convenient perspective from which to appraise the program's failure or success in achieving its goals, and from which to derive useful policy implications. Our model is again a linear regression model which relates each of our test scores with the explanatory variables, for different values of "Percentage black pupils in the class." This is equivalent to assuming that every explanatory variable behaves differently in relation to the dependent variable, for different racial compositions in the schools.[19] From the regression coefficients exhibited in Appendix Table A-3 we have calculated the average effects of Head Start, other summer program, and Kindergarten, on first grade pupils in classes with different percentages of black children, for each of our dependent variables. These effects are shown in Tables 5 to 9. For amplification, let us look at Table 5: The average effect of Head Start on a pupil's verbal test wrong score in a class with 0 per cent black students is .1156. This figure is the coefficient of the variable "Attended Head Start" in Appendix Table A-3.

The average effect of "Attended other summer program" on a pupil in a class with 100 per cent black students is -.1876, obtained by adding the relevant coefficients as follows, all other variables held constant:

"Attended other summer program"	-.0990
"Per cent black pupils" x "Attended summer program"	-.000886 x 100
	-.1876

While the effects of Head Start and "Other summer program" are mutually exclusive, those of Kindergarten are additive to any of them; thus the combined effect of having attended Kindergarten and Head Start on a pupil in an all-black school involves an average loss of

$$-.0398 + .0748 = .0350$$

points in his verbal test wrong score.

TABLE 5

AVERAGE EFFECTS OF HEAD START, OTHER SUMMER PROGRAM AND KINDERGARTEN ON FIRST GRADE PUPILS IN CLASSES WITH DIFFERENT PER CENT BLACK CHILDREN

PERFORMANCE MEASURED BY VERBAL TEST WRONG SCORE

Mean: 5.8084

Standard Deviation: 2.8671

Type of Program	Percentage black				
	0	10	50	90	100
HEAD START	.1156 (.0632)	.1001 (.0566)	.0379 (.0384)	- .0242 (.0443)	- .0398 (.0494)
SUMMER PROGRAM	-.0990* (.0439)	-.1079** (.0394)	-.1434** (.0339)	-.1788** (.0500)	-.1876** (.0562)
KINDERGARTEN	-.5368** (.0331)	-.4756** (.0297)	-.2308** (.0265)	.0140 (.0398)	.0748 (.0444)

Note: One and two asterisks denote significance at five per cent and one per cent respectively.

Figure between brackets is standard deviation of effect.

With the exception of "Verbal test wrong score" and "Punctuality," Head Start effects show the same pattern for all the dependent variables: the effect is significant and negatively related to ability for all-white schools, and significant and positively related to ability for all-black schools, with the turning point at 50 per cent black in the case of the most favorable result for Head Start ("Good speaking vocabulary"). The results for "Verbal test wrong score"[20] show the same trend, but they are never significant. This variable also shows an impact of "Other summer program" different from the variables in Tables 6 - 9; such programs appear to be highly effective for all pupils in reducing their wrong score for this test; their effect is also positively related to "Good speaking vocabulary," and significantly so for higher percentages of black pupils.

Our control variables standing for age, sex and race are generally significant and related to the dependent variables in the expected direction: where the objective tests are concerned, the effect on the score of the pupil seven years or older is consistently higher than that arising from his previous educational experience, while the effect of his being six years old is of comparable magnitude with the latter. The indices designed to control for lack of randomness in the selection of communities and participants turn out to be significant most of the time. "Predicted Head Start school" displays a consistent pattern for every dependent variable, taking a negative sign for the whole range of racial composition in the school, with larger coefficients for classes more heavily populated with blacks. "Predicted percentage Head Start participants" is directly related to our measures of ability for pupils in all-white schools, and negatively related to them for pupils in all-black schools. Having controlled for Head Start being offered in a community, we expect higher percentages of Head Start participants to be associated with more deprived areas and hence with lower scores. This is true for all-black schools, but not for all-white schools. Statistics on Head Start indicate that, especially in its beginnings, the number of non-poor children in the program was in excess of the 10 per cent allowance. If we assume that these higher proportions of non-poor children were heavily concentrated in all-white areas, we would have

TABLE 6

AVERAGE EFFECTS OF HEAD START, OTHER SUMMER PROGRAM AND KINDERGARTEN ON FIRST GRADE PUPILS IN CLASSES WITH DIFFERENT PER CENT BLACK CHILDREN

PERFORMANCE MEASURED BY NONVERBAL TEST TOTAL RIGHT SCORE

Mean: 21.89

Standard Deviation: 9.79

Type of Program	Percentage black				
	0	10	50	90	100
HEAD START	-1.16** (.19)	- .90** ((.17)	.15 (.12)	1.20** (.14)	1.46** (.15)
SUMMER PROGRAM	- .07 (.14)	- .04 (.12)	.01 (.10)	.17 (.15)	.19 (.17)
KINDERGARTEN	2.40** (.10)	2.39** (.09)	2.36** (.08)	2.32** (.12)	2.31** (.14)

Note: One and two asterisks denote significance at five per cent and one per cent respectively.

Figure between brackets is standard deviation of effect.

TABLE 7

AVERAGE EFFECTS OF HEAD START, OTHER SUMMER PROGRAM AND KINDERGARTEN ON FIRST GRADE PUPILS IN CLASSES WITH DIFFERENT PER CENT BLACK CHILDREN

PERFORMANCE MEASURED BY NONVERBAL TEST TOTAL RESPONSE

Mean: 32.28

Standard Deviation: 10.47

Type of Program	Percentage black				
	0	10	50	90	100
HEAD START	-1.06** (.22)	- .81** (.20)	.19 (.13)	1.20** (.15)	1.45** (.17)
SUMMER PROGRAM	- .01 (.15)	- .03 (.13)	- .10 (.11)	- .17 (.17)	- .19 (.19)
KINDERGARTEN	.89** (.11)	1.08** (.10)	1.83** (.09)	2.58** (.13)	2.77** (.15)

Note: One and two asterisks denote significance at five per cent and one per cent respectively.

Figure between brackets is standard deviation of effect.

TABLE 8

AVERAGE EFFECTS OF HEAD START, OTHER SUMMER PROGRAM AND KINDERGARTEN ON FIRST GRADE PUPILS IN CLASSES WITH DIFFERENT PER CENT BLACK CHILDREN

PERFORMANCE MEASURED BY SPEAKING VOCABULARY[a]

Mean: .7504

Standard Deviation: .4328

Type of Program	Percentage black				
	0	10	50	90	100
HEAD START	-.0296** (.0095)	-.0198* (.0085)	.0194** (.0058)	.0586** (.0067)	.0686** (.0074)
SUMMER PROGRAM	.0019 (.0066)	.0052 (.0060)	.0184** (.0051)	.0316** (.0076)	.0356** (.0085)
KINDERGARTEN	.0732** (.0050)	.0742** (.0045)	.0782** (.0040)	.0822** (.0060)	.0832** (.0067)

Note: One and two asterisks denote significance at five per cent and one per cent respectively.

Figure between brackets is standard deviation of effect.

[a]: This is a binary variable derived from teacher's response to question "Does pupil usually have a good speaking vocabulary?", and coded 1 if the response was Yes, 0 otherwise.

TABLE 9

AVERAGE EFFECTS OF HEAD START, OTHER SUMMER PROGRAM AND KINDERGARTEN ON FIRST GRADE PUPILS IN CLASSES WITH DIFFERENT PER CENT BLACK CHILDREN

PERFORMANCE MEASURED BY PUNCTUALITY[(a)]

Mean: .9228

Standard Deviation: .2669

Type of Program	Percentage black				
	0	10	50	90	100
HEAD START	.0078 (.0060)	.0089 (.0054)	.0133** (.0036)	.0177** (.0041)	.0185** (.0046)
SUMMER PROGRAM	-.0010 (.0041)	-.0015 (.0037)	-.0035 (.0032)	-.0055 (.0047)	-.0065 (.0053)
KINDERGARTEN	-.0144** (.0031)	-.0148** (.0028)	-.0164** (.0025)	-.0180** (.0037)	-.0185** (.0042)

Note: One and two asterisks denote significance at five per cent and one per cent respectively.

Figure between brackets is standard deviation of effect.

(a): This is a binary variable derived from teacher's response to question "Does pupil usually come to school on time?", and coded 1 if the response was Yes, 0 otherwise.

an explanation for the direct relationship between "Predicted percentage Head Start participants" and achievement in schools within such areas. Finally, "Predicted Head Start participants" does not really conform to a pattern for all the variables, and is not always significant, due to the fact that race appears both as a control variable and as a strong component of this index.

In analyzing our results, the first question that comes to mind relates to the significant and negative effect on ability that Head Start is having on a segment of the population. Assuming that we have properly controlled for all the variables which would affect the score, especially for socioeconomic status, *such negative effect would imply that Head Start replaced something that was more valuable in terms of the child's educational and motivational abilities.* Some ways in which this situation could have come about are:

(i) through differences in the content of Head Start programs. If such differences were systematically associated with differerences in ethnic composition of the communities, our results would indicate which type of curriculum is more successful.

(ii) through differences in the characteristics of the staff for the program. Some observers have reported the existence of a higher level of enthusiasm among staff members in predominantly black communities.

(iii) through differences in the quality and stimulation provided by the home environment. If (i) and (ii) above are not plausible, the conclusion according to our data is that children in mainly white neighborhoods would have fared better in the tests had they stayed at home during the summer instead of attending Head Start.

An alternative explanation is that our ex-post statistical control techniques were not successful in isolating the impact of Head Start from that of the other variables affecting the scores. If we take socioeconomic status, for example, we have already mentioned that our data does not include income of the pupil's family, and that information on father's education was discarded because of high rates of nonresponse; we also commented briefly on the crudity of our SES measure. However,

given the size of our sample and the apparent relevance of the variables we construct to provide more adequate control of selection bias, we feel that the marginal or incremental effect of Head Start has been quite well approximated in this study.

VI Conclusion

According to the estimations in Tables 5 to 9, the only dependent variable on which the impact of Head Start appears to be of a non-controversial nature is our measure of behavior or motivation, "Punctuality." Although not effective for children in predominantly white schools, the impact is never negative, while we do get a negative effect for summer program and Kindergarten attendance. There has been at least one other study reporting the same finding, i.e., that Head Start pupils show significant gains in regularized school attendance.[21] As far as our other non-objective measure of ability or readiness is concerned, "Good speaking vocabulary" behaves similarly to the objective measures, except for the fact that "Attended other summer program" never shows any negative effects on it, and that in schools for all-black pupils, the gain from Head Start is about 80 per cent of the gain from Kindergarten.

Because of their nature, it is obvious that we should place greater emphasis on the effects of Head Start as measured by the objective tests. We are aware that these tests require a body of assumptions as to their validity that may not be justified here. Hence, our study just assumes that these measures are of use to us, without going into their appraisal and evaluation which seems to be the task of the educator and the child development specialist.

It has been hypothesized that Head Start children will prove they are more highly motivated by attempting to answer more questions in a test situation, even if they do not answer them correctly. We used the dependent variable "Nonverbal test total response" as a proxy for "trying," but found no evidence to sustain such hypothesis: the Head Start effects for this variable follow the same pattern as for the "Nonverbal test total right score."

We did not explore the relationship between the combination of being black, a Head Start participant and a member of a class with a certain percentage black, and achievement. But our analysis does allow us to establish the nature of the association between our measure of ability and the interaction "Percentage black pupils in class" x "Black." Such association is consistently direct and significant, after controlling for the pupil's demographic and ethnic characteristics (sex, age, race), his educational experience (summer programs and Kindergarten attendance), and his background factors ("Predicted Head Start participant," "Predicted Head Start school" and "Predicted percentage Head Start participants"). One of the more widely discussed inferences drawn from the Coleman Report (and about which the report is not categorical) refers to a positive effect of integration on the achievement of black pupils.[22] In an appraisal of this report, Bowles and Levin contend that the correlation between proportion white and achievement of black pupils is ". . . likely due, at least in part, to the fact that the proportion white in a school is a measure of the otherwise inadequately controlled social background of the Negro student."[23]

Our own results cannot be contrasted with Coleman's, because his deals only with higher school grades, on the assumption that any influence of student body characteristics could not have had any impact on achievement by the first weeks of school in first grade. One explanation for the positive correlation between proportion black and achievement of black pupils according to our analysis lies in that (a) we have more appropriately controlled for social backgroumd of the pupil, and (b) the integrated classroom may immerse the black student in new conditions (in many ways uncomfortable), which would tend to diminish his aptitudes in the testing situation, especially when this takes place early in the year.

Comparison of average effects of Head Start and "Other summer programs" on achievement is definitely favorable to the former; however, the comparison lacks interest as long as we do not know the main characteristics of the programs lumped together under this heading. On the other hand, Kindergartens throughout the country tend to exhibit standard characteristics in their staffs and curricula, and are in

session for the length of the academic year. From Table 8 and concentrating on the 100 per cent black schools, we see that Head Start effects average about 60 per cent of Kindergarten effects. If we assume a linear relationship between number of months in a program and gains in test scores, it turns out that monthly gains derived from Head Start are about three times those derived from Kindergarten. Making a rough cost comparison, and taking the educational costs of a summer Head Start program to be about $120 and those of Kindergarten to be about $400 for the school year, we would infer that $100 would buy 1.25 points of gain in test scores if put into Head Start and .57 points if put into Kindergarten. Admittedly, these comparisons rest on very tenuous ground and are just an indication of the kind of analysis that should be undertaken. In order to produce a benefit-cost ratio of Head Start programs based on the present body of data, it is necessary to know what the mean, median or normal score for the average non-deprived child is on these tests, what are their reliability coefficients, and what are the yearly gains expected from the average child. This kind of knowledge would enable us to extrapolate our results so as to appraise the probability for Head Start participants to emerge from the educational system with more satisfactorily developed capabilities than those of non-participants from similarly deprived backgrounds.

Although the research evidence on Head Start is voluminous, it is also inconclusive. Most of the evaluations on the Head Start summer programs have been local in character; they have generally indicated gains derived from the program in some area by Head Start participants; but a high proportion of them are of questionable reliability because they either failed to set up control groups, or when this was done, the groups were not adequate from an experimental point of view. There have been at least two large-scale studies: one undertaken by the Planning Research Corporation[24] and the other by the Westinghouse Learning Corporation and Ohio University (1969). The Planning Research Corporation drew a one per cent sample which was intended to be a nationwide representative picture of the 560,000 children who participated in Head Start during the summer of 1965. These children were tested twice on the Peabody

Picture Vocabulary Test and the Preschool Inventory Test, at the beginning and at the end of their Head Start experience, showing a highly significant difference in the PPVT scores. This difference was still present after stratification by certain demographic, ethnic and background variables. Unfortunately, the fact that there were no control groups available in this study makes one wonder if the gains were not merely due to the passing of time, or to retesting.

The study conducted more recently by the Westinghouse Learning Corporation and Ohio University was carefully designed to determine if pupils in the first, second or third grade who have had Head Start experience in either a summer program or a full year program differ significantly in cognitive and affective development from comparable pupils now in these grades who did not participate in either program. They report to have found summer programs ineffective and full year programs marginally effective. Our main objections to their conclusions dwell on (a) the small size of their sample, and (b) the adequacy of their control for socioeconomic status. However, it is interesting to note that for the full year programs they found that:

> Children who attended Centers in the nation's core cities, or Centers in the Southeastern part of the country, or Centers in which the enrollment was predominantly Negro were more often superior to their controls on the various measures and at different grade levels. (Chapter V, p. 3)

Thus, the effectiveness of the full year Head Start program, according to their results, is present in the same situations where we find the summer program to be successful.

It is apparent from the current debate at the federal level, that a change of emphasis from summer to full year programs is likely to take place in the near future. Such a decision would be based on the "very limited benefits produced by the shorter program, which tend to dissipate after entry into regular school."[25] We do not feel this decision is warranted by the results of our study. We have presented evidence of very significant gains from Head Start shown by children from predominantly black areas, who constitute such a large proportion of the population of preschoolers affected by poverty and deprivation. Moreover, in terms of

real and monetary resources, there are numerous advantages enjoyed by the summer programs. Availability of both teachers and schools is greater in the summer and these programs have been well-established and in operation for the last four years. Another consideration is that some of the non-educational benefits derived from Head Start (e.g., medical examinations, nutritional and other health objectives, community and parent participation) are certainly being generated by the summer program.

In the light of our results, we cannot endorse wholesale continuation of Head Start summer program on the basis of its beneficial effects on educational readiness in all-white or heavily white populated environments; rather, our recommendation to the policy-maker would be to commit the available resources most heavily to programs functioning in the midst of predominantly black neighborhoods, while at the same time conducting further research aiming at identifying more widely successful projects.

FOOTNOTES

[1]More detailed information concerning how the sample was drawn and how the data were collected can be found in James S. Coleman, *et al., Equality of Educational Opportunity* (Washington: U.S. Office of Education, 1966).

[2]Bureau of the Census, *City County Data Book 1962.*

[3]Setting up such an experiment would have involved controlling for all the various causes which it was felt would produce variations in the tests scores by making them a part of the experiment; as for those causes that were not liable to experimental control because they were unknown, they should have been controlled by the device of randomization.

[4]Division of Research and Evaluation of Project Head Start, "Evaluation and Research 1965-1967" (mimeo).

[5]In mathematical notation, we have a multiple regression of the limited dependent variable y_{jt} (j = 1, 2; t = 1,...,N) on the vector x_t, where

y_{1t} = 1 if the t^{th} unit is a "Head Start-eligible" school
y_{2t} = 0 if the t^{th} unit is a "Non-Head Start-eligible" school
x_t is the multidimensional measurement on the t^{th} school
N is the number of schools in the sample.

[6]James S. Coleman, *op. cit.*, p. 491.

[7]Dummy variables are constructed variables that assume values of zero or unity for all but one class. For example, we have classified the country in four regions. Then we set up three dummy variables, such that if a school is located in New England or the Mid-Atlantic region, one of them will be unity, the others zero. When the three take a zero value, the school is assumed to be located in the South.

[8]James S. Coleman, *op. cit.*, p. 111.

[9]Quoted by S. M. Miller and Martin Rein, "Poverty, Inequality and Policy" in Howard S. Becker (editor), *Social Problems: A Modern Approach.* (New York: John Wiley and Sons, 1966), p. 457.

[10]James N. Morgan, *et al.*, *Income and Welfare in the United States* (New York: McGraw-Hill, 1962), Table 16-22, p. 214.

[11]Bureau of the Census, *U.S. Census of Housing, 1960, U.S. Summary.*

[12]In mathematical notation, for each individual school we assume a linear relationship of the form

$$y_i = x_i' \beta_i + u_i \qquad i = 1,\ldots,1,144$$

where y_i is the percentage of Head Start participants
x_i is the vector of independent variables
β is the vector of unknown parameters
u_i is a random vector.

[13]Bureau of the Census, *Statistical Abstract of the U.S.* (Washington, 1965), p. 344.

[14]S. M. Miller and Martin Rein, *op. cit.*, p. 458.

[15]Sar A. Levitan, "Head Start: It is Never too Early to Fight Poverty," Center for Manpower Policy Studies, the George Washington University, December 10, 1967 (mimeo), p. 37.

[16]In mathematical notation, we have a multiple regression of the limited dependent variable y_{jt} $(j = 1, 2;\ t = 1,\ldots,6,885)$ on the vector x_t, where

$y_{1t} = 1$ if the t^{th} pupil attended Head Start
$y_{2t} = 0$ if the t^{th} pupil did not attend Head Start
x_t is the multidimensional measurement on the t^{th} pupil.

[17]We wish to thank Dr. Frederick Williams, formerly a member of the Institute senior research staff, now Director, Communications Research Center, University of Texas, Austin.

[18]Our regression model is:

$$y_j = \beta_0 + \sum_{i=1}^{11} \beta_i x_{ij} + \sum_{i=2}^{11} \beta_{i+10} x_{ij} x_{1j} + u_j$$

$j = 1,\ldots,68,884$

where for the j^{th} pupil we have:

- y dependent variable (one of several test scores)
- β's parameters to be estimated
- u random error
- x_5 Predicted Head Start participant
- x_6 Predicted Head Start school
- x_7 Predicted percentage Head Start participants
- x_{11} Percentage black pupils in class

and the rest of the explanatory variables are dummy variables, as follows:

- x_1 Black (Standard is not black)
- x_2 Attended Head Start
- x_3 Attended other summer program

(Standard is attended neither)

- x_4 Attended Kindergarten (Standard is did not attend)
- x_8 Sex (Boy) (Standard is girl)
- x_9 Age is 6
- x_{10} Age is 7

(Standard is age is 5 or younger)

[19]In mathematical notation, the model is:

$$y_j = \beta_0 + \sum_{i=1}^{12} \beta_i x_{ij} + \sum_{\substack{i=1 \\ i \neq 11}}^{12} \beta_{i+12} x_{11j} x_{ij}$$

$j = 1,\ldots,68,884$

where for the j^{th} pupil we have:

- y dependent variable (one of several test scores)
- β's parameters to be estimated
- u random error
- x_5 Predicted Head Start participant
- x_6 Predicted Head Start school
- x_7 Predicted percentage-Head Start participants

x_{11} Percentage black pupils in class

and the rest of the explanatory variables are dummy variables, as follows:

x_1 Black
x_{12} Race other than black or Caucasian } (Standard is Caucasian)

x_2 Attended Head Start
x_3 Attended other summer program } (Standard is attended neither)

x_4 Attended Kindergarten (Standard is did not attend)

x_8 Sex (Boy) (Standard is girl)

x_9 Age is 6
x_{10} Age is 7 } (Standard is age is 5 or younger)

[20]Due to the existence of illegal characters for the verbal test right scores in the data file, we carried on the regression analysis using the wrong scores as our dependent variable. Such variable is not the complement of the right scores, however, as there is the possibility of nonresponse. Therefore, the results in Table 5 are not strictly comparable with those shown in Table 6 and 7.

[21]Chorost, Sherwood B., *et al.*, "An Evaluation of the Effects of a Summer Head Start Program," Staten Island Mental Health Society, June 1967.

[22]James S. Coleman, *op. cit.*, pp. 29, 30 and 307.

[23]Samuel Bowles and Henry Levin, "The Determinants of Scholastic Achievement--An Appraisal of Some Recent Evidence," *The Journal of Human Resources*, Vol. III, No. 1, p. 22.

[24]Planning Research Corporation, "Results of Summer 1965 Project Head Start," Washington, D. C., May 1966.

[25]Robert H. Finch, Secretary of Health, Education and Welfare, quoted by *The New York Times* in its edition of April 25, 1969.

APPENDIX TABLES

TABLE A - 1

THIRD STAGE REGRESSIONS - GENERAL FORMULATION - REGRESSION COEFFICIENTS AND THEIR STANDARD DEVIATIONS

Dependent Variable	Const.	R^2	Const.	R^2	Const.	R^2	Const.	R^2	Const.	R^2
Verbal Test wrong score	5.8891	.0588								
Nonverbal Test total right score			23.4110	.2249						
Nonverbal Test total response					34.6209	.1494				
Good Vocabulary							.7851	.0502		
Punctuality									.9544	.0143

Independent Variable	Coef.	St.Dev.	Coef.	St.Dev.	Coef.	St.Dev.	Coef.	St.Dev.	Coef.	St.Dev.
Attended Head Start	.3356	.0612	-1.13	.3082	-.54	.3458	-.0117	.0105	.0212	.0094
Attended Other Summer Program	-.0694	.0439	.57	.2621	.83	.2938	.0183	.0083	.0076	.0080
Attended Kindergarten	-.3017	.0250	2.10	.0777	1.24	.0874	.0692	.0038	-.0212	.0024
Predicted Head Start Pupil	-.0020	.0014	.006	.0043	-.03	.0061	.0005	.0002	.0009	.0001
Predicted Head Start School	.0058	.0006	-.07	.0019	-.06	.0022	-.0006	.0000	-.0002	.0000
Predicted Perc. Head Start Part.					.02	.0056			-.0003	.0001
Sex (Boy)			-.72	.0757	-.51	.0848	-.0164	.0037	.0277	.0023
Age is 6	-.5956	.0379	2.10	.1267	.96	.1421	.0187	.0057	-.0113	.0038
Age is 7 or older	-.5791	.0479	4.44	.1495	3.50	.1688	-.0824	.0072	-.0233	.0046
Black	1.0246	.0560	-3.04	.1736	-1.25	.1953	-.0364	.0076	.0780	.0053
Other Race	1.3338	.0523	-.96	.1621	-.29	.1838	-.1605	.0079	-.0131	.0050
Percent Black Pupils in Class	.0015	.0006	-.04	.0020	-.04	.0022	-.0012	.0000	-.0013	.0000
Sex * Head Start			-.69	.2025	-1.49	.2270	-.0599	.0099	-.0411	.0062
Sex * Summer Program			-.78	.2037	-1.26	.2283	-.0331	.0099	-.0473	.0062
Age is 6 * Head Start			.76	.2657	1.50	.2980			.0074	.0081
Age is 6 * Summer Program			-.17	.2410	.01	.2702			.0202	.0074
Black * Head Start	-.8420	.1659	-.77	.5140	-2.82	.5764			-.0667	.0158
Black * Summer Program	-.4376	.167[illegible]	-1.17	.5180	-2.31	.5807			-.0844	.0159
Percent. Black * Head Start	.0037	.0017	.03	.0055	.03	.0062	.0011	.0001	.0008	.0001
Percent. Black * Summer Program	.0026	.0018	.01	.0056	.02	.0063	.0004	.0001	.0008	.0001

TABLE A - 2

THIRD STATE REGRESSIONS - BLACK AS CLASSIFICATORY VARIABLE - REGRESSION COEFFICIENTS AND THEIR STANDARD DEVIATIONS

	Verbal Test wrong score				Nonverbal Test total right score				Nonverbal Test Total response			
	Nonblack		Black		Nonblack		Black		Nonblack		Black	
Independent Variable	Coef.	St.Dev.	Coef.	St.Dev.	Coef.	St.Dev.	Coef.	St. Dev.	Coef.	St.Dev.	Coef.	St.Dev.
Attended Head Start	.2317	.0612	-.0922	.05	-.8667	.1885	1.2012	.1450	-.6384	.2111	1.1277	.1624
Attended other summer program	-.0428	.0423	-.2212	.05	.0111	.1304	.0763	.1634	.1146	.1461	-.3447	.1830
Attended Kindergarten	-.4541	.0318	.0429	.04	2.3337	.0979	2.3178	.1288	.8525	.1096	2.7098	.1442
Predicted Head Start participant	.0420	.0029	-.0063	.00	-.0258	.0090	.0075	.0070	-.0076	.0100	-.0046	.0080
Predicted Head Start school	-.0011	.0008	.0058	.00	-.0548	.0027	-.0849	.0030	-.0535	.0030	-.0921	.0034
Predicted Percentage Head Start participants	-.0149	.0022	.0069	.00	.0292	.0069	-.0154	.0070	.0375	.0078	-.0084	.0078
Sex (Boy)	.0753	.0268	-.0714	.03	-.8194	.0824	-1.1420	.1072	-.3508	.0923	-1.7561	.1204
Age is 6	-.6655	.0465	-.4607	.06	2.2342	.1432	1.9605	.2022	.8525	.1604	1.5596	.2267
Age is 7 or older	-.2501	.0609	-.6596	.08	3.7616	.1874	5.0177	.2445	2.5384	.2099	5.1503	.2740
Percentage black pupils in class	.0097	.0008	-.0008	.00	-.0880	.0025	.0185	.0025	-.0852	.0028	.0195	.0028
Constant term	6.1052		6.8210		23.1062		16.4536		34.3087		28.4465	
R^2	.0576				.2343				.1611			

TABLE A - 2 continued

THIRD STAGE REGRESSIONS - BLACK AS CLASSIFICATORY VARIABLE - REGRESSION COEFFICIENTS AND THEIR STANDARD DEVIATIONS

	Good speaking vocabulary				Punctuality			
	Nonblack		Black		Nonblack		Black	
Independent Variable	Coef.	St.Dev.	Coef.	St.Dev.	Coef.	St.Dev.	Coef.	St.Dev.
Attended Head Start	-.0169	.0105	.0531	.0092	.0208	.0058	.0082	.0044
Attended other summer program	.0028	.0064	.0288	.0080	.0046	.0040	-.0149	.0050
Attended Kindergarten	.0575	.0048	.0927	.0020	-.0241	.0030	-.0058	.0039
Predicted Head Start participant	-.0054	.0004	.0015	.00035	-.0005	.0002	.0007	.00017
Predicted Head Start school	.0003	.0001	.0006	.00015	.0002	.00008	-.0002	.00009
Predicted percentage Head Start participants	.0020	.0003	-.0001	.0003				
Sex (Boy)	-.0103	.0040	-.0620	.0053	.0328	.0025	-.0217	.0033
Age is 6	.0143	.0070	.0247	.0099	-.0217	.0044	.0177	.0062
Age is 7 or older	-.1287	.0092	-.0056	.0120	-.0323	.0057	-.0120	.0074
Percentage black pupils in class	-.0028	.0001	.0004	.00012	-.0023	.00007	.00003	.00007
Constant term	.7856		.6098		.9672		.9034	.78
R^2	.0518				.0217			

TABLE A-3

THIRD STAGE REGRESSIONS - PERCENTAGE BLACK AS CLASSIFICATORY VARIABLE - REGRESSION COEFFICIENTS AND THEIR STANDARD DEVIATIONS

Dependent variable	Coefficient	St. Dev.
Verbal Test wrong score		
Independent variable		
Percentage black pupils in class	.0018	.0013
Attended Head Start	.1156	.0632
Attended other summer program	-.0991	.0440
Percentage black pupils in class x Attended Head Start	-.0015	.0008
Percentage black pupils in class x Attended other summer program	-.0009	.0007
Attended Kindergarten	-.5368	.0331
Percentage black pupils in class x Attended Kindergarten	.0061	.0006
Predicted Head Start participant	.0220	.0033
Percentage black pupils in class x Predicted Head Start participant	-.0003	.00004
Predicted Head Start school	.0009	.0009
Percentage black pupils in class x Predicted Head Start school	.00004	.00001
Predicted percentage Head Start participants	-.0035	.0024
Percentage black pupils in class x Predicted percentage Head Start participants	.0001	.00003
Age is 6	-.6622	.0484
Age is 7 or older	-.3875	.0640
Percentage black pupils in class x Age is 6	.0017	.0009
Percentage black pupils in class x Age is 7 or older	-.0032	.0011
Black	1.1625	.0733
Race other than black or Caucasian	1.1351	.0629
Percentage black pupils in class x Black	-.0066	.0012
Percentage black pupils in class x Race other than black or Caucasian	.0015	.0025
Constant term	6.0864	.0563
R^2	.0634	

Table A-3 continued

THIRD STAGE REGRESSIONS - PERCENTAGE BLACK AS CLASSIFICATORY VARIABLE - REGRESSION COEFFICIENTS AND THEIR STANDARD DEVIATIONS

Dependent variable	Coefficient	St. Dev.
Nonverbal Test total right score		
Independent variable		
Percentage black pupils in class	-.0678	.0042
Attended Head Start	-1.1585	.1951
Attended other summer program	-.0681	.1356
Percentage black pupils in class x Attended Head Start	.0262	.0026
Percentage black pupils in class x Attended other summer program	.0026	.0023
Attended Kindergarten	2.3968	.1022
Percentage black pupils in class x Attended Kindergarten	-.0008	.0018
Predicted Head Start participant	.0052	.0101
Percentage Head Start school	-.0588	.0029
Percentage black pupils in class x Predicted Head Start school	-.0003	.00005
Predicted percentage Head Start participants	.0294	.0074
Percentage black pupils in class x Predicted percentage Head Start participants	-.0005	.0001
Age is 6	2.3717	.1495
Age is 7 or older	3.9814	.1977
Percentage black pupils in class x Age is 6	-.0067	.0028
Percentage black pupils in class x Age is 7 or older	.0090	.0035
Black	-7.8719	.2264
Race other than black or Caucasian	-.9636	.1940
Percentage black pupils in class x Black	.1027	.0037
Percentage black pupils in class x Race other than black or Caucasian	.0117	.0077
Sex (boy)	-.9025	.0860
Percentage black pupils in class x Sex (Boy)	-.0010	.0015
Constant term	22.9778	.1791
R^2	.2350	

Table A-3 continued

THIRD STAGE REGRESSIONS - PERCENTAGE BLACK AS CLASSIFICATORY VARIABLE - REGRESSION COEFFICIENTS AND THEIR STANDARD DEVIATIONS

Dependent variable	Coefficient	St. Dev.
Nonverbal Test total response		
Independent variable		
Percentage black pupils in class	-.0814	.0047
Attended Head Start	-1.064	.2185
Attended other summer program	-.0122	.1519
Percentage black pupils in class x Attended Head Start	.0251	.0029
Percentage black pupils in class x Attended other summer program	-.0018	.0026
Attended Kindergarten	.8926	.1145
Percentage black pupils in class x Attended Kindergarten	.0188	.0020
Predicted Head Start participant	.0279	.0113
Percentage black pupils in class x Predicted Head Start participant	-.0003	.0001
Predicted Head Start school	-.0576	.0033
Percentage black pupils in class x Predicted Head Start school	-.0004	.00005
Predicted percentage Head Start participants	.0416	.0083
Percentage black pupils in class x Predicted percentage Head Start participants	-.0006	.0001
Age is 6	.9628	.1674
Age is 7 or older	2.6700	.2215
Percentage black pupils in class x Age is 6	.0038	.0031
Percentage black pupils in class x Age is 7 or older	.0247	.0039
Black	-6.5403	.2535
Race other than black or Caucasian	-.9518	.2173
Percentage black pupils in class x Black	.0071	.0042
Percentage black pupils in class x Race other than black or Caucasian	.0375	.0086
Sex (Boy)	-.4481	.0964
Percentage black pupils in class x Sex (Boy)	-.0116	.0017
Constant term	34.6846	.2006
R^2		.1618

Table A-3 continued

THIRD STAGE REGRESSIONS - PERCENTAGE BLACK AS CLASSIFICATORY VARIABLE - REGRESSION COEFFICIENTS AND THEIR STANDARD DEVIATIONS

Dependent variable	Coefficient	St. Dev.
Good speaking vocabulary		
Independent variable		
Percentage black pupils in class	-.0025	.0002
Attended Head Start	-.0296	.0096
Attended other summer program	.0020	.0067
Percentage black pupils in class x Attended Head Start	.0010	.0001
Percentage black pupils in class x Attended other summer program	.0003	.0001
Attended Kindergarten	.0732	.0050
Percentage black pupils in class x Attended Kindergarten	.0001	.00009
Predicted Head Start participant	-.0028	.0005
Percentage black pupils in class x Predicted Head Start participant	.00005	.000006
Predicted Head Start school	.0003	.0001
Percentage black pupils in class x Predicted Head Start school	-.00001	.000002
Predicted percentage Head Start participants	.0012	.0004
Percentage black pupils in class x Predicted percentage Head Start participants	-.00002	.000005
Age is 6	.0230	.0073
Age is 7 or older	-.1074	.0097
Percentage black pupils in class x Age is 6	-.0001	.0001
Percentage black pupils in class x Age is 7 or older	.0005	.0002
Black	-.1664	.0111
Race other than black or Caucasian	-.1559	.0095
Percentage black pupils in class x Black	.0032	.0002
Percentabe black pupils in class x Race other than black or Caucasian	.0019	.0004
Sex (Boy)	-.0148	.0042
Percentage black pupils in class x Sex (Boy)	-.0004	.00007
Constant term	.7773	.0088
R^2	.0557	

TABLE A-3 continued

THIRD STAGE REGRESSIONS - PERCENTAGE BLACK AS CLASSIFICATORY VARIABLE - REGRESSION COEFFICIENTS AND THEIR STANDARD DEVIATIONS

Dependent variable	Coefficients	St. Dev.
Punctuality		
Independent variable		
Percentage black pupils in class	-.0025	.0001
Attended Head Start	.0078	.0060
Attended other summer program	-.0010	.0042
Percentage black pupils in class x Attended Head Start	.0001	.00008
Percentage black pupils in class x Attended other summer program	-.00006	.00007
Attended Kindergarten	-.0144	.0031
Percentage black pupils in class x Attended Kindergarten	-.00004	.00005
Predicted Head Start participant	.0005	.0002
Percentage black pupils in class x Predicted Head Start participant	-.000002	.000003
Predicted Head Start school	.00003	.0090
Percentage black pupils in class x Predicted Head Start school	-.000004	.000001
Sex (Boy)	.0260	.0026
Percentage black pupils in class x Sex (Boy)	-.0003	.00005
Age is 6	-.0191	.0046
Age is 7 or older	-.0301	.0061
Percentage black pupils in class x Age is 6	.0003	.00009
Percentage black pupils in class x Age is 7 or older	.0001	.0001
Black	-.0466	.0069
Race other than black or Caucasian	-.0260	.0058
Percentage black pupils in class x Black	.0026	.0001
Percentage black pupils in class x Race other than black or Caucasian	.0016	.0002
Constant term	.9600	.0054
R^2	.0204	

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