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Factors Affecting Educational Opportunity and Their Implications for School Finance Reform: an Empirical Study

C. DAVID BILLINGS AND JOHN B. LEGLER*

Introduction

The 1966 Coleman Report initiated a wave of doubt about the importance of the level of resources devoted to a student's education and his measured achievement.[1] In short, it found no appreciable relationship between expenditures and achievement. This finding was reinforced in 1972 by the Jencks Report which, in addition, presented evidence that "neither school resources nor segregation has an appreciable effect on either test scores or educational attainment."[2] These results contradict and discredit the conventional concepts of the relationship between educational spending and achievement. If the findings by Coleman and Jencks are accepted by the courts and legislatures, substantial changes in educational financing can be expected.

However, sufficient questions may be raised regarding the methodology and data base of these studies to prevent their empirical evidence from being used in legislative and judicial policy discussions.[3] In particular, Coleman and Jencks utilized data from a national sample. We suggest that expenditure per student and integration may appear to be unimportant simply because of data problems associated with a national sample, such as noncomparable salary-teacher quality variations and cultural variations among

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[1] J. COLEMAN, EQUALITY OF EDUCATIONAL OPPORTUNITY (1966) [hereinafter cited as COLEMAN].

[2] C. JENCKS, INEQUALITY 8 (1972) [hereinafter cited as JENCKS].

[3] Studies criticizing the methodology and statistical analysis include Bowles and Levin, *The Determinants of Scholastic Achievement: An Appraisal of Some Recent Evidence*, 3 J. HUMAN RESOURCES 1 (1968); Bowles, *Toward Equality of Educational Opportunity?* 38 HARVARD EDUC. REV., 89 (1968); Dyer, *School Factors and Equal Educational Opportunity*, 38 HARVARD Educ. REV. 38 (1968); GUTHRIE, SCHOOLS AND INEQUALITY (1971); and Perl, *Family Background, Secondary School Expenditure, and Student Ability, Achievement*, 8 J. HUMAN RESOURCES 156 (Spring, 1973).

states. While we find the Coleman-Jencks' findings untenable, we believe that state legislatures would have valuable information for their policy deliberations on educational financing if, for their particular state, it could be shown how expenditures and integration affect achievement. We believe that additional investigation is warranted to determine (1) the effect of instructional expenditures and culture on achievement and (2) the required distribution of resources necessary to equalize *life chances*. This second point moves research in this subject into the legislative and judicial policymaking area of educational finance reform.

The purpose of this study is to investigate the influence of expenditure and integration on student achievement in one state. The study has three specific objectives: first, to determine if the Coleman-Jencks' general findings (based on a national sample) apply to a particular state; second, to determine if alternative measures or subclasses of educational expenditures significantly affect achievement within a particular state; third, to determine if expenditure per student, when considered together with integration, significantly affects achievement for a particular state.

The study produces evidence contrary to the Coleman-Jencks' findings for one state and methodology which could be applied in other states. We maintain the study's usefulness is its potential policy application in designing the alternative state educational financing systems and resource allocation formulas necessitated by court decisions holding the traditional property tax financing scheme in violation of state constitutions. This study extends the criticism of Coleman-Jencks into a new area of inquiry, the state level policy applicability of their conclusions for reforming educational financing. This study's empirical evidence is also evaluated in terms of the contrasting principles set forth in the *Serrano* and *McInnis* decisions.

Attempts to reform educational financing generally have followed two procedures, the *educational need concept* and the *equal resource principle*.[4] Proponents seeking equal educational opportunity defined on the basis of educational need have not been successful. The Supreme Court has held educational need too nebulous a concept to control the distribution of educational resources.[5]

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[4] The first approach asserts that equal educational opportunity is attained when the financing system apportions funds in accordance with the educational needs of students. Compensatory expenditure directed toward those needs is a characteristic of this type system. However, if there is no appreciable relationship between expenditure per student and educational achievement, then attempting to equalize for differences in needs could be a frustrating and costly experience.

The second approach maintains that property tax financing of education violates equal protection guarantees since expenditure per student depends on the capricious location of commercial and industrial property. This approach is based on the belief, that given equal resources, every individual's achievement will be the result of his native ability, motivation and use of equal resources.

These two approaches would be synonymous if equal resources per student were utilized with the same degree of efficiency for the same functions, and no students were relatively advantaged or disadvantaged. However, these conditions do not hold in the real world. Hence in operational terms, their results would not be the same.

[5] *McInnis v. Shapiro*, 293 F. Supp. 327 (N. D. Ill., 1968), *aff'd.*, 394 U.S. 322 (1969); *Burruss v.*

On the other hand, advocates attempting to redress inequities in educational opportunities defined on the basis of unequal educational resources have been more successful. In August 1971 the California Supreme Court ruled in *Serrano v. Priest*[6] that great disparities in expenditures per student, despite state equalization aid, discriminated against the poor. Subsequently, in *Rodriguez v. San Antonio Independent School District,*[7] a U. S. District Court ruled that Texas' financing system was violating the U. S. Constitution. However, in a five-to-four decision, the U. S. Supreme Court reversed the decision citing, among other points, the findings of Coleman's and Jencks' reports.[8] The Court stated that inequities in educational financing were policy matters more properly addressed by state legislatures.[9]

This ruling allows state courts to find state educational financing systems in violation of state constitutions. Shortly thereafter a New Jersey Superior Court in *Robinson v. Cahill* held the New Jersey financing system in violation of the equal protection clause of the State Constitution. This decision was subsequently upheld by the New Jersey Supreme Court.[10] While the courts have ruled unfavorably on the *educational need concept* and favorable on the *equal resource principle,* this study provides evidence that, under certain circumstances, the *equal resource principle* does not provide equal educational opportunity but fosters unequal opportunity.

Methodology

The conditions generally believed to influence achievement are (1) the quality of classroom instruction and (2) the students' cultural backgrounds. One measure of the quality of classroom instruction is instructional expenditure per student. Teachers are paid on the basis of a salary scale which considers training and experience. Local school systems trying to attract better teachers generally have a salary supplement plan. To the extent salary differentials affect quality differentials, instructional expenditure per stu-

Wilkerson, 310 F. Supp. 572 (W. D. Va., 1969), *affid.,* 397 U.S. 44 (1970). For a comprehensive study of the *educational need concept, see* J. GUTHRIE, SCHOOLS AND INEQUALITY (1971).

[6] *Serrano v. Priest,* 5 Cal. 3d 584, 96 Cal. Rptr. 601, 487 P.2d 1241 (1971). For a comprehensive study of the *educational resource principle, see* COONS, CLUNE AND SUGARMAN, PRIVATE WEALTH AND EDUCATION (1970). For an intensive study of the case law on this principle, *see* H. Shanks, *Educational Financing and Equal Protection,* 7 J. LAW & EDUC. 73 (1972). This usage has been endorsed by the Courts in *Serrano* and related decisions, including Van Dusartz v. Hartfield, 334 F. Supp. 870 (D. Minn., 1971); Robinson v. Cahill, 118 N.J. Super. 223, 287 A.2d 187 (1972), *supplemented,* 119 N.J. Super. 40, 289 A.2d 569 (1972), *modified and aff'd.,* 62 N.J. 473, 303 A.2d 273 (1973) *enforcing,* 63 N.J. 196, 306 A.2d 65, *cert. denied,* 414 U.S. 976; Sweetwater County Planning Committee v. Hinkle, 493 P.2d 1050 (Wyo., 1972); Hollins v. Shofstall, No. C-253652, (Super. Ct. Ariz. July 7, 1972); Caldwell v. Kansas, No. 50616 (D. Kan. Aug. 30, 1972); and Milliken v. Green (Mich. Sup. Ct., Dec. 29, 1972).

[7] 337 F. Supp. 280 (W.D. Tex., 1971). For an intensive study of *Rodriguez see* Berke, Carnevale, Morgan and White *The Texas School Finance Case,* 1 J. LAW & EDUC. 659 (1972).

[8] Rodriguez v. San Antonio Indep. Sch. Dist., 411 U.S. 1 (1973), at 23–24, 42–43, 46–47 and 83.

[9] *Id.* at 58–59.

[10] Robinson v. Cahill, 118 N.J. Super. 223, 287 A.2d 187 (1972), *aff'd.,* 62 N.J. 473, 303 A.2d 273 *aff'd on rehearing* 63 N.J. 196, 306 A.2d 65, *cert. denied,* 414 U.S. 976 (1973).

dent is a good proxy of the quality of instruction. Consequently, educational achievement should be related positively to instructional expenditure per student.

In examining the relation between achievement and expenditure per student, Coleman and Jencks used current expenditure per student. Current expenditure per student includes operating costs other than instructional costs. Since school systems' current cost structures vary in composition between instructional and non-instructional costs, using current expenditure per student instead of instructional expenditure per student may result in inappropriate policy recommendations. We believe disaggregation of current expenditure per student is necessary to examine the relation between achievement and quality of instruction. Particularly, attention should focus on instructional expenditure per student. We acknowledge, however, that even with equal instructional expenditure per student, there are other factors which may result in unequal educational opportunities.[11]

One measure of the students' cultural background is the racial composition of a school system. After a generation of widespread achievement testing, a substantial difference has been measured between average white and average black IQ test scores.[12] This difference is believed to result from differences in cultural background. Therefore, the same quality instruction in two culturally different school systems would produce different levels of measured achievement. Hence, when looking at the conditions that influence achievement, both instructional expenditure per student and the racial composition of the school system must be examined. On an *a priori* basis, measured achievement should be related inversely to a school system's percentage of non-white population. Ignoring this relationship may result in inappropriate policy recommendations.

In this light, Coleman's and Jencks' findings are not surprising. Rather

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[11] One factor is the existence of economies of scale. Allocating equal resources per student to school systems of different size or scale of operations will result in different *amounts* of education per student. While this production function characteristic is generally acknowledged in education, much research remains to be done on the nature of its presence in education. For an analysis of empirical methodology, see Billings and Legler, *Empirical Evidence of Economies of Scale in Education as a Justification of Differentials in Expenditures per Student,* 2 J. LAW & EDUC. 667 (1973). In *Hobson v. Hansen,* 327 F. Supp. 844 (D.D.C. 1971), the court ruled that the existence of economies of scale had not been sufficiently demonstrated. For the economic analyses of the case, see Clune, *Law and Economics in Hobson v. Hansen,* 7 J. HUMAN RESOURCES 275 (1972); Michelson, *Equal School Resource Allocation,* 7 J. HUMAN RESOURCES 283 (1972); and O'Neill, Gray, and Horowitz, *Educational Equality and Expenditure Equalization Orders,* 7 J. HUMAN RESOURCES 307 (1972).

Another factor affecting the *amount* of education is the efficiency of the school system. Schools of the same size with equal instructional resources per student will not provide equal education unless they are equally efficient in their usage of equal resources. While this differential production characteristic of firms of the same size is acknowledged in general, we know of no research in its application to education.

[12] The Jencks Report summarizes studies on the importance of cognitive abillity and of the effects of race on cognitive skills. In short, the average white child scores 100 on standarized tests and the average black child scores 85. Furthermore, the differences are consistent on both IQ and achievement tests. JENCKS, at 81, 144–146, 254.

than accept their findings, the effect of instructional expenditures and culture on achievement and the required distribution of resources necessary to equalize *life chances* should be determined. The methodology used in this study attempts to do this for a particular state by testing three hypotheses.

The first hypothesis is that there is no significant relation between achievement and current expenditure per student. Acceptance of this hypothesis would indicate that Coleman's and Jencks' general findings from the national sample apply to a particular state, i.e., that expenditures do not affect achievement. Rejection of this hypothesis would discredit Coleman's and Jencks' findings for the state as well as cast doubt on their general findings. In addition, it would imply no need to disaggregate expenditures or consider cultural effects.

The second hypothesis is that there is no significant relation between achievement and instructional expenditure per student. Acceptance of the hypothesis would indicate that disaggregation of expenditure by itself does not sufficiently explain achievement, but that another explanatory variable is needed. Rejection of the hypothesis would discredit Coleman's and Jencks' findings for the state. Furthermore, it would indicate that cultural effects may not need to be considered since instructional expenditure per student by itself is a significant variable.

The third hypothesis is that instructional expenditure per student and the school system's percentage of non-white population are not significantly related to achievement. Acceptance of this hypothesis would indicate that Coleman's and Jencks' findings apply to a particular state. Rejection of the hypothesis would discredit their findings' applicability for that state and cast doubt on their applicability for other states. Rejection would provide policymakers with new evidence to consider in discussions on reforming educational financing systems. Furthermore, rejection would indicate that the *equal resource principle* does not necessarily result in equal opportunity, but that resources must be distributed to compensate for a school system's percentage of non-white population.

In this study we are attempting to determine the impact of expenditure and integration on achievement. We have postulated that neither current expenditure nor instructional expenditure by itself is a determinant of achievement. In addition, we have postulated that instructional expenditure and racial composition additively affect achievement. These hypotheses are tested by ordinary least squares regression analysis in order to estimate the correlation coefficients and parameters of the models from data of a state.

Data

The state selected for analysis, Georgia, has several characteristics which make its selection appropriate. Cultural differences are easily identified with race in the South, but this association may not be made so easily in other regions. Previous research shows there is a significant positive relation between expenditure per student and assessed property value per student in

Georgia.[13] Hence, Georgia fails to meet the *Serrano* principle of fiscal neutrality, implying inequality of educational opportunity as measured by the level of available educational resources. Hence, Georgia does not satisfy the *equal resource principle*. It lends itself to testing the *educational need concept* since it has school systems with varying percentages of non-white population (from 3.8 percent to 73.8 percent).

While it might be desirable to correlate achievement, instructional quality and cultural background on a classroom basis, the data generally are not available. For each school system, however, the reading achievement and mathematics achievement levels of each tested grade usually are available. These are the bases of a composite reading-mathematics achievement index (RMAI) for each school system.[14]

The achievement data used in the study are from a 1971–72 Georgia reading and mathematics achievement testing program.[15] Fourth, eighth and twelfth grade test results of 154 school systems constitute the data base.[16] The achievement data are used (see footnote 14) to calculate a composite reading-mathematics achievement index (RMAI) for each school system. The RMAI ranges from 75.7 to 106.6 with 89.2 being Georgia's average, compared to the national average of 100. The other data on current expenditure per student, instructional expenditure per student and school system's percentage of non-white population were taken from state government documents.

Findings[17]

Applying the methodology to Georgia, we found no significant relation between achievement and *current* expenditure per student. Hence, the first hypothesis is accepted, implying that Coleman-Jencks' general findings from the national sample apply to Georgia. Furthermore, we found achievement is not related significantly to *instructional* expenditure per student. Hence, the second hypothesis is accepted, implying disaggregated expenditure by itself does not affect achievement. However, when instructional expenditure per student and the school system's percentage of non-white population are correlated with achievement, the results are quite different.

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[13] Billings and Legler, *Property Tax Financing of Education in Georgia,* 23 ATLANTA ECON. REV., 20 (March-April, 1973). The General Assembly subsequently adjusted the funding formula to reduce the disparity in resources per student.

[14] The RMAI is calculated by weighting the average achievement of each area in each grade by the number of grades tested. For example, suppose the fourth, eighth and twelfth grades are tested for reading achievement and mathematics achievement. Then each school system would have six average achievement observations, three in reading and three in mathematics. Each observation would be weighted by one-sixth in order to calculate a RMAI for the school system.

[15] The cognitive abilities test was administered to three grades. The Iowa Test of Basic Skills was administered to the fourth and eighth grades, while the Test of Academic Progress was administered to the twelfth grade. The vendor for the statewide testing program was the Houghton Mifflin Publishing Company.

[16] Georgia has 189 school systems. Those systems without a high school were excluded from the data base.

[17] In the interest of presentation and space the statistical tables associated with the findings have been deleted. These tables are available from the authors upon request.

When examined together, the percentage of non-white population and instructional expenditure per student significantly affect achievement. Both variables are significant at the 95 percent confidence level. Each independent variable has the anticipated sign, positive for instructional expenditure and negative for percentage of non-white population--meaning that average achievement scores increase with increases in instructional expenditures per student and average achievement scores decrease with increases in the percentage of non-white population. These two independent variables, when taken in conjunction, explain a majority (60 percent) of the variation in achievement scores. While we would have liked to have explained a larger percentage of the variation, 60 percent is quite respectable for cross-sectional data. Furthermore, the two explanatory variables do not appreciably interact with one another; therefore, multicollinearity is not a problem.[18]

We reject the third hypothesis that instructional expenditure per student and the school system's percentage of non-white population are not significantly related to achievement. In so doing, we reject the applicability of Coleman-Jencks' general findings from a national sample to Georgia and question their applicability to other states.

Our research indicates that to attain equal opportunity, resources must be distributed to compensate for cultural differences resulting from the non-white population in the school system. If the racial composition of a school system remains constant and instructional expenditure per student is increased $100, then the analysis indicates that the school system's achievement level should decrease about 0.3 of a point. To maintain the same achievement level should increase about 2.5 points. If instructional expenditure per student remains constant and the percentage of non-white population increases one percentile, then the analysis indicates that the school system's achievement level with a one percentile increase in non-white population, the school system would have to increase its per student instructional expenditures by $13. While these findings have been stated in terms of changes within a school system, the same points apply between school systems. For example, on the average, a school system that spends $100 more instructional funds per student will have an achievement level about 2.5 points higher, all other things being the same. However, the sudden infusion of $100 per student could be expected to have a differential impact on achievement, depending on the grade of the student, since 11 years of lower funding would apply to a senior and no prior funding level would apply to a first grader.

Conclusions

On the basis of these results, we must reject Jencks' assertion that neither school resources nor racial composition appreciably affect achievement. Both

[18] In the case of two explanatory variables, the significance of the correlation coefficient between the independent varables indicates whether or not multicollinearity exists. In this case it is statistically insignificant. Another test for multicollinearity is the magnitude of the determinant of the correlation matrix. If the determinant approaches zero, there is evidence of very severe multicollinearity. In this case the determinant is 0.81, indicating little or no multicollinearity. This test is explained by Farrar and Glauber, *Multicollinearity in Regression Analysis*, 49 REV. ECON. & STAT. 92 (1967).

significantly affect achievement in Georgia. In fact, we believe racial composition must be included when evaluating the importance of educational resources on achievement.

Defining equal opportunity as equal resources as in the *Serrano* decision ignores the relative initial position of a school system's students and the effect of culture on their achievement. Even if each school system had equal resources and the same production function, students' relative standings before schooling would tend to be perpetuated after schooling because of the culture effect. Defining that situation as equality of educational opportunity is a cruel joke.

Furthermore, aggregate current expenditure per student is not a desirable policy variable to correlate with educational achievement. But instructional expenditures are appreciably related to educational test scores when controlled for the racial composition of the school system. What matters in achieving equality among school systems is the type of expenditure per student and the characteristics of the students.

What are the policy implications of these findings given that opportunity, as defined here, is dependent on test scores which could be artificially increased by tests that would produce higher achievement scores? In order to equalize educational opportunity, resources must be distributed in a compensatory manner, or the racial composition of school systems must be equalized, or some combination of both.[19] This conclusion specifically rejects equal expenditure per student as equal educational opportunity unless the school systems also have equal racial composition. In other words, the *equal resource principle* of the *Serrano* decision will provide equal achievement opportunity only if there is uniform integration among the school systems of a state.

In general, to have equal opportunity for educational achievement without uniform racial composition, instructional resources per student must increase with the percentage of non-white population. For example, in order for two school systems, which differ in non-white population by one percent, to have equal opportunity for educational achievement, the system with the larger percentage of non-white population must spend (in the case of Georgia) approximately $13 more per student in instructional funds.

In other words, compensatory financing is necessary to offset the cultural effect of non-white students. The *educational need concept* will provide equal achievement opportunity if the state is willing to devote the necessary resources. However, since substantial resources would be required to eliminate inequality, some states may prefer to reduce the degree of inequality gradually over time.

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[19] According to Coleman:

> "The higher achievement of all racial and ethnic groups in schools with greater proportions of white students is largely, perhaps wholly, related to effects associated with the student body's educational background and aspirations. This means that the apparent beneficial effect of a student body with a high proportion of white students comes not from racial composition per se, but from the better educational background and higher educational aspiration that are, on the average, found among white students." COLEMAN, at 307.