OPTIMAL ALLOCATION OF FUNDS FOR SCHOOLING AMONG GEOGRAPHIC DIVISIONS WITHIN THE UNITED STATES

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PREFACE

Appreciation is extended to Dr. Luther G. Tweeten, dissertation adviser, for his assistance during the course of this study and throughout all phases of the graduate program. Thanks are also due Dr. Leo V. Blakley and Dr. Robert L. Sandmeyer for their helpful criticisms and suggestions.

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CHAPTER I

INTRODUCTION

Values held widely in society are that every child is entitled to an "adequate" education at public expense, and that local and state government (rather than the federal government) should provide as large a portion of public spending for schooling as is consistent with ability to pay and the incidence of benefits.

Previous studies have documented that schooling is an economically profitable investment for society as a whole. State and local governments pay a high proportion of the cost of schooling. Because of the spillout of schooling benefits through migration of former students, state and local governments may realize within their boundaries only a small proportion of the benefits from their investment in schooling. They may experience low benefit-cost ratios, despite the over-all profitability of schooling to society. Of course, spillin of benefits in the form of educated immigrants may compensate. State and local governments may be more inclined to invest optimally in schooling if their costs are kept in line with benefits which they derive within their boundaries. The federal government might fund that portion of schooling cost which is lost through net spillouts to other areas.

It may be contended that the Southeast, for example, should not have to pay the cost of educating its youth who later move to, say, California. Another dimension of the funding problem is the ability

to pay for schooling. Aside from the problem of spillouts, not all states and localities have an equal ability to finance an adequate education. A case can be made from an equity standpoint for outside assistance to states with low incomes to enable their youth to realize the same quality of schooling as realized by youth in other states.

When the problem of disassociation of benefits and costs is combined with the problem of differences in ability to invest, the school funding situation appears even more critical. Frequently, states with the least ability to finance schooling experience the highest spillout of benefits through outmigrants. The result is substantial underinvestment in schooling of many youth. A case can be made that a child should not be denied a quality education because he was born in the "wrong" state. The problem is national in scope: states which do not have the will and means to provide a quality education spill their problems into other states through migration.

The objective of this study is to develop an optimal model for financing schooling investments by considering differences in ability to finance schooling along with the disassociation of schooling costs and benefits. The procedure for developing the optimal model is as follows:

(1) Develop an ability criterion for financing schooling based on measures to finance these investments for each of nine U. S. Census Divisions (see Figure 1).

(2) Analyze the relationship between age, schooling and the probability of interdivisional mobility, and estimate the flows of educational capital through spillout and spillin of migrants among the nine divisions.

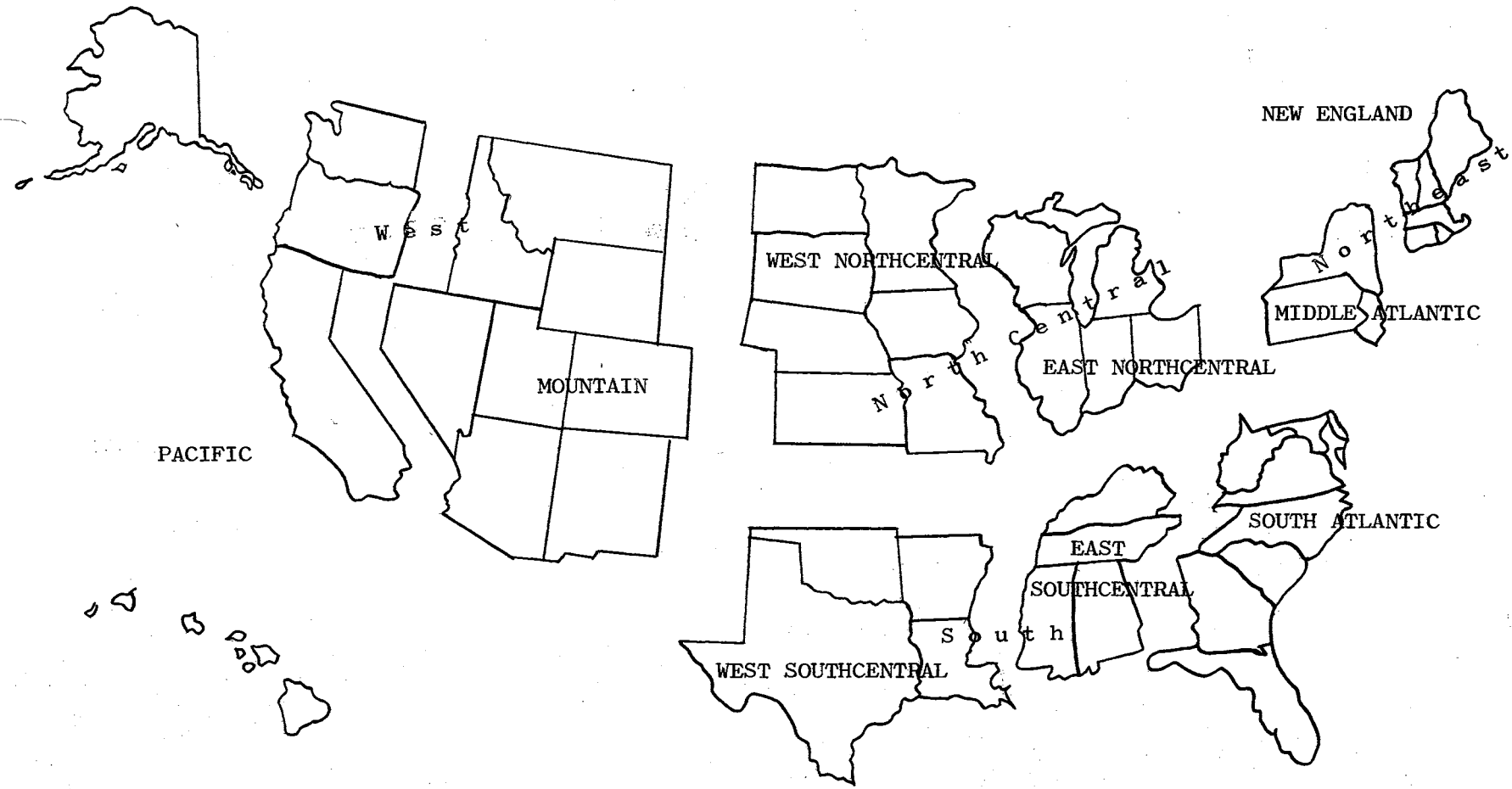

Figure 1. Census Regions and Divisions of the United States

(3) Measure the profitability of social investment in schooling from both the national point of view and from the point of view of the division where the investment was made through calculating benefit-cost ratios and internal rates of return.

(4) Develop an efficient-equitable model for financing schooling among Census Divisions based on internal rates of return from the point of view of both the nation as a whole and the point of view of the division where the investment was made.

(5) Finally, develop the optimal model for financing schooling investment by combining the ability criterion (analyzed in Procedure 1) with the efficient-equitable model (analyzed in Procedure 4).

The Current Study in Relation to Other Studies in the Economics of Education

Education has long been an important public as well as private investment in American life. From a private viewpoint, people invest in themselves through education to obtain more lifetime earnings, psychic benefits and, in general, a better quality of life. On the other hand, the public benefits from investment in education include a larger tax base (brought about by greater incomes), reduced crime rates, greater social involvement, and enrichment of culture. The private economic returns to schooling investment have been well documented in several studies, with all indicating that private investment in schooling is highly profitable.[1] The measureable economic profitability of

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[1]Private rates of return in 1949 for United States males are calculated by W. Lee Hansen, "Total and Private Rates of Return to

schooling investment to society has also been well documented in several studies.[2] In 1961, T. W. Schultz estimated that social investment in education accounted for 21-40 percent of national income growth in the United States over the period 1929-56.[3] In 1962, Edward Denison credited increased education per member of the employed labor force with 23 percent of the national income growth rate.[4] In their recent study (after calculating a social rate of return to all formal schooling within the United States of 13.0 percent), Hines, Tweeten, and Redfern found that the economic payoff from the 1959 investment in education (in terms of benefits) was equal to 20 percent of the average annual growth in national income during 1958-60.

Investment in Schooling," Journal of Political Economy, Vol. LXXI, No. 2 (April, 1963), pp. 128-140. Private rates of return for white and nonwhite males in the North and South in 1959 were calculated by Giora Hanoch, "An Economic Analysis of Earnings and Schooling," Journal of Human Resources, Vol. II, No. 3 (Summer, 1967), pp. 310-329. Private rates of return to schooling investment for white and nonwhite males and females are reported by: Fred Hines, Luther Tweeten and J. Martin Redfern, "Social and Private Rates of Return to Investment in Schooling by Race-Sex Groups and Regions," Journal of Human Resources, Vol. V, No. 2 (Summer, 1970).

[2]Hansen and Hines, Tweeten and Redfern also computed social rates of return for their respective groups. Absolute income values by level of schooling are calculated in Herman Miller, "Annual and Lifetime Income in Relation to Education, 1929-59," American Economic Review, Vol. L, No. 5 (December, 1960), pp. 962-986. The present value concept is used at alternative discount rates in H. S. Houthakker, "Education and Income," Review of Economics and Statistics, Vol. XLI, No. 1 (February, 1959), pp. 24-28.

[3]T. W. Schultz, "Education and Economic Growth," Social Forces Influencing American Education (Chicago: National Society for the Study of Education, 1961).

[4]Edward F. Denison, The Sources of Economic Growth in the United States and the Alternatives Before Us. Supplementary Paper No. 13. New York: Committee for Economic Development, 1962.

These past studies were concerned with both the private and social aspects of investing in schooling. Private investment decisions are based on private costs versus the resulting added lifetime earnings. Likewise, social schooling investment decisions are based on social costs versus social benefits. However, the studies mentioned thus far were concerned only with the over-all productivity of such investments from the individual and/or national point of view. They were not concerned with the availability of funds among divisions (ability) or the geographic distribution of the United States' benefits from schooling investments among divisions.

Two major studies have been concerned in a general way with the disassociation of schooling costs and benefits. In a study by Burton Weisbrod, the community was treated as an aggregative entity that received benefits and incurred costs. The local community was the decision-making body for schooling investment.[5] Using Clayton, Missouri, as an example, Weisbrod calculated spillovers of educational capital from the community by employing 1959 age-income data for white males and females in the non-South discounted at 5 percent. Weisbrod found that 91 percent of the educational capital formed from 12 years of schooling in Clayton migrated outside the community. But imports of educational capital from other communities totaled 87 percent of total production of educational capital in Clayton in 1960.

Rashi Fein, like Weisbrod, was concerned with the measurement of aggregate human capital gains and losses of spatially defined

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[5]Burton A. Weisbrod, Spillover of Public Costs and Benefits: Part 1: Benefits, U. S. Department of Health, Education and Welfare, Cooperative Research Project No. 1045, 1963.

units.[6] However, in Fein's case, the units were the three southern divisions within the Southern Region of the United States. Fein chose to work with migration between 1955-60 and age-income profiles for 1949 for white and nonwhite males. It was found that the net human capital loss for the Southern Region over the five-year period was about 0.34 percent of its stock of white capital and 3.3 percent of its nonwhite capital for a combined loss of 0.4 percent, or 0.08 percent at an annual rate. A much larger rate of in- and out-migration was found within each of the divisions encompassed within the Southern Region, suggesting a large amount of interflow of human capital within the region itself.

In a recent article, Mary Jean Bowman and Robert Myers presented some theoretical models on migration both from the private and social point of view.[7] This article points to many of the problems of accessing flows of human capital brought about through migration and makes some suggestions for new census tabulations which would allow for some sophisticated application of human capital concepts to migration.

The ability dimension in financing social investments in elementary and secondary schooling was studied to some extent by Hines[8] and in

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[6]Rashi Fein, "Educational Patterns in Southern Migration," The Southern Economic Journal, Vol. XXXII, No. 1, Part 2 (July, 1965), pp. 106-124.

[7]Mary Jean Bowman and Robert G. Myers, "Schooling, Experience, and Gains and Losses in Human Capital Through Migration," American Statistical Association Journal, Vol. LXII (September, 1967), pp. 875-898.

[8]Fred K. Hines, "Propensities to Invest in Schooling in the South and Non-South," American Journal of Agricultural Economics, Vol. LI, No. 5 (December, 1969), pp. 1561-1564.

financing higher education by McIntyre.[9] Hines found that per capita income was by far the most important variable in explaining the level of a state's current expenditures for public elementary and secondary schooling during 1959-60. Likewise, in McIntyre's model of the determinants of expenditures per student for public higher education in the United States, the financial ability of a state, measured in personal incomes per capita, was the most important variable "external" to a four-year institution in 1965-66.

The present study combines the three dimensions: the ability to invest, the disassociation of investments and benefits, and the overall productivity of the investment. Thus, this study includes more dimensions than previous studies dealing with the economies of social investment in schooling. It also has a broader geographic scope.

General Outline of the Study

The organization of this study is built around the ultimate objective of developing a model for optimal allocation of schooling expenditures among the nine U. S. Census Divisions outlined in Figure 1. The three dimensions of financing social schooling are first analyzed separately and then combined to form the optimum model. Chapter II deals with the "ability to invest" dimension. Variables in regression analysis are used to adjust for differing abilities to finance schooling among divisions. The regression results provide an ability norm for allocating schooling investment among the nine divisions. A division whose actual level of investment is higher than the norm, as dictated

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[9] M. Charles McIntyre, "Determinants of Expenditures for Public Higher Education," National Tax Journal, Vol. XXII, No. 2 (June, 1969), pp. 262-272.

by the ability criterion, is assigned more schooling funds from outside sources. Conversely, based on the ability norm, divisions whose actual investment levels are below the level dictated by the ability regression are assigned more schooling funds from state and local (divisional) sources by the model.

Chapter III initiates the analyses of a second dimension--the disassociation of schooling costs and benefits. Interdivisional mobility probabilities by age and schooling attainment are computed. These probabilities are used to analyze the separate effect of age and schooling on interdivisional movements of people and to make some general inferences about the disassociation of schooling benefits and costs among divisions.

Chapter IV deals with a third dimension of investing in schooling (the over-all productivity of schooling investment) and, though employing the mobility estimates of Chapter III, concludes the analysis of the disassociation of divisional schooling costs and benefits. The over-all profitability of investing in schooling within each division from the national point of view is measured by computing both benefit-cost ratios and internal rates of return for elementary, secondary, and college schooling investment and the aggregate of schooling investment over all schooling levels. The disassociation of schooling costs and benefits is measured by comparing internal rates of return with respect to national investment (includes investment from local, state, and federal funds) with internal rates of return with respect to divisional investments (includes state and local funds only) for investments within each division. National benefits from investment in a given division include all benefits regardless of geographic location,

whereas divisional benefits include only those benefits accruing within the division where the investment was made.

By employing the national and divisional internal rates of return from Chapter IV, two models for the reallocation of United States schooling investment are analyzed in Chapter V. The first model of Chapter V equalizes national internal rates of return among all divisions--an over-all efficiency criterion with regard to all United States schooling investment. The second model of Chapter V combines the efficiency criterion of the first model with an equity criterion to form an equitable-efficient allocation of schooling investments among and within the nine divisions. The equity criterion considers divisional spillovers of schooling benefits to reapportion investment among divisional and federal funds within each division. Thus, the equitable-efficient model not only distributes total United States schooling funds efficiently among divisions but also allocates equitably the total schooling investment within a particular division into state and local funds (divisional) on the one hand and federal funds on the other.

The final chapter combines the "ability to invest" criterion of Chapter II with the equity-efficiency criteria of Chapter V to form an optimum model for financing United States investments in schooling among Census Divisions.

CHAPTER II

PUBLIC ABILITY AND SOCIAL INVESTMENT IN SCHOOLING

The purpose of this chapter is to:

(1) Discuss and measure the ability to invest in public schooling.

(2) Discuss and measure the concept of effort to invest in public schooling.

(3) Compute divisional levels of schooling appropriations per student which equalize effort to invest among divisions.

Within the thirty year interval 1929-59, the demand for public outlays to finance education grew steadily. This growing demand, resulting from more schooling costs per student as well as larger enrollments, was met by increased efforts in financing public education. Between 1929 and 1959, total education expenditures as a percent of Gross National Product increased from 2.1 percent to 5.1 percent.[1] Over the same period, public schooling expenditures as a percent of United States personal income increased from 3.8 to 7.6 percent. Personal income in the United States increased from $85.7 billion to $380.7 billion (a gain of 344 percent), while United States expenditures

[1] U. S. Department of Health, Education and Welfare, Office of Education, Digest of Educational Statistics, 1967 (Washington, D. C.: 1968), Table 24.

for public education increased from $3.2 billion to $24.7 billion (a gain of 665 percent). Personal income per capita is one prime measure of the public's ability to finance public services, one of which is formal schooling. On the other hand, the percentage of personal income spent on schooling can be defined as a measure of the effort to finance schooling.

Effort to finance schooling has never been evenly distributed among states and divisions. Some states and divisions spend a substantially greater proportion of their total personal income for schooling than do other states. Often wealthier states and divisions, whose level of schooling investment is high, spend a smaller percentage of their income in financing schooling than poorer states and divisions where the level of schooling investment is quite low.

Table I relates divisional levels of schooling investment per student to: (1) per capita income and (2) the percentage of income spent on schooling in 1960. In general, divisions with high levels of schooling investment had high abilities to invest in schooling. The Middle Atlantic Division which had the highest level of schooling investment ranked second among divisions in per capita income. On the other hand, both the level of schooling investment and the per capita income were lowest in the East Southcentral Division. The rank correlation between per capita income and the level of investment was 1.0.

The percentage of personal income spent on schooling was not closely correlated with per capita income or the actual schooling investment level. The Pacific Division, having the greatest per capita income, ranked last among the nine divisions in the percentage of

TABLE I

PER CAPITA INCOME, SCHOOLING INVESTMENT, AND THE PERCENTAGE OF INCOME SPENT IN FINANCING SCHOOLING INVESTMENT BY DIVISIONS, UNITED STATES, 1960

Division	Per Capita Income[a]		Schooling Investment[b]		Personal Income Spent on Schooling[c]	
	Dol.	Rank	Dol./Student	Rank	Pct.	Rank
New England	2471	(3)	590	(2)	5.28	(7)
Middle Atlantic	2594	(2)	691	(1)	5.65	(4)
East Northcentral	2373	(4)	565	(4)	5.45	(6)
West Northcentral	2071	(6)	530	(5)	5.92	(3)
South Atlantic	1856	(7)	397	(8)	5.06	(8)
East Southcentral	1455	(9)	328	(9)	5.65	(4)
West Southcentral	1791	(8)	452	(7)	6.09	(1)
Mountain	2079	(5)	511	(6)	6.09	(1)
Pacific	2630	(1)	588	(3)	5.02	(9)
United States	2223		532		5.49	

[a]U. S. Department of Commerce, Bureau of the Census, The Statistical Abstract of the United States, 1962 (Washington, D. C.: 1962), Table 431.

[b]Taken from Appendix A, Table XI and represents per student current plus fixed expenditures aggregated over all students enrolled in elementary, secondary and college schooling.

[c]Represents the expenditures per student times the division's enrollment (see Appendix B, Table XIV) divided by total personal income.

income spent on schooling investment. At the other extreme, the West Southcentral Division, which ranked seventh and eighth in the level of schooling investment and per capita income, respectively, ranked first (along with the Mountain Division) in the percentage of income spent in financing schooling investments. The rank correlation between per capita income and the percentage of personal income spent on schooling was -.47. The rank correlation between the level of schooling investment and the percentage of personal income spent was -.28.

Ability and Effort in Investing in Schooling

Ability

The public's ability to invest in schooling is determined by the level of available funds and the competition among alternative uses for these funds. Ability to finance schooling is measured here by a multiple regression analysis which relates the level of schooling investment (total expenditures per student in public schools from state and local sources aggregated over all levels of schooling) to three variables: (1) per capita income, (2) the percentage of the population enrolled in school, and (3) non-public school enrollment as a percent of public school enrollment. Thus, in this study, a state or division's ability to invest in schooling is defined by the regression of Equation (1). Per capita income was chosen as the prime indicator of the ability to invest in public schooling because per capita income does, to a large degree, relate positively to the size of the tax base of a state or division. Higher per capita incomes mean not only more money for private individuals but also more money for the public sector to finance public goods and services such as roads, welfare, schools, etc.

Greater percentages of the population enrolled in school mean less ability to finance a given level of public schooling investment, other things equal. Also, larger percentages of students enrolled in public schools lead to less ability to finance a given level of public schooling investment, when the other two ability variables are held constant.[2]

Equation (1) relates the level of schooling investment (Y_1) to

$$Y_1 = 133.29 - 2.03X_1 + 0.187X_2 + 2.34X_3 \qquad (1)$$
$$(.67) \quad (8.94)^{**} \quad (2.23)^{**}$$

t values in parentheses

$$R = .75$$

the percentage of the population enrolled in school (X_1), per capita income (X_2) and nonpublic school enrollees as a percent of public school enrollees (X_3).[3] The ability regression employs data for each of the 48 coterminous states on total expenditures in elementary, secondary and college schooling from state and local sources in

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[2]Although families with children enrolled in nonpublic schools would spend more on schooling than would be the case if their children were enrolled in public schools, the public as a whole would be able to support public schooling investment at higher levels when nonpublic school enrollment was high relative to public school enrollment. That is, families who have children enrolled in nonpublic school, nevertheless pay as much in terms of tax dollars, for public schooling as would be the case if their children were in public schools. Thus, greater nonpublic enrollment leads to less public school enrollment which, in turn, leads to more tax dollars to spend on each public school student.

[3]The data are on a state basis and are for elementary and secondary schools only. However, they may also reflect the relationship between nonpublic and public enrollment at the college level. Data taken from: U. S. Department of Health, Education and Welfare, Office of Education, Digest of Educational Statistics, 1962 (Washington, D. C.: 1962), Table 21.

1959-60, personal income in 1960, and 1959-60 school enrollment data. The data are taken from the Statistical Abstract of the United States, 1962 and 1963 and the Digest of Educational Statistics, 1962 and 1967. The 1959-60 school year was chosen for the study because of available 1959 earnings data used to compute benefits from schooling in later chapters.

Per capita income and nonpublic school enrollment as a percent of public school enrollment were both highly significant in explaining the level of investment in public schools. The percentage of the population enrolled in schools, which did not vary greatly among states or divisions, was not significant in explaining the level of public schooling investments, other things equal. The three ability variables together explained 75 percent of the variation in the level of investment among states (as denoted by the R^2). The regression coefficient for the per capita income variable of .187 suggest that an increase of $100 in a state's per capita income would result in an $18.70 increase in the state's schooling expenditures per student, the other variables held constant. States with high percentages of students enrolled in nonpublic schools exhibited significantly higher levels of public schooling investments than states with low nonpublic school enrollments. According to the coefficient of X_3, an increase of one percentage point in the nonpublic school enrollment relative to public school enrollment is associated with a gain of $2.34 in public investment per student.

Effort

Effort to finance public schooling was previously defined as the percentage of personal income spent in financing public schools.

However, this definition omits two of the three ability variables--the percentage of the population enrolled in school and nonpublic school enrollment as a percent of public school enrollment. States having high levels of nonpublic school enrollment relative to public school enrollment and low percentages of their population in school are expected to invest more of a given level of income in public schooling than do states with high public school enrollments and a high percentage of the total population enrolled in school. By comparing the actual level of schooling investment with the predicted value (Y_1) from Equation (1), an estimate of a division's effort which accounts for all three ability variables is obtained. The predicted value of Y_1 can be interpreted as a national norm. States and divisions whose actual investment was less than the amount they "should have invested" as determined by Equation (1) are here defined as underachievers in schooling--their efforts were less than the national average. States and divisions that invested more than what the ability regression dictated they "should have invested" based on the national average are termed overachievers.

Figure 2 shows the level of effort in financing all levels of schooling among divisions in 1959-60 after considering all three ability variables. The Middle Atlantic, which ranked second among the nine divisions in per capita income, exhibited the greatest overachievement in financing public schooling. Overachievement in the Middle Atlantic Division totaled $42 per student or 6.1 percent of the actual investment level. At the other extreme, the South Atlantic Division, which ranked seventh in per capita income, exhibited the

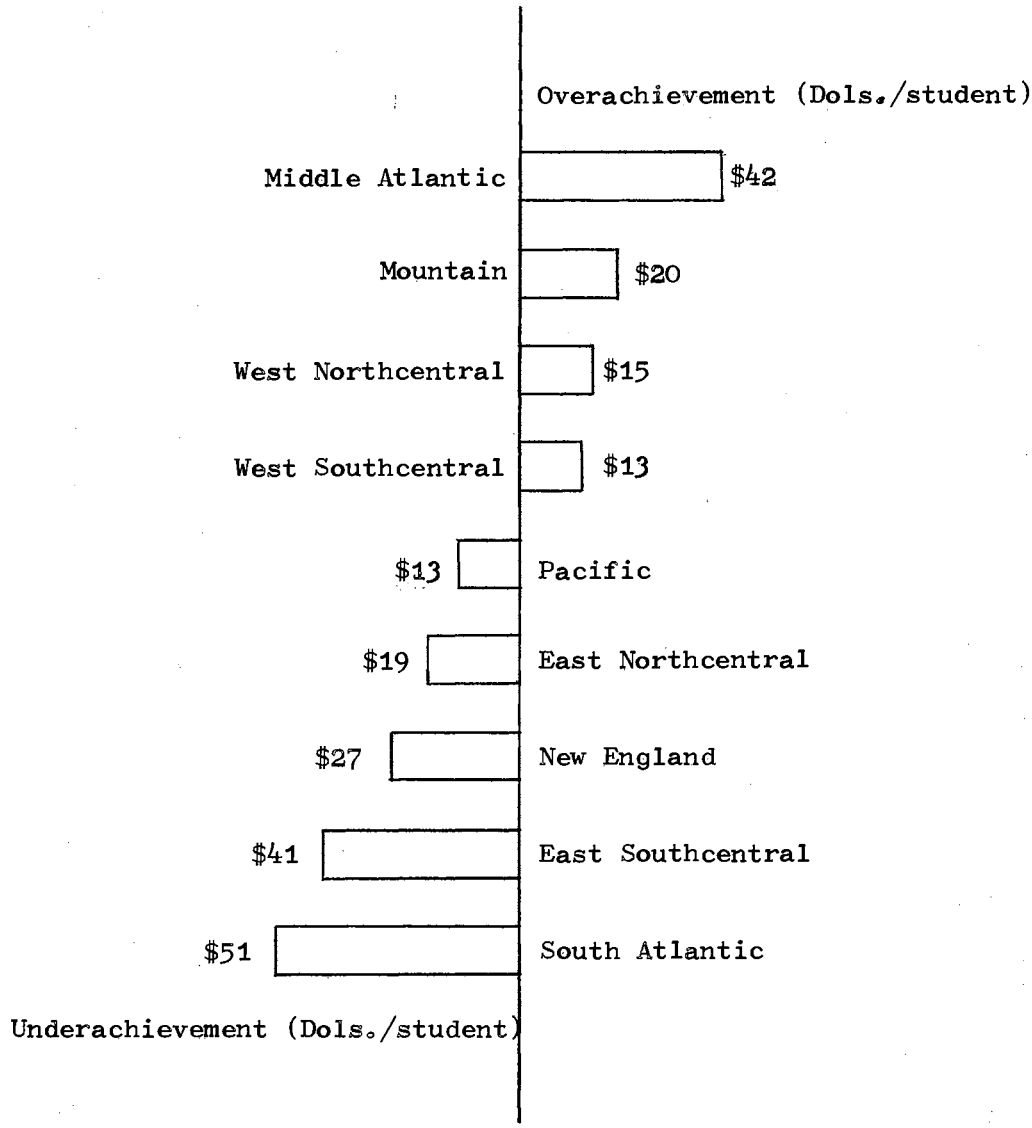

Figure 2. Effort to Finance Public Schooling Over All Levels, by Divisions, United States, 1959-60

greatest underachievement--$51 per student or 12.8 percent of its actual investment level.

By comparing the effort rankings of Figure 2, which were based on ability (as defined by three variables), and the effort rankings of Table I, which are based on only one ability variable (per capita income), the importance of adjusting for the relative size of the nonpublic school enrollment and the percentage of the population enrolled in school can be seen. When effort is defined as the percentage of personal income spent on public schooling, the Pacific Division ranked last among the nine divisions. However, when adjustments were made for the percentage of the population enrolled in school and the size of nonpublic school enrollment relative to public school enrollment (as was the case in Figure 2), the Pacific Division ranked fifth in effort to finance public schooling. In the Pacific Division, the percentage of the population enrolled in school totaled 23.4 percent compared with a low of 18.8 percent in the Middle Atlantic Division. Nonpublic school enrollment as a percent of public school enrollment was 7.9 percent in the Pacific Division--considerably lower than the high of 29.2 percent in the Middle Atlantic Division.

Ability Model

Table II presents divisional and federal expenditures per student under an ability model. The ability model equalizes divisional efforts in financing schooling investment. The total level of investment (from all sources) is the same as the actual 1959-60 investment level with federal investment comprising the differences between the divisional investment (dictated by Equation (1)) and the actual total investment.

TABLE II

ABILITY MODEL FOR THE REALLOCATION OF U. S. PUBLIC SCHOOLING INVESTMENT, BY DIVISIONS, 1959-60

Division	Level of Investment							Federal Assistance	
	Divisional			Federal			Total	Total	Change from 1959-60
	Actual	Additional	Total	Actual	Additional	Total			
	Dol./Student							Pct.	Pct.
New England	590	27	617	74	-27	47	664	7.1	+ 0.6
Middle Atlantic	691	-42	649	38	42	80	729	11.0	+ 5.8
East Northcentral	565	19	584	35	-19	16	602	2.7	- 3.4
West Northcentral	530	-15	515	37	15	52	567	9.2	+ 2.7
South Atlantic	397	51	448	48	-51	- 3	445	- 0.7	-11.5
East Southcentral	328	41	369	31	-41	-10	359	- 2.8	-11.4
West Southcentral	452	-13	439	36	13	49	488	10.0	+ 2.6
Mountain	511	-20	491	61	20	81	572	14.2	+ 3.5
Pacific	588	13	601	103	-13	90	691	13.0	- 1.9
Total	532	0	532[a]	49	0	49[a]	581	8.4	0.0

[a]Because of rounding error, investment levels weighted across divisions may not equal the exact U. S. level.

Thus, in the ability model there is no under- or overachievement among divisions. Instead, each division's share of the investment within the division is adjusted for its ability to finance such investments.

In the ability model, divisions which overachieved in 1959-60, according to the ability equation, would invest less in schooling. Conversely, divisions which underachieved in schooling in 1959-60 would invest more in schooling. Thus, the Middle Atlantic, Mountain, West Northcentral and West Southcentral Divisions (the overachievers of Figure 2) would invest less of their own funds in schooling, whereas all remaining divisions would invest more of their own funds in public schooling.

The greatest percentage increase in federal assistance under the ability model would be in the Middle Atlantic Division (5.8 percent). At the other extreme, federal assistance would decrease by 11.5 percent in the South Atlantic Division and 11.4 percent in the East Southcentral Division. Under the ability model, both the South Atlantic and East Southcentral Divisions' schooling investments from divisional funds would exceed total investments; i.e., federal assistance would be negative. The ability equation dictates that these two divisions invest, from their own funds, more in schooling than the actual total investment in 1959-60.

Summary

Ability and effort to invest in schooling was examined as one dimension of the economics of social investment in schooling in the United States. Ability to invest was measured by a regression equation relating the level of investment to per capita income, percent of the

population enrolled in public school and nonpublic school enrollment as a percent of public school enrollment. Effort to invest was measured by comparing the investment level suggested by the ability regression with the actual investment. States and divisions having low investment levels tended to have low abilities to invest but often exhibited greater efforts than the national norm. The highest levels of schooling investment among states and divisions were associated with the high abilities to invest but not necessarily with greater than average efforts to invest in schooling.

The social profitability of making greater investments in schooling within a particular division or in all divisions depends on the productivity of the added investment as well as the cost of the investment in terms of social opportunities foregone. In this chapter only the differences in opportunity cost of added investments among divisions is analyzed. In the following two chapters, the productivity of schooling investment is examined from the point of view of the nation as a whole and the individual divisions. In the final chapter the analyses of this chapter is tied to the productivity analysis to draw some conclusions concerning the profitability of added United States schooling investments and from where, and in what proportions, these investments should come.

CHAPTER III

MIGRATION AND SCHOOLING

In the previous chapter, ability to invest was examined as a determinate of the level of social investment in schooling. Another dimension of funding is the prevalence of the geographic disassociation of schooling inputs (investments) and outputs (benefits) resulting from geographic mobility of schooling recipients. This chapter is concerned directly with this dimension.

Profitability of schooling investment in a particular division depends on the proportion of the total benefits which actually accrue within the investing division. Despite favorable national benefit-cost ratios, divisions losing a significant portion of the total benefits from investments in schooling (spillouts to other divisions) may realize low returns to schooling within their division. These divisions might be inclined to underinvest in schooling by national standards.

Schooling itself exacerbates the over-all problem of financing education. Through schooling, geographic mobility is increased. Therefore, more schooling investment leads to more disassociation of schooling benefits and costs. The greater the cost the greater the probability of the associated benefits being realized outside the division making the investment.

The aims of this chapter are to:

(1) Compute the probability of interdivisional movement of

persons by age and schooling level during the period 1955-60.

(2) Calculate the net migration rates for every race-sex-age-schooling group.

(3) Study the relationship between previous schooling investment and interdivisional migration by calculating net migration elasticities with respect to schooling for each race-sex group for each division.[1]

The net migration rates employed in this analysis provide a basis for studying the effects of age and schooling on the probability of net movement to a division, and provide a foundation for estimating gains and losses of schooling benefits to be used in later chapters.

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[1]Migration data are taken from: U. S. Department of Commerce, Bureau of the Census, Census of Population, 1960, Subject Report, Recent and Lifetime Migration, PC(2)2P (Washington, D. C.: 1964), Table 8. The migration data are available by years of school completed for the population 25 to 64 years of age in 1960, by division of residence in 1960, division of 1955 residence, division of birth, and race-sex group. Individuals were initially classified according to their characteristics as of April 1, 1960. They were listed by (1) division of 1960 residence, (2) race-sex group (white male and female, nonwhite male and female), (3) age (eight five-year intervals from 25-29 through 60-64 years of age), and (4) years of school completed by seven categories--elementary: less than 5 years, 5 to 7 years, 8 years; high school: 1 to 3 years, 4 years; college: 1 to 3 years and 4 or more years. The data allowed for several calculations by division-race-sex-age-schooling groups such as: (1) 1955 population, (2) 1960 population, (3) net migration rates (in-migrants minus out-migrants divided by the 1960 population), (4) gross migration rates (in-migrants plus out-migrants divided by the 1960 population), and (5) return migration rates (the percentage of in-migrants who return to the division of their birth). Also by comparing all migrants with the total population over all divisions by age-schooling groups, the probability of inter-divisional movement (percentage of the population who changed division of residence during 1955-60) was calculated for each age-schooling group aggregated over the four race-sex groups. For a very comprehensive study of the migration data see: Ava Schwartz, "Migration and Life Span Earnings in the United States," (unpublished Ph.D. Thesis, University of Chicago), 1968.

Selectivity in Interdivisional Migration

The probability of interdivisional mobility among all divisions was calculated by expressing the number of migrants during the period 1955-60 as a percent of the total sample for all possible age-schooling groups aggregated over the nine divisions and four race-sex groups. A simple selectivity index technique and multiple regression analysis were applied to the probability data to study the relation of age and schooling to interdivisional mobility.

Table III shows that interdivisional mobility for the 1955-60 period was greatest among the young and better educated people and was least among the old and less educated. Over all schooling-age groups of Table III, the 25-29 year olds with at least a college education exhibited the highest mobility rate of all: 27.6 percent changed division of residence during 1955-60. The least mobile of all schooling-age groups was the 60-64 year olds with only 1-4 years of school: 1.8 percent changed division of residence during 1955-60. Aggregated over all age groups, mobility by schooling groups ranged from a low of 2.8 percent for the lowest schooling group (1-4 years) to a high of 13.7 percent for those with the most schooling (4 or more years of college). And aggregating over schooling groups, mobility ranged from a low of 2.9 percent for the 55-59 year olds to a high of 13.8 percent for those persons 25-29 years of age. The 60-64 year old group was more mobile than the 55-59 year old group largely because of high North-South migration of retirees.

TABLE III

PERCENTAGE OF UNITED STATES POPULATION 25-64 YEARS OF AGE LIVING OUTSIDE DIVISION OF 1955 RESIDENCE IN 1960 BY AGE AND SCHOOLING ATTAINMENT

Age	Years of Schooling							Total
	Elementary			High School		College		
	1-4	5-7	8	1-3	4	1-3	4 or more	
25-29 years	5.8	8.1	9.9	10.6	12.4	19.1	27.6	13.8
30-34 years	4.7	5.9	6.7	7.1	7.9	11.9	18.2	8.8
35-39 years	3.8	4.4	4.9	5.4	6.6	10.1	13.5	6.9
40-44 years	3.0	3.3	3.6	4.1	5.2	8.1	10.4	5.1
45-49 years	2.5	2.6	2.9	3.4	4.2	5.8	7.5	3.8
50-54 years	2.2	2.3	2.6	3.0	3.7	4.6	5.9	3.2
55-59 years	2.0	2.1	2.5	3.1	3.6	4.1	5.0	2.9
60-64 years	1.8	2.9	2.7	3.3	4.0	4.2	4.9	3.1
Total	2.8	3.5	3.8	5.3	6.8	9.6	13.7	6.2

Source: Compiled with data from U. S. Department of Commerce, Bureau of the Census, Census of Population, 1960, Subject Report, Lifetime and Recent Migration, PC(2)2P, (Washington, D. C: 1964), Table 8.

Selectivity Index

From the interdivisional mobility factors of Table III, indexes of selectivity of migration were computed with respect to age and schooling.[2] The selectivity index with respect to age, S_A, is defined as:

$$S_A = \frac{M_A - M_t}{M_t} 100$$

where:

M_A = migration rate of each of the eight age groups over all education groups, and

M_t = average migration rate over all schooling and age groups.

The selectivity index with respect to schooling, S_S, is defined as:

$$S_S = \frac{M_S - M_t}{M_t} 100$$

where

M_S = migration rate of each of the seven schooling groups aggregated over all age groups.

A plus sign indicates overselectivity for migration in any particular age or schooling group in relation to the over-all average migration rate. A minus sign indicates underselectivity within a given group in relation to the over-all average migration rate.

Figure 3 shows the selectivity index with respect to schooling (S_S), and Figure 4 shows the index with respect to age (S_A). Each

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[2]This technique was based upon the methodology outlined by Elmer H. Johnson, "Methodology Note on Measuring Selection in Differential Migration," Social Forces, Vol. XXXIII, No. 3 (March, 1955), pp. 289-292. A similar approach was also used by Rein.

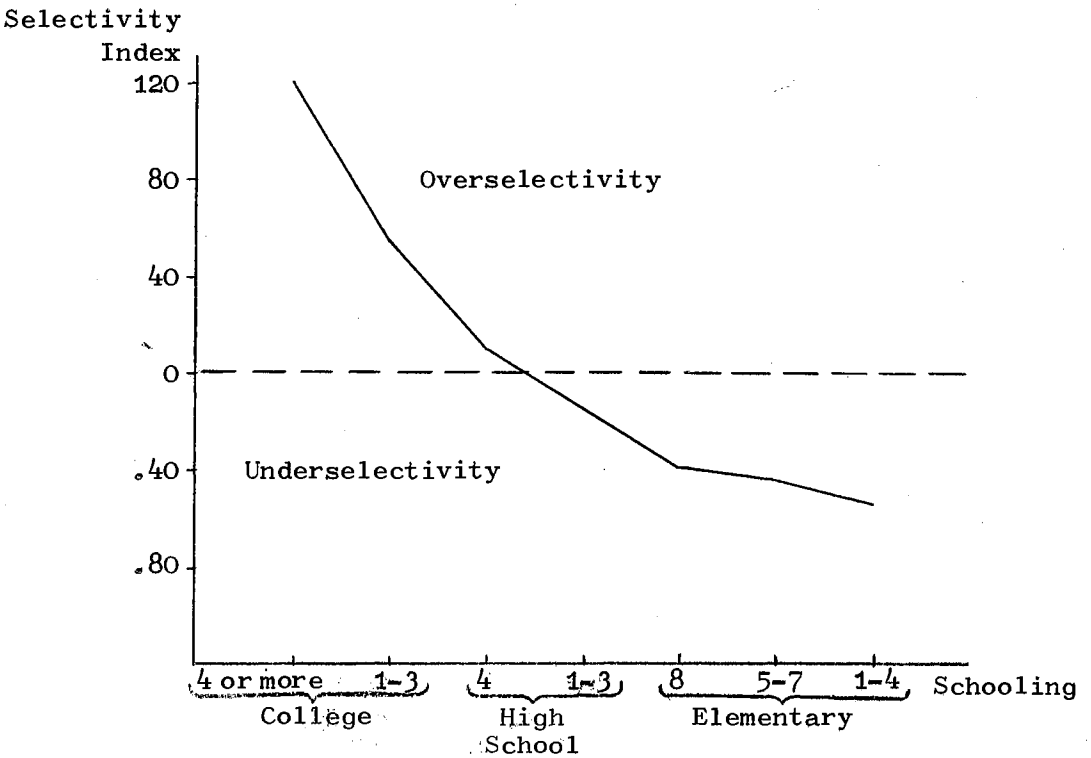

Figure 3. Selectivity of Interdivisional Mobility With Respect to Schooling, United States, 1955-60

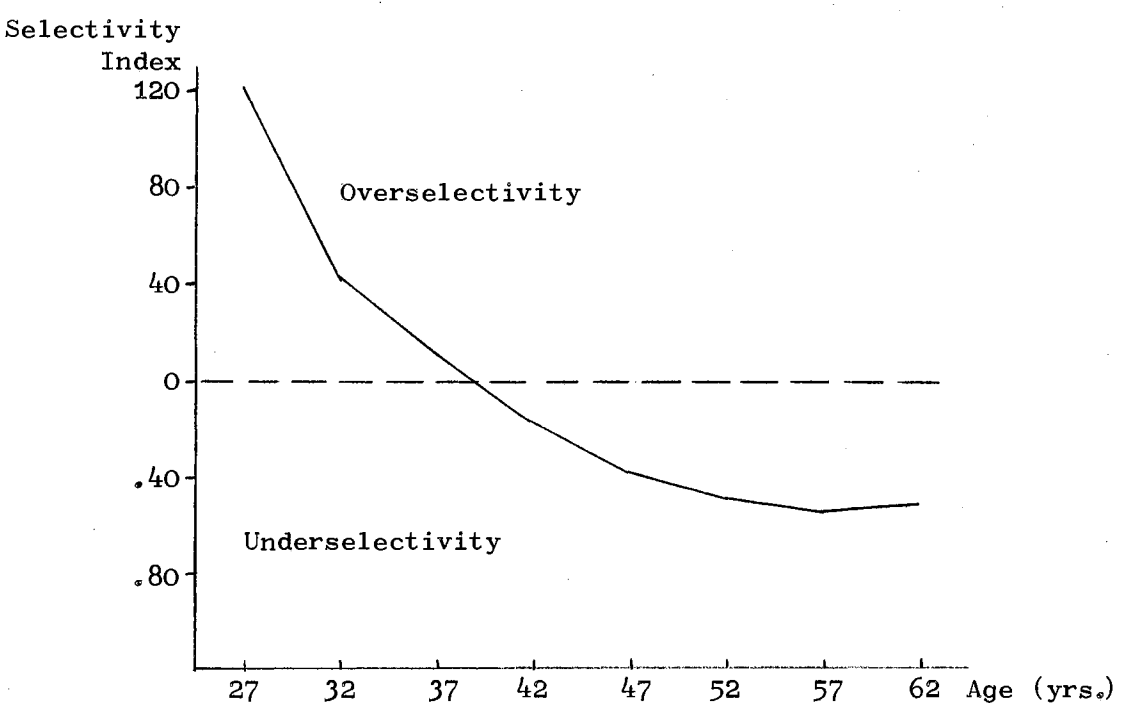

Figure 4. Selectivity of Interdivisional Mobility With Respect to Age, United States, 1955-60

figure contains two regions - overselectivity and underselectivity. Selectivity on the basis of age and schooling follows much the same pattern. The magnitudes of the schooling selectivity indexes in the higher schooling groups and of the age selectivity indexes in younger age groups are similar. Likewise, the selectivity indexes are similarly low in lower schooling groups and older age categories. There is over-selection in the three highest schooling levels and the three youngest age groups, and underselection in the four lowest schooling levels and four oldest age groups.

Multiple Regression Analysis

Multiple regression analysis based on the data in Table III was also employed to study the effects of age and schooling on interdivisional mobility. Such analysis allows one to "hold constant" one of the independent variables and study the effects of the other on interdivisional mobility. It also shows how much variation in mobility is explained independently by the two variables and by the interaction between the two variables. The regressions are as follows:

$$M_{ij} = 11.88 - .262X_{1(ij)} + .596X_{2(ij)} \qquad (1)$$

$$(8.15)^{**} \qquad (6.84)^{**} \qquad \text{t values in parenthesis}$$

$$R^2 = .68$$

$$M_{ij} = -2.40 + .059X_{1(ij)} - .033(X_{1(ij)}X_{2(ij)}) + 2.04X_{2(ij)} \qquad (2)$$

$$(0.89) \qquad (5.24)^{**} \qquad (7.17)^{**}$$

$$R^2 = .79$$

where:

M_{ij} = Interdivisional migration probability of persons in

the i^{th} age group and j^{th} schooling group.

X_1 = Median ages in each of the eight age groups of Table III.

X_2 = Schooling, where 3, 6, 8, 10, 12, 14, and 16 years of schooling were used as the median schooling levels for the seven schooling groups in Table III.

Equation (1) suggests that both age and schooling are highly significant in explaining interdivisional mobility. Coefficients of both variables are significant at the .01 level. However, Equation (2), which includes the interaction term, suggests that age, in fact, has an insignificant independent effect on interdivisional mobility. Schooling, on the other hand, has a highly significant positive effect on mobility. The highly significant negative coefficient of the interaction between age and schooling indicates a dampening of the positive effects of the two variables taken separately. That is, when age is held constant and schooling increased, some of the independent positive effect of schooling on mobility is offset by the negative influence of the interaction between age and schooling. Equation (3) explains substantially more of the variation in interdivisional mobility than does Equation (2) - 79 percent as compared to 68 percent.

Equation (2) indicates that the selectivity index with respect to age in the previous section is misleading. The selectivity index suggested that mobility was inversely related to age. Equation (2) suggests that this negative relationship resulted from the interaction of age and education.

Net Migration Rates by Division

Table IV summarizes net migration rates by schooling levels for four race-sex groups and for the total population for each of the nine U. S. Census Divisions. Estimates of the elasticity of net migration with respect to schooling are shown for each race-sex group and the aggregate over all race-sex groups within each division to gain more precision in quantifying the effects of schooling on net migration. These point elasticities of net migration are based on a simple linear regression relating the seven net migration rates of Table IV to years of schooling (represented by the median value of each group as in Equation (1)). Elasticities show the percentage increase in net migration rates associated with a one percent increase in schooling level with age held constant.

Positive elasticities of net migration with respect to schooling indicate an overselection for migration in the higher schooling groups; negative elasticities indicate a selectivity which favors the least educated. For instance, an elasticity of net migration of 1.00 indicates that as schooling increases by one percent, net migration to (or from) the division in question also increases by one percent. On the other hand, an elasticity of net migration with respect to schooling of -0.50 indicates that if the level of schooling increases by one percent the net migration rate to (or from) the division in question diminishes by 0.5 percent.

The elasticities of net migration for whites and for the total population for each division are thought to be reliable since the sample sizes are substantial for all schooling groups. But the elasticities of net migration for nonwhites, especially in the New England, West

TABLE IV

NET MIGRATION RATES AND ELASTICITIES OF NET MIGRATION OF THE POPULATION 25-64 YEARS OF AGE BY SCHOOLING ATTAINMENT, BY RACE-SEX GROUP, BY DIVISIONS, 1955-60

Division and Race-Sex Group	Years of Schooling: Elementary 1-3	Elementary 5-7	Elementary 8	High School 1-3	High School 4	College 1-3	College 4 or more	Total	Elasticity of Net Migration
	Net Migration Rates								
New England									
White Males	-0.47	-0.57	-0.91	-1.21	-1.09	-1.23	-2.24	-1.16	1.04
White Females	-0.45	-0.76	-0.86	-1.23	-1.23	-1.51	-0.57	-1.09	.39
Nonwhite Males	6.91	8.12	5.75	6.11	7.32	6.54	-3.12	6.24	-0.77
Nonwhite Females	5.51	9.32	6.72	6.44	5.28	3.76	0.56	6.17	- .68
Total	-0.07	-0.34	-0.74	-1.04	-1.06	-1.30	-1.62	-0.97	1.28
Middle Atlantic									
White Males	-0.69	-0.85	-1.14	-1.59	-1.98	-2.91	-1.93	-1.65	.93
White Females	-0.95	-0.96	-1.31	-1.80	-2.30	-2.86	-2.26	-1.88	.80
Nonwhite Males	2.54	2.74	2.10	1.99	1.66	1.64	4.37	2.24	0.02
Nonwhite Females	2.96	3.39	2.51	2.52	1.90	1.81	5.64	2.64	.24
Total	-0.14	-0.37	-0.98	-1.35	-1.95	-2.67	-1.85	-1.44	.76
East Northcentral									
White Males	0.34	-1.22	-0.72	-1.51	-1.20	-1.91	-1.87	-1.25	1.24
White Females	-0.06	-0.46	-1.00	-1.87	-1.83	-2.40	-2.40	-1.62	1.30
Nonwhite Males	2.68	2.01	1.46	1.20	0.68	0.10	-0.55	1.40	-1.49
Nonwhite Females	2.99	3.04	2.26	1.68	0.87	0.71	5.23	2.00	.03
Total	0.81	-0.34	-0.68	-1.42	-1.45	-2.03	-1.93	-1.20	1.85
West Northcentral									
White Males	-1.31	-3.17	-1.83	-3.07	-2.59	-3.61	-5.84	-2.92	.93
White Females	-1.41	-1.64	-1.77	-3.03	-3.25	-4.08	-5.52	-3.01	1.11
Nonwhite Males	2.32	1.67	0.72	-0.87	0.14	-2.05	-3.88	0.32	-12.15
Nonwhite Females	2.16	1.03	0.87	-1.01	-1.27	-2.13	-3.58	-0.28	14.23
Total	-0.78	-2.22	-0.73	-2.94	-2.92	-3.85	-5.68	-2.86	1.19
South Atlantic									
White Males	0.74	0.98	3.32	2.91	3.21	3.24	2.94	2.51	.75
White Females	1.06	1.14	4.22	3.59	4.28	4.26	3.65	3.40	.73
Nonwhite Males	-0.44	-1.16	-2.32	-2.65	-3.41	-3.54	-3.11	-1.57	1.03
Nonwhite Females	-0.71	-1.31	-2.27	-2.54	-3.22	-3.32	-3.27	-1.90	.87
Total	-.15	-.36	2.62	2.21	3.15	3.21	2.60	1.98	1.11

TABLE IV (Continued)

Division and Race-Sex Group	Years of Schooling: Elementary 1-3	Elementary 5-7	Elementary 8	High School 1-3	High School 4	College 1-3	College 4 or more	Total	Elasticity of Net Migration
	Net Migration Rates								
East South central									
White Males	-1.45	-1.64	-1.80	-1.56	-1.56	-2.11	-5.08	-1.94	.92
White Females	-1.20	-1.75	-1.70	-1.56	-1.77	-2.32	-4.01	-1.84	.85
Nonwhite Males	-2.40	-3.48	-4.95	-6.25	-8.62	-9.56	-10.11	-4.34	.98
Nonwhite Females	-2.17	-3.23	-4.46	-5.20	-7.26	-8.64	-7.10	-4.21	.86
Total	-1.77	-2.16	-2.22	-2.24	-2.20	-2.75	-4.99	-2.36	.69
West South central									
White Males	-1.76	-0.82	-0.77	-0.68	-1.55	-1.97	-3.62	-1.48	.92
White Females	-1.82	-0.72	-0.33	-0.64	-0.51	-1.39	-2.01	-0.85	.03
Nonwhite Males	-0.75	-1.44	-2.77	-3.48	-4.30	-4.95	-7.41	-2.28	1.47
Nonwhite Females	-0.63	-1.29	-2.33	-2.72	-3.32	-4.64	-4.59	-2.08	1.26
Total	-1.44	-0.91	-0.87	-0.98	-1.12	-1.86	-3.17	-1.31	.86
Mountain									
White Males	1.57	2.10	4.32	5.20	5.67	6.76	5.22	4.97	.81
White Females	1.19	2.02	4.26	5.15	6.57	5.97	5.72	5.37	.83
Nonwhite Males	0.64	4.36	2.14	3.34	1.82	-2.81	-2.91	1.83	-1.76
Nonwhite Females	0.35	3.49	2.39	3.18	2.10	8.33	7.70	2.66	1.64
Total	1.19	2.24	4.22	5.10	6.08	6.26	5.36	5.05	.83
Pacific									
White Males	6.00	8.96	5.02	5.44	4.78	5.47	10.56	6.15	.20
White Females	7.08	6.11	5.80	5.77	5.63	5.82	7.96	5.96	.04
Nonwhite Males	3.09	4.17	5.06	6.79	5.50	7.84	11.65	5.75	.73
Nonwhite Females	4.09	6.13	5.68	8.02	5.96	7.93	11.95	6.69	0.68
Total	5.67	7.25	5.38	5.76	5.30	5.77	9.65	6.07	.27

Source: U. S. Department of Commerce, Bureau of the Census, Census of the Population, 1960, Subject Report, Recent and Lifetime Migration, PC(2)2P (Washington, D. C.: 1964), Table 8.

Northcentral and Mountain Divisions and especially in the higher education groups, may be misleading because of the small sample size.

Northeast Divisions

The New England and Middle Atlantic Divisions experienced substantial net outmigration rates for white males and females but even greater net inmigration rates for nonwhites. Over all schooling groups, New England experienced net outmigration rates of 1.16 and 1.09 percent for white males and females, respectively, and net inmigration rates of 6.24 for nonwhite males and 6.17 for nonwhite females. The elasticities of net migration with respect to schooling suggest for both of the Northeast Divisions that: (1) the outmigration of whites, both male and female, was highly selective in favor of better educated persons, (2) the inmigration of nonwhites favored the least educated groups as denoted by the negative elasticities, and (3) aggregated over all race-sex groups the net outmigration displayed high selectivity for the better educated groups.

Northcentral Divisions

The Northcentral Divisions experienced substantial net outmigration of whites with the net migration strongly favoring the better educated groups. The East Northcentral Division incurred outmigration rates of 1.25 and 1.62 of white males and white females, respectively. White males and females migrated from the West Northcentral Division at net rates of 2.92 and 3.01, respectively, during the 1955-60 period. The elasticity of net migration with respect to schooling for white males and females for both the East Northcentral and West Northcentral

Divisions was near or greater than unity, suggesting a high degree of outmigration selectivity for the better educated. The sample of nonwhites was not large enough to place strong confidence in migration calculations for either division. However, the figures do suggest some inmigration of nonwhites, especially the less educated.

Southern Divisions

The South Atlantic Division experienced high inmigration of whites and high outmigration of nonwhites. The migration, for whites as well as nonwhites, favored the better educated groups. That is, the South Atlantic Division tended to gain better-educated whites and lost better-educated nonwhites. Aggregated over race-sex groups, the South Atlantic Division had a net inmigration rate of 1.98 and a migration elasticity with respect to education of 1.11.

The East Southcentral and West Southcentral Divisions experienced substantial outmigration for all races, and the outmigration rates of nonwhites were more than twice the outmigration rates of whites. On all counts, selectivity was high for the better educated. The net outmigration rate over all race-sex groups was 2.36 percent for the East Southcentral Division and 1.31 percent for the West Southcentral Division.

Western Divisions

The Mountain Division had high net inmigration rates across all race-sex groups. The net inmigration rates for whites was substantially higher than those for nonwhites. Selectivity in the white groups favored the better educated groups as denoted by a net migration

elasticity of .81 for white males and .83 for white females. The number of nonwhites within the Division and the flows to and from the Division during 1955-60 were too small for any conclusive statements concerning migration of nonwhites. The over-all net inmigration rate to the Mountain Division was 5.05 percent, second in magnitude only to the Pacific Division. The over-all elasticity of migration with respect to schooling was .83.

The Pacific Division incurred very high inmigration rates over all race-sex groups and the total inmigration rate was 6.07 percent. Inmigration rates were of similar magnitudes for the four race-sex groups. Migration into the Pacific Division displayed no significant selectivity among schooling groups for whites. However, inmigration to the Division was selective for the better educated nonwhites. For the total population, the elasticity of migration with respect to schooling was the lowest of any division (.27).

In summary, 6.2 percent of persons 25-64 years of age in 1960 changed divisions of residence during 1955-60. This interdivisional mobility favored the young and well-educated. Among divisions, inmigration was highest in the Pacific Division, and outmigration was highest in the West Northcentral Division. The elasticity of net migration with respect to education across race-sex groups was highest for migration from the East Northcentral Division and lowest for migration to the Pacific Division.

Summary

The disassociation of schooling costs and benefits presents problems in financing schooling in the United States. The positive

correlation between schooling and interdivisional mobility point up one problem of financing schooling investments among divisions - that of who should finance the investment.

In the following chapters, measures of disassociated schooling costs and benefits derived from divisional net inmigration rates by age and schooling are employed to compute divisional gains and losses of schooling capital embodied in migrants. These estimates of gains and losses are then employed to allocate schooling expenditures more equitably among divisions on the premise that divisional schooling investment should be geared to realized benefits from schooling.

CHAPTER IV

NATIONAL AND DIVISIONAL BENEFITS TO SOCIAL INVESTMENT IN SCHOOLING

Returns from schooling investment in a given geographic division from a national point of view are measured by the over-all productivity of the investment. On the other hand, returns from schooling investment in the division from a divisional point of view are measured by the over-all productivity of investment adjusted for the disassociation of the benefits and the investment. Formally, national benefits, B_j^N, to schooling investment made in division j and benefits actually accruing within the division (divisional benefits), B_j^D, are related as follows:

$$B_j^N = P_j \cdot B_j^D \qquad (1)$$

where P_j is the portion of benefits resulting from investment within division j which actually accrue within division j. The magnitude of P_j depends on the structure of net migration with respect to age and schooling. With a given over-all net migration rate of people, a selectivity of outmigration for the young and well-educated would result in a greater proportion of the schooling benefits being lost (a smaller P_j) than would be the case when the net outmigration exhibited selectivity for the aged and less educated.

The purpose of this chapter is to:

(1) Calculate total and per student national benefits from

schooling investment by major level of schooling for the four U. S. Census Regions.

(2) Calculate total and per student benefits from schooling investment aggregated over all levels of schooling from a national and divisional point of view for each of nine U. S. Census Divisions.

(3) Compute both benefit-cost ratios and internal rates of return to schooling investment aggregated over all levels of schooling from both the national and divisional point of view for each division.[1]

(4) Draw general inferences about optimal schooling investment levels among divisions based on the calculated benefit-cost ratios and internal rates of return from the national and divisional points of view.

Throughout the remainder of this study, benefit-cost ratios and internal rates of return accruing to the particular division where the investment was made are termed divisional benefit-cost ratios and divisional rates of return. On the other hand, the terms national benefit-cost ratios and national rates of return are applied to the profitability of investment in the particular division from the national point of view.

Earnings data for 1959 are used here to calculate the benefits from the 1959-60 schooling investment for each of the four U. S. Census Regions and nine Census Divisions. Divisional earnings data are not available; therefore, earnings of persons of a given 1959

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[1]The estimates of the level of schooling investment from the national point of view (including federal, state, and local expenditures) and from the divisional point of view (which includes only state and local expenditures) are taken from Appendix A.

race-sex-age-schooling group are assumed to be equal in all divisions within a given region.

The earnings data are from the One-in-One Thousand Sample of the 1960 Census of Population and represent wages and salaries plus self-employment income for all persons within the four U. S. Census Regions (outlined in Chapter I) and for each of four race-sex groups (white males, nonwhite males, white females, and nonwhite females). These earning data were further classified according to 1960 age and schooling attainment. The twelve age groups classified according to nine schooling groups ranged from 14-15 years of age to 75 years and above. From this cross classification of 1959 earnings by age and schooling, age-earnings profiles for each of eight schooling levels (from no schooling through four years of college) were computed for each race-sex group within each region.

Theoretical Framework for Assessing Benefits From Schooling Investments

National Benefits

National benefits from schooling investment are defined as the present value of all additional lifespan earnings resulting from the schooling investment. Benefits from investment in the marginal level of schooling (k) are defined as the present value of the additional lifespan earnings of persons completing the k^{th} level of schooling over the earnings of persons completing the $(k-1)^{th}$ level of schooling.

Two approaches were used to compute benefits aggregated over schooling levels within each of the four regions and/or nine divisions. The first was to compute age-earnings profiles for each of the eight

schooling groups within each of the 16 region-race-sex groups. The second was to compute age-earnings profiles for each schooling group aggregated over the four race-sex groups for each of the four regions.

Formally, the first alternative for computing total national benefits, B_1, from all United States schooling investment is expressed in Equation (2) and the second alternative, B_2, is expressed in Equation (3).

$$B_1 = \sum_{j=1}^{9} \sum_{k=1}^{7} \sum_{n=1}^{74} P_{jk}(b_{njk})_1 \ (1+r)^{-(n-a)} \qquad (2)$$

where:

j = division

k = schooling level

where:

k = 7, 4 years of college

k = 6, 1-3 years of college

k = 5, 12 years of schooling } Secondary Schooling

k = 4, 9-11 years of schooling }

k = 3, 8 years of schooling

k = 2, 5-7 years of schooling } Elementary Schooling

k = 1, 1-4 years of schooling }

n = age

a = age at finishing the k^{th} level of schooling and is the same as used by Hanoch

P_{jk} = number of persons enrolled in division j in schooling level k in 1959-60 (See Appendix B, Table XIV)

r = discount rate of six percent

$(b_{njk})_1$ = average annual benefit from schooling for the average person in division j and schooling level k of age n in the One-in-One Thousand Sample of the 1960 Census of Population.

$$= \sum_{s=1}^{4} \left[\left(\frac{\sum_{u=1}^{U} E_{njksu}}{U} \right) - \left(\frac{\sum_{v=1}^{V} E_{nj(k-1)sv}}{V} \right) W_s \right]$$

where:

S = race-sex group

u = persons with schooling level k

U = last counted person in the One-in-One Thousand Sample with schooling level k within race-sex group S

E = annual earnings of persons from the One-in-One Thousand Sample

v = person with schooling level (k - 1)

V = last counted person in the One-in-One Thousand Sample within race-sex group S with schooling level (k - 1)

$W_s = \frac{(U + V)}{(X + Y)}$

= the proportion of all persons in the One-in-One Thousand Sample having k and (k - 1) levels of schooling belonging to race-sex group S

where:

X = last person counted in the One-in-One Thousand Sample with schooling level k over all race-sex groups

Y = last person counted in the One-in-One Thousand Sample with schooling level (k - 1) over all

race-sex groups.

An alternative measure of benefits is:

$$B_2 = \sum_{j=1}^{9} \sum_{k=1}^{7} \sum_{n=a}^{74} P_{jk}(b_{njk})_2(1+r)^{-(n-a)} \qquad (3)$$

where:

$(b_{njk})_2$ = average annual benefit from schooling for the average person in division j and schooling level k of age n in the One-in-One Thousand Sample of the 1960 Census of Population

$$= \frac{\sum_{x=1}^{X} E_{njkx}}{X} - \frac{\sum_{y=1}^{Y} E_{nj(k-1)y}}{Y}$$

where:

x = person with schooling level k

y = person with schooling level (k - 1).

Both B_1 and B_2 represent the expected social benefits from schooling for all persons in 1959-60 enrolled in elementary school through four years of college within all nine divisions. Whereas the aggregate profiles (over all race-sex groups) computed in Equation (3) are easy to construct, the computation has a major shortcoming: it assumes the race-sex structure is constant across adjoining schooling levels. B_1, although involving greater effort to compute, allows for differing race-sex structure across schooling groups.

Equation (2) is used to compute national benefits by major levels of schooling (elementary, secondary, and college schooling) and schooling benefits aggregated over all schooling levels within each region.

Equation (3) is also used to compute national benefits aggregated over all levels by regions and division. However, Equation (3) is not used to compute benefits by major levels of schooling. Because of differences in the race-sex structure of different schooling groups, Equation (3) tends to underestimate benefits to lower schooling levels and slightly overestimate benefits to higher schooling levels. Nonwhites, who within a given age-schooling group earn less than their white counterparts, comprise a greater than average proportion of the sample in the lower schooling groups and comprise less than the average proportion of the total sample in higher schooling groups.

Aggregated over all levels of schooling, Equation (3) may underestimate the benefits from schooling. But Equation (3) estimates are more easily adjusted for interdivisional mobility than are estimates of Equation (2). Thus, Equation (3) is used to compute <u>divisional</u> benefits from schooling investment.

<u>Divisional Benefits</u>

The aggregate age-earnings profiles employed in Equation (3) are also employed in Equation (4) to compute schooling benefits from the point of view of the investing division. Divisional benefits are calculated by adjusting the <u>regional</u> aggregate age-earnings profiles (see Appendix B, Table XV) for <u>divisional</u> net migration rates (also aggregated over the four race-sex groups). Net migration rates aggregated over the four race-sex groups were used because such aggregates greatly reduced the calculations to obtain estimates of divisional benefits.

Schooling benefits accruing within division j, B_j^D, are computed as follows:

$$(B_j^D) = \sum_{k=1}^{7} \sum_{n=1}^{74} P_k (b_{nk}^D) \ (1+r)^{-(n-a)} \qquad (4)$$

where:

P_k = number of persons enrolled in schooling level k in 1959-60 (see Appendix B, Table XIII)

$$b_{nk}^D = \frac{\sum_{x=1}^{X} E_{nkx}(1+\alpha)_{nkx}}{X} - \frac{\sum_{y=1}^{Y} E_{n(k-1)y}(1+\alpha)_{n(k-1)y}}{Y}$$

where:

$\alpha = \sum_{n=(a+1)}^{q} \gamma_n$; (see Appendix B, Table XVII),

where:

q = median year of the age group in question.

γ = annual probability of net inmigration to division j (see Appendix B, Table XVI).

Therefore, the net gains to division j from interdivisional migration of schooling benefits are:[2]

$$(\Delta B_j^D) = \sum_{k=1}^{7} \sum_{n=1}^{75} P_k \ (\Delta b_{nk}^D) \ (1+r)^{-(n-a)} \qquad (5)$$

where:

$$(\Delta b_{nk}^D) = \frac{\sum_{x=1}^{X} E_{nkx} \ \alpha_{nkx}}{X} - \frac{\sum_{y=1}^{Y} E_{n(k-1)y}\alpha_{n(k-1)y}}{Y}.$$

[2] Net gains of benefits is also equal to (B_j^D) from Equation (4) minus $(B_j)_2$ derived from Equation (3).

Interdivisional annual migration adjustments (γ) were derived from The Census of Population, 1960 (Subject Report, Recent and Lifetime Migration, PC(2)2P, Table 8) and Net Migration of the Population, 1950-60, by Age, Sex, and Color, Vol. II.[3] The migration factors (α), shown in Appendix B, Table XVI, represent the sum of the annual probabilities of net inmigration (γ) to the division in question (shown in Appendix B, Table XV) from the year of entering the workforce ($n = a + 1$). For instance, a migration factor (α) of 0.10 for the 55-59 year old group with 12 years of schooling indicates that between the age of 20 years (the year of entering the workforce after finishing 12 years of school) and 57 years of age (the median age of 55-59 year age group), the cohort has increased by 10 percent. The assumption implicit within the migration factors is that of a static migration flow with respect to age and schooling level for the population in school in 1959-60. That is, the structure of interdivisional flows of people during 1955-60 with respect to age and schooling is applicable throughout the lifespan of all persons enrolled in school in 1959-60. For instance, persons completing 12 years of schooling in 1959-60 in division j will migrate out of (or into) division j at ages 55-59 years in the same annual proportions as 55-59 year olds migrated from (or to) division j during the period 1955-60.

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[3] The annual migration probabilities by education level from age 25-64 were computed from: U. S. Department of Commerce, Bureau of the Census, Census of the Population, 1960, Subject Report, Recent and Lifetime Migration, PC(2)2P (Washington, D. C.: 1964), Table 8. Migration probabilities from age 14-24 are computed from: Bowles, Gladys and James Tarver, Net Migration of the Population, 1950-60 by Age, Sex and Color, Vol. II, U. S. Department of Agriculture, Economic Research Service (Washington, D. C.: 1965). Migration probabilities by age from ages 14-24 were adjusted for the effects of schooling by the migration probabilities by schooling level over all age groups shown in Table IV of Chapter III.

The calculation of divisional net gains of schooling benefits also implicitly assumes that the benefits from an additional year of schooling is the same for migrants and nonmigrants. Migrants to and nonmigrants of division j with schooling level k are assumed to have the same 1959 level of annual earnings.

Benefits Accruing to the 1959-60 Schooling Investment

Equations (2) through (5) compute benefits from schooling investment in all marginal levels of schooling. Benefits from each marginal level of schooling are results of either two or three years of schooling investment. They do not represent the returns to any one year of investment. For instance, when the level of schooling is $k = 7$, the benefits derived from the previous equations are for completing four years of college versus completing one-to-three years of college - an average of two years of schooling. Likewise, when $k = 6$, the benefits represent those accruing from the first two years of college (one-to-three years versus no college).[4] Equation (6) formulates an adjustment factor, (V), to reduce the benefits derived from Equations (2) through (5) to those benefits accruing from only one year of investment. Equation (6) is as follows:

$$V = B' B_1^{-1} \tag{6}$$

where:

[4] When $k = 1$ and $k = 2$, the equations compute benefits derived from three years of investment -- 1-4 years versus no schooling and 5-7 years versus 1-4 years of schooling. The assumption here is the first six years of schooling (the average of 5-7 years) is broken into two equal parts designated by the two lower marginal levels of schooling.

B_1 = total benefits from investing in all marginal schooling levels over all divisions in the United States (taken from Equation (2)). Instead of B_1, the results of Equations (3) through (5) could be used,

B' = benefits accruing from the 1959-60 schooling investment,

$$= \left[\sum_{j=1}^{9} \sum_{k=1}^{7} B_{jk} \quad L_k \right] F^{-1}$$

where:

B_{jk} = benefits from the k^{th} level of schooling in division j,

L_k = proportion of the total schooling span (16 years) represented by the k^{th} level of school; $L_k = 2/16$ when $k = 3, 7$; $L_k = 3/16$ when $k = 1, 2$,

F = length in years of average schooling level = 16/7, where 16 years equal the total schooling span and seven in the number of marginal schooling levels.

The implicit assumption in the formulation of V is that benefits derived from investing in a given marginal schooling level are distributed evenly over the years of investment included in the marginal schooling. For instance, benefits from the last two years of college (four years of college over one-to-three years of college) are attributed equally to the third and fourth years of college. Likewise, the benefits derived from the last two years of elementary school (eight years over five-to-seven years) are attributed equally to the seventh and eighth years of schooling.

Benefit-Cost Ratios and Internal Rates of Return

Benefit-cost ratios and internal rates of return are employed below to evaluate the profitability of schooling investment from both the national and divisional points of view. Benefit-cost ratios relate the benefits to costs at a selected interest rate. An interest rate of six percent was used in this study and represents the assumed rate at which society can borrow capital for investment in schooling. At the six percent rate of interest, if the benefit-cost ratio is greater than one it is profitable for society to borrow money for schooling at six percent. If the benefit-cost ratio is less than one, it is not profitable to finance schooling when capital must be borrowed at six percent. The benefit-cost ratio provides an "all-or-nothing" criterion for evaluating investment proposals.

On the other hand, the internal rate of return technique calculates that rate of interest which allows the investor to "break even" if all capital is borrowed. The internal rate of return technique computes the rate of interest which sets the present value of net benefits equal to zero; i.e., finds that interest rate which yields a benefit-cost ratio of one. In this sense, it defines the average rate of interest that the investor can pay and just break even.

Formally, the benefit-cost ratio to total United States schooling investment in 1959-60, (B/C), is:

$$(B/C) = \frac{B_1 V}{C} \tag{7}$$

where:

B_1 is taken from Equation (2),

C = level of investment in schooling over all levels of

schooling and divisions (computed in Appendix A),

V = derived from Equation (6).

The national benefit-cost ratio for 1959-60 schooling investment in division j, $(B/C)_j$ is computed as follows:

$$(B/C)_j = \frac{(B_j)_1 \ (V_j)}{C_j} \tag{8}$$

where:

B_j is derived from Equation (2),

V_j is derived from Equation (6),

C_j = schooling costs from all sources (local, state, and federal) over all levels of schooling in division j.

The benefit-cost ratio from division j's point of view, $(B/C)_j^D$, is defined as:

$$(B/C)_j^D = \frac{B_j^D \ V_j^D}{C_j^D} \tag{9}$$

where:

B_j^D is taken from Equation (4),

C_j^D = divisional schooling costs (includes <u>state</u> and <u>local</u> funds only) over all schooling levels (computed in Appendix A),

V_j^D is derived as in Equation (6).

By comparing $(B/C)_j$ of Equation (8) and $(B/C)_j^D$ from Equation (9), one can determine if division j gains or loses from interdivisional migration of schooling recipients. If federal support for schools just

offsets net spillouts of schooling benefits, the two ratios will have the same value. In divisions that gain in absolute schooling benefits, $(B/C)^D_j > (B/C)_j$, since divisional schooling costs are always smaller than national costs.

The internal rate of return to all United States schooling investment through four years of college, R^N, is that interest rate that sets the net United States benefits (benefits-costs) equal to zero. Formally, R^N, is computed as follows:

$$\sum_{j=1}^{9} \sum_{k=1}^{7} \sum_{n=d}^{74} P_{jk}(b-c)_{njk}(1+R^N)^{-(n-D)} = 0 \qquad (10)$$

where:

d = year of beginning marginal level of schooling k,

b = benefits per person from schooling. Computed as in Equation (2) or Equation (3). Benefits per person as computed in Equation (3) are shown in Appendix B, Table XIV,

c = 1959-60 costs of schooling per student from all sources as computed in Appendix A.

The internal rate of return to divisional investment (aggregated over all divisions), R^D, is computed as follows:

$$\sum_{j=1}^{9} \sum_{k=1}^{7} \sum_{n=d}^{74} P_k(b^d - c^d)_{njk}(1+R^D)^{-(n-d)} = 0 \qquad (11)$$

where:

b^d = divisional benefits per person computed as in Equation (4) and represent the difference in the respective regional age-earning profiles of Appendix B, Table XIV adjusted for the divisional migration factors of

Appendix B, Table XVI,

c^d = divisional cost per student computed in Appendix A.

Documentation of Benefits and the Profitability of Schooling Investment

National Benefits by Region and Major Level of Schooling

Table V presents the estimated national benefits from the 1959-60 schooling investment for the three major levels of schooling in each U. S. Census Region and for the entire United States. These per student benefits represent the additional lifespan earnings of schooling group k over the earnings of schooling group (k - 1) discounted at six percent to the year of finishing the marginal level of schooling (k). Specifically, per student benefits from 1959-60 investment in each major level of schooling are found by adjusting the results of Equation (2) by the value of V from Equation (6) and dividing by total enrollment. Table V also presents costs per student by major level of schooling for each region. These cost estimates represent direct costs (from federal, state, and local sources), plus indirect cost (foregone earnings of students). The national benefit-cost ratios of Table V are derived from Equation (8). Equation (10) is used to derive the national rate of return by major level of schooling by regions and employs per person benefits as derived in Equation (2).

National benefits per student aggregated over all schooling levels and regions in the United States averaged $2,349. National benefits per student in the Northcentral Region were the highest ($2,706) whereas benefits per student were lowest in the Southern Region ($2,012). Among

TABLE V

BENEFITS, COSTS, BENEFIT-COST RATIOS, AND INTERNAL RATES OF RETURN TO PUBLIC SCHOOLING INVESTMENT, BY MAJOR LEVEL OF SCHOOLING, BY REGIONS, UNITED STATES

Region	Elementary	High School	College	Average
Northeast				
Cost (Dols. per student)[a]	648	1550	4218	1109
Benefit (Dols. per student)[b]	2074	2496	4935	2373
Benefit-Cost Ratio	3.20	1.61	1.17	2.14
Rate of Return (Pct.)	14.6	9.0	6.9	11.8
Northcentral				
Cost (Dols. per student)	547	1188	4039	905
Benefit (Dols. per student)	2122	3623	6059	2706
Benefit-Cost Ratio	3.88	3.05	1.50	2.99
Rate of Return (Pct.)	15.8	14.1	8.2	13.9
South				
Cost (Dols. per student)	398	874	3463	664
Benefit (Dols. per student)	1568	2998	3913	2012
Benefit-Cost Ratio	3.94	3.43	1.13	3.03
Rate of Return (Pct.)	16.1	16.9	6.8	14.6
West				
Cost (Dols. per student)	611	1345	3928	1024
Benefit (Dols. per student)	1815	3591	3889	2345
Benefit-Cost Ratio	2.97	2.67	0.99	2.29
Rate of Return (Pct.)	12.0	14.0	5.8	11.0
United States				
Cost (Dols. per student)	531	1204	3904	893
Benefit (Dols. per student)	1880	3141	4763	2349
Benefit-Cost Ratio	3.54	2.61	1.22	2.63
Rate of Return (Pct.)	14.6	13.8	7.0	13.0

[a] Taken from Appendix A.

[b] Derived as in Equation (2) and adjusted by Equation (6).

the three major schooling groups, social investment in college education in 1959-60 reaped the most benefits per student ($4,763). The benefits per student from a year of college were 52 percent higher than benefits from high school and 153 percent larger than the benefits for investing in an elementary school student.

Among regions, there was a direct correlation between the level of investment and the benefit-cost ratios and internal rates of return (Table V). In the South, where the investment from divisional plus federal sources was lowest ($664 per student), both the benefit-cost ratio (3.03) and the internal rate of return (14.6 percent) from the national point of view were highest among the four regions. On the other hand, the Northeast and West, with similar levels of schooling investment ($1,109 and $1,024 per student, respectively), had the lowest benefit-cost ratios of 2.14 and 2.29 and internal rates of return of 11.8 and 11.0 percent, respectively. This inverse relationship between the level of investment and the return from the investment suggest that, from the point of view of total United States schooling investment, some reallocation would be economically profitable. The reallocation, based on the optimizing principle that the rate of return be the same in all regions, suggests that more investment in schooling be made in the South.

The highest benefit-cost ratios and internal rates of return among regional-schooling level groups was obtained from investing in elementary schooling in the Northcentral and Southern Regions and in secondary schooling in the Southern Region. The lowest profitability came from college investment in the West. For the United States as a whole, investment in elementary schooling was the most profitable even though the

absolute level of benefits per student was lowest among major schooling groups. For United States elementary schooling, the benefit-cost ratio was 3.54 and the internal rate of return was 14.6 percent. This compares with benefit-cost ratios of 2.31 and 1.22 for high school and college, respectively; and an internal rate of 13.8 percent for investment in high school and 7.0 percent in college. In summary, investment in elementary schooling was somewhat more profitable than investment in secondary schooling and substantially more profitable than investment in college.

National and Divisional Benefits by Divisions

National and divisional benefits accruing to investment within each division are compared in Table VI with estimated divisional net gains of schooling benefits from interdivisional migration. Among divisions, national benefits per student were highest in the West Northcentral Division ($2,354) and lowest in the East Southcentral Division ($1,985). The national benefits per student in the East Southcentral Division were 84 percent of those in the West Northcentral Division.[5] The similarity of national benefits per student among regions and divisions implies a

[5]Differences in national benefits among divisions within a given region result from differences in the grade structure of 1959-60 school enrollment. Within a given region, if one division has a higher per pupil national benefit than other divisions within the region, this implies that a bigger percentage of its students were enrolled in the more productive grades with regard to additional lifetime earnings. Some of the differences in per student benefits among regions can also be attributed to differences in the grade structure of the 1959-60 school year. For instance, the total Southern enrollment was comprised of larger percentages of elementary students and smaller percentages of college students than the enrollment in other regions. Thus, part of the lower benefits in the South can be attributed to schooling greater percentages of less productive enrollees in terms of the absolute level of benefits per student.

TABLE VI

NATIONAL AND DIVISIONAL BENEFITS FROM 1959-60 SCHOOLING INVESTMENT

Region and Division	Total		Per Student		Percentage Net Spillins[c]
	National[a]	Divisional[b]	National	Divisional	
	---- Mil. Dols. ------		------- Dols. ------		Pct.
Northeast	21,094.2	19,119.6	2211[d]	2004	- 9.4
New England	5,236.6	4,685.9	2263	2025	-10.5
Middle Atlantic	15,857.6	14,433.7	2194	1997	- 9.0
Northcentral	27,755.1	26,020.9	2335[d]	2189	- 6.3
East Northcentral	19,327.1	19,368.7	2327	2332	+ 0.2
West Northcentral	8,428.0	6,652.2	2354	1858	-21.1
South	26,609.8	25,082.5	2010[d]	1894	- 5.8
South Atlantic	12,276.1	12,374.3	2001	2017	+ 0.8
East Southcentral	5,975.0	4,906.5	1985	1630	-17.9
West Southcentral	8,358.7	7,801.7	2041	1905	- 6.7
West	13,878.7	17,829.8	2147[d]	2759	+28.5
Mountain	3,617.0	4,382.5	2126	2576	+21.2
Pacific	10,261.7	13,447.3	2155	2824	+31.0
United States	89,337.8	88,052.8	2172[d]	2141	- 1.4[e]

[a] Derived in Equation (3).

[b] Derived in Equation (4).

[c] Equal to ΔB_j^D of Equation (5) divided by divisional benefits.

[d] Derived from Equation (3). They can be compared with the regional benefits of Table V to compare the results of Equation (2) with those of Equation (3). The greatest difference between the results of Equation (2) and those of Equation (3) was for benefits derived in the Northcentral Region where the benefits from Equation (2) were 15.9 percent higher than benefits computed in Equation (3). The benefits from Equation (2) were 7.3, 0.1, 9.2 percent higher than benefits computed from Equation (3) for the Northeast, South and West Regions, respectively. For the United States benefits per student computed from Equation (2) were 8.1 percent higher than those computed from Equation (3).

[e] The loss of U. S. schooling benefits from interdivisional migration of 1.4 percent results because of the general tendency of net movements of persons from Regions with higher than average benefits per student to Regions with lower than average benefits per student. For instance the larger net loss of regional schooling benefits was from the Northeast Region whose benefits per student were 1.8 percent higher than the national average. On the other hand, the greatest gain in benefits from schooling was in the West where benefits per student were 1.2 percent below the national average. However, in the South low benefits per student was associated with net losses of benefits from migration but this was not large enough to yield a positive relation between interdivisional migration and a net gain in schooling benefits at the U. S. level. The small loss of schooling benefits from interdivisional migration of 1.4 percent serves as a very weak basis for rejecting the hypothesis that people migrate for more benefits from their past investments in schooling. In fact, migrants from the South to the West serve to support this hypothesis since benefits per student in the West do exceed benefits per student in the South.

strong degree of homogeneity in the productivity of schooling benefits within the United States.

Per student divisional benefits actually accruing within the division were highest in the Pacific Division ($2,824) and the lowest in the East Southcentral Division ($1,630). The greatest percentage loss of schooling benefits (spillouts) were incurred in the West Northcentral Division (21.1 percent), whereas the Pacific Division experienced the largest net percentage gain (spillins) of schooling benefits of 31.0 percent resulting from inmigrations of persons schooled in other divisions.

Other divisions experiencing net spillins of benefits from interdivisional mobility, along with the Pacific Division, were the Mountain (21.2 percent), South Atlantic (0.8 percent) and the East Northcentral Divisions (0.2 percent). Other divisions experiencing net spillouts of benefits included the East Southcentral (17.9), New England (10.5 percent), Middle Atlantic, (9.0 percent) and the West Southcentral Divisions (6.7 percent).

Table VII presents the level of national schooling investment (includes funds from federal, state, and local sources) and divisional schooling investment (includes funds from state and local sources only) for the nine census divisions. Also benefit-cost ratios and internal rates of return are presented for both the national and divisional points of view. Among divisions, national investment levels aggregated over all schooling levels were highest in the Middle Atlantic, New England, and Pacific Divisions and lowest in the three Southern Divisions. But both the benefit-cost ratios and the internal rates of return from the national point of view were highest for investment in

TABLE VII

NATIONAL AND DIVISIONAL SCHOOLING INVESTMENT AND ASSOCIATED BENEFIT-COST RATIOS AND INTERNAL RATES OF RETURN BY DIVISIONS, UNITED STATES, 1959-60

Division	Level of Investment Per Student[a]		Benefit-Cost Ratios[b]		Internal Rate of Return	
	National	Divisional	National	Divisional	National[c]	Divisional[d]
	Dol.	Dol.			Pct.	Pct.
New England	1060	986	2.13	2.05	11.4	11.2
Middle Atlantic	1125	1087	1.95	1.84	10.6	10.9
East Northcentral	916	879	2.54	2.65	12.1	12.6
West Northcentral	881	844	2.67	2.20	12.3	11.5
South Atlantic	670	622	2.99	3.24	13.9	14.7
East Southcentral	584	553	3.40	2.95	15.3	14.7
West Southcentral	713	677	2.86	2.82	13.2	13.2
Mountain	936	875	2.27	2.94	11.8	13.2
Pacific	1055	952	2.04	2.97	10.7	13.0
United States	893	844	2.43	2.54	12.2[e]	12.8

[a]Taken from Appendix A, Table XI.

[b]Benefits taken from Table VI.

[c]Derived from Equation (10).

[d]Derived from Equation (11).

[e]This rate of return computed from Equation (3) compares with 13.0 percent computed from Equation (2) as shown in Table V.

the Southern Divisions and lowest in the three divisions of highest investment per student.

Because of interdivisional migration of benefits from schooling, which was documented in Table VI, substantial differences exist between economic payoffs from a divisional versus a national point of view. Because of the great influx of schooling benefits to the Pacific Division, the benefit-cost ratio from a divisional point of view was 2.97 as compared to 2.04 for the national point of view; the corresponding internal rates of return for investment in the Pacific Division were 13.0 percent (from the division's own point of view) and 10.7 percent from the point of view of the nation as a whole. At the other extreme, in the West Northcentral Division, which incurred spillouts of schooling benefits (see Table VI), the benefit-cost ratio from the division's point of view was only 2.20 as compared to benefit-cost ratio of 2.67 from the national point of view. In short, divisions experiencing net spillouts of schooling benefits, which were not offset by the gain in outside (federal) schooling investment, incurred benefit-cost ratios and internal rates of return from their own point of view which were lower than these measures from the national point of view. Divisions gaining in schooling benefits through interdivisional migration incurred benefit-cost ratios and internal rates of return from the division's own point of view which exceeded those from the national point of view.

Summary

This chapter contains estimates of the profitability of schooling investments and of the disassociation of schooling costs and benefits within the United States. The geographic disassociation of schooling

benefits and costs was analyzed by comparing benefit-cost ratios and internal rates of return from the national and divisional points of view associated with investment within each of the nine Census Divisions.

The over-all profitability was high for the social schooling investment of $36.8 billion in the United States in 1959. The benefit-cost ratio to all United States schooling investment was estimated to be 2.63 with the internal rate of return being 13.0 percent.[6] Among major schooling levels, investment in elementary schooling was the most profitable with a benefit-cost ratio of 3.54. Investment in college was the least profitable with the benefit-cost ratio of 1.22. Among regions, the over-all profitability of schooling investment was highest in regions where investment per student was low and lowest in regions where investments per student were high. The national benefit-cost ratio was highest for United States investment in the South (3.03) and lowest in the Northeast (2.14). The internal rates of return from a national point of view for the South and Northeast were 14.6 and 11.8 percent, respectively.

The disassociation of schooling costs and benefits was shown to effect the profitability of investment in schooling from the division's point of view. Because of high outmigration of schooling recipients, the payoff from schooling investments in some divisions (mainly the West Northcentral, East Southcentral, and New England) was reduced at the expense of divisions gaining the schooling recipients. Divisions gaining educational capital (in the form of people educated elsewhere) included primarily the Pacific and Mountain Divisions. Despite large losses of

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[6] These estimates are based on benefits calculated as in Equation (2) instead of Equation (3).

educational capital through migration by some divisions, investment in schooling from a divisional point of view is still profitable in all divisions. In the West Northcentral Division where losses of schooling benefits totaled 21.1 percent, the divisional rate of return was 11.5 percent - still a favorable rate of return.

CHAPTER V

EFFICIENCY AND EQUITY IN FINANCING SCHOOLING INVESTMENT

The aims of this chapter are to:

(1) Develop a marginal efficiency of capital curve for United States investment in schooling. This curve quantitatively relates the level of investment to the returns from the investment;

(2) Develop a model for the efficient allocation of schooling expenditures among U. S. Census Divisions. The efficiency criterion is implemented by equating internal rates of return (from the national point of view) among divisions;

(3) Develop a model for both the efficient and equitable allocation of schooling expenditures among all and within each U. S. Census Division. The efficiency criterion is the same as in the first model. The equity criterion allocates the efficient level of investment within each division equitably among divisional and federal funds by realigning the incidence of direct costs to coincide with the incidence of benefits. Thus, in the combined efficient-equitable model, the total level of investment among division is based on the efficiency criterion whereas the partitioning of the total investment into state and local funds (divisional investment) and

federal funds (outside investment) is accomplished by employing the equity criterion.

The direct costs of schooling are used in the reallocation analysis because direct costs are the only costs which can be redistributed among divisions. The total cost estimates employed in Chapter IV included foregone earnings of students which cannot be reallocated among divisions.

Marginal Efficiency of Schooling Capital

Regional direct schooling investment levels and the associated rates of return are employed to develop a marginal efficiency of schooling investment curve. As shown in Chapter IV, rates of return are negatively correlated with schooling investment among regions. This suggests diminishing returns. In Equation (1), the level of direct investment and the national rate of return for the four U. S. Census Regions are related by a linear regression.[1] Equation (1), representing a marginal efficiency of schooling capital curve (MESC), is as follows:

$$R = 19.11 - 0.0119C \qquad (1)$$

$$R^2 = .98$$

where R is the national rate of return to investment in a region and C is the level of direct cost (from all sources) in that region. The coefficient of the investment variable indicates that if United States

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[1]The rates of return by regions from a national point of view were calculated by employing Equation (3) in Chapter IV and are therefore comparable to rates of return by divisions employed in this chapter.

investment per student in any region was increased $100, the rate of return would decline 1.19 percentage points.

The marginal efficiency of schooling capital curve (MESC), shown in Figure 5, illustrates the relation between direct investment levels and resulting rates of return from the national point of view among regions. The MESC curve also applies to investment in division within each respective region. The East Southcentral Division which has the lowest level of total schooling investment per student experienced the highest rate of return (from a national point of view) of all divisions. On the other extreme, the Middle Atlantic Division, which invested the most per student, incurred the lowest rate of return. The assumption in Figure 5 is that given the same initial level of schooling investment, an additional dollar of schooling investment in, say, New England would have the same effect on the rate of return as an additional schooling dollar in the Pacific Division. While the well behaved data and high R^2 give some support to this assumption, it is recognized that resource mobility and other preconditions for its validity are not in fact entirely satisfied.

The MESC curve also aids in illustrating the effects of spillovers of schooling benefits on the rate of return realized by each division. Divisions whose own rate of return falls above the MESC curve have gained from spillins of schooling benefits. Divisions whose divisional rate of return falls below the MESC curve have incurred economic losses from interdivisional movement of schooling recipients; these divisions have not been completely compensated for losses of schooling benefits through inflows of federal funds.

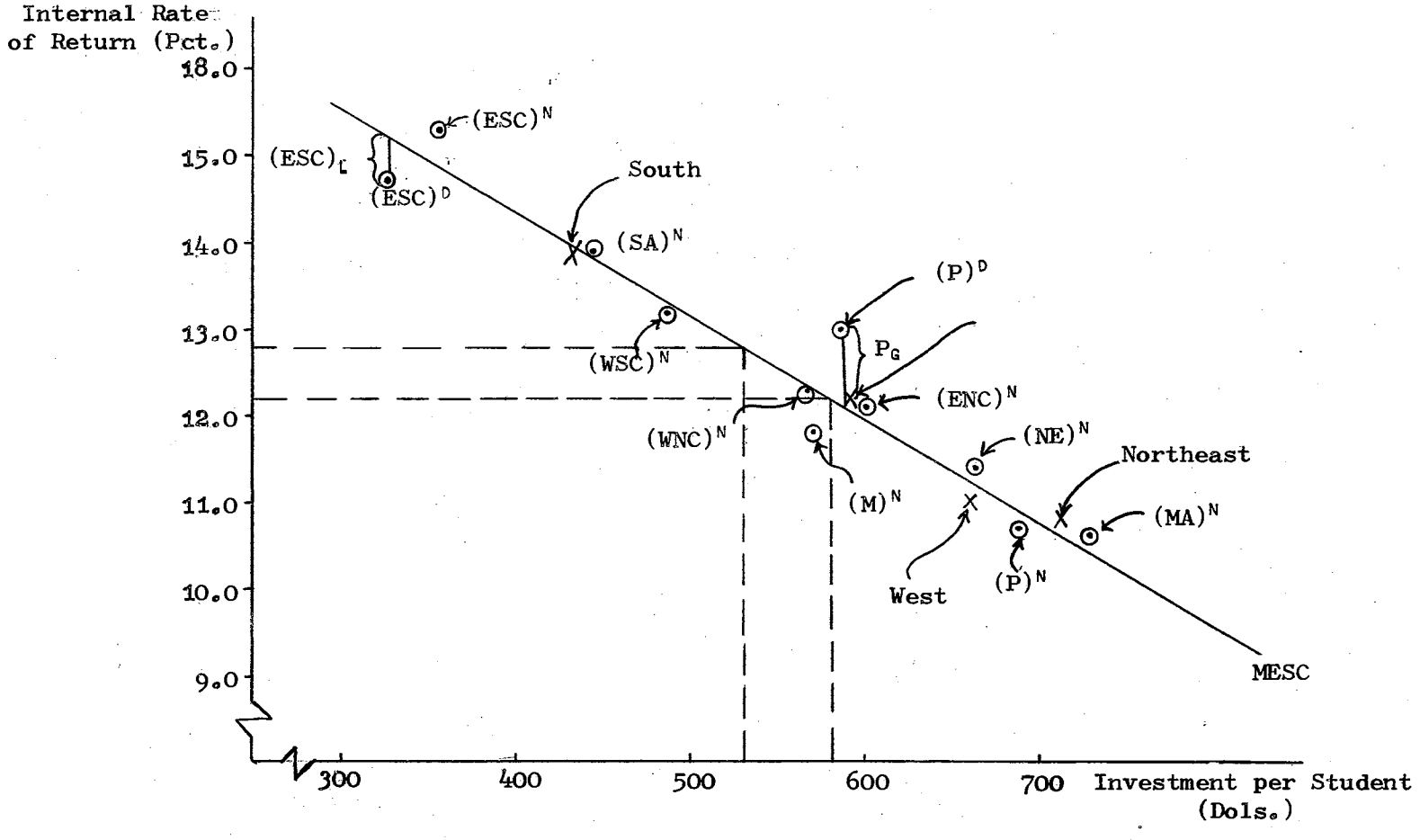

Figure 5. The Marginal Efficiency of Schooling Capital Curve, United States, 1959-60

To illustrate the effects of spillouts and spillins of schooling benefits on the rate of return realized from the division's point of view, divisional rates of return for the Pacific and East Southcentral Divisions (denoted by $(P)^D$ and $(ESC)^D$, respectively) are compared with the corresponding rates of return from a national point of view ($(P)^N$ and $(ESC)^N$). Comparisons of national and divisional rates of return for all divisions were not made in Figure 5 since nine such comparisons would unduly complicate the illustration. The Pacific Division gained from spillins (denoted by P_g) and the East Southcentral Division lost from spillouts (denoted by $(ESC_{\ })$), as shown in Figure 5. In the Pacific Division the divisional rate of return was 2.3 percentage points higher than the rate of return from the national point of view. On the other hand, the result of spillouts of schooling benefits from the East Southcentral Division was a divisional rate 0.6 percentage points lower than the national rate of return.

Efficiency Model

The efficiency model for reallocating schooling investments among divisions employs the conventional equilibrium criterion that returns to investment in all uses (or locations) must be the same. Here, the relative returns among divisions are measured by the internal rate of return from the national point of view. To achieve an equal rate in all divisions, direct costs per student was set equal to the national average of $581 which yields an internal rate of return of 12.2 percent.[2]

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[2]If the rates of return were adjusted downward for differences in ability and other biases, they would be somewhat in line with rates of return on nonschooling investments. Hence the rates would represent a position in line with equilibrium for alternative investments among uses and among schooling investments over divisions.

The efficiency model makes no attempt to repartition schooling investment within divisions into divisional and federal investments. Instead, divisional costs in all divisions total $532 per student representing again the national average and yielding an internal rate of return of 12.8 percent to each division's own investment.

Table VIII presents the reallocation of schooling investment among divisions based on the efficiency criterion. This model reallocates more schooling investment to divisions with high internal rates of return and less investment to divisions with low return rates. Additional investment is made in the Southern Divisions and less investment is made in the Middle Atlantic and Pacific Divisions. The change in investment in the Northcentral Divisions and Mountain Division was small because the actual investment was near the national average. The greatest percentage increase in schooling investment under the efficiency model was in the East Southcentral Division (61.8 percent) whereas the greatest percentage decrease in schooling investment occurred in the Middle Atlantic Division (20.3 percent).

Efficient-Equitable Model

The efficient-equitable model combines the efficiency criterion of the previous model with an equity criterion. This model equitably allocates the efficient level of total investment within each division into divisional and federal (outside) funds on the basis of benefits actually realized within each division.

The equitable partitioning of total investment in each division into divisional and federal investment is based on the mechanism provided by the MESC curve. The partitioning considers spillovers of

TABLE VIII

AN EFFICIENCY MODEL FOR THE REALLOCATION OF SCHOOLING INVESTMENT AMONG DIVISIONS, 1959-60

Divisions	Investment Level: Divisional Actual	Divisional Additional	Divisional Total	Federal Actual	Federal Additional	Federal Total	Total	Pct. Change From Actual
	Dol./Student			Dol./Student			Dol./Student	Total
New England	590	- 58	532	74	-25	49	581	-12.5
Middle Atlantic	691	-159	532	38	+11	49	581	-20.3
East Northcentral	567	- 35	532	35	+14	49	581	- 3.4
West Northcentral	530	+ 2	532	37	+12	49	581	+ 2.5
South Atlantic	397	+135	532	48	+ 1	49	581	+30.6
East Southcentral	328	+204	532	31	+18	49	581	+61.8
West Southcentral	452	+ 80	532	36	+13	49	581	+19.1
Mountain	511	+ 21	532	61	-12	49	581	+ 2.5
Pacific	588	- 56	532	103	-54	49	581	-15.9
Total	532	0	532	49	0	49	581	0.0

[a]The efficiency model yields an internal rate of return of 12.2 and 12.8 percent from the national point of view and the division's point of view, respectively, for investment in all divisions.

schooling benefits among divisions compensating divisions with net spillouts in the form of increased federal assistance at the expense of lower assistance to divisions with net spillins of schooling benefits.

Changes in federal assistance, under the equity criterion, are derived below by manipulating Equation (1). The efficient level of total investment within division j, (C_j^N), is found as:

$$C_j^N = 1606 - 84R^N \tag{2}$$

where R^N = rate of return from all investment in schooling in the United States (12.2 percent). Likewise, the efficient level of divisional investment within division j, C_j^D, is found as:

$$C_j^D = 1606 - 84R^D \tag{3}$$

where R^D = rate of return from divisional investment in schooling in the United States (12.8 percent). Thus, the efficient level of federal assistance in each division, C_j^F, is

$$C_j^F = (C_j^N - C_j^D) = -84(R^N - R^D) \tag{4}$$

If there are no spillovers of schooling benefits, then efficient levels of divisional and federal investment are also equitable levels. However, when spillovers of schooling benefits occur, the divisional-federal makeup of investment must be altered to be equitable. The value $[(R_j^N - R_j^D) - (R^N - R^D)]$ determines the interchange of the efficient level of divisional and federal funds in division j to meet the equity criterion.[3]

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[3] The quantity $(R^N - R^D)$ indicates the effects of the divisional costs relative to national cost on the rate of return in the efficient model. The average federal cost of $49 yields a divisional rate of return 0.6 percentage points higher than the average national rate of return.

If $(R_j^N - R_j^D) = (R^N - R^D)$, the efficient partitioning of investment into federal and divisional funds is also an equitable partitioning. But, if $(R_j^N - R_j^D) > (R^N - R^D)$ then federal funds should be increased relative to divisional funds. Thus equitable federal assistance is comprised of two parts under the efficient-equitable model: (1) the efficient level (from Equation (4)), and (2) the change in the efficient level to yield an equitable level. The efficient-equitable level of federal assistance to division j, $\hat{C}_j^F$, is:

$$\hat{C}_j^F = -84 \quad \underbrace{[R^N - R^D]}_{\text{efficiency}} - \underbrace{[(R_j^N - R_j^D) - (R^N - R^D)]}_{\text{change for equity}} \qquad (5)$$

Table IX presents investments under the efficient-equitable model. Divisions gaining in federal assistance (relative to the efficient quota) included all divisions except the Pacific, Mountain, and the South Atlantic Divisions where spillins of schooling benefits resulted in losses of part or all federal assistance. The level of federal assistance under the efficient-equitable model ranged from a high of 28.7 percent in the West Northcentral Division to a low of -16.2 percent in the Pacific Division. In both the Pacific and Mountain Divisions, federal assistance was negative because the equitable level of divisional investment was greater than the level of total investment under the efficiency criterion. This, of course, results from the great influx of schooling benefits generated in other divisions.

From a total investment standpoint, the efficient-equitable model dictates that a substantially larger investment be made in the Southern Divisions at the expense of investment levels in the Middle Atlantic and Pacific Divisions. From a divisional investment standpoint,

TABLE IX

AN EFFICIENT-EQUITABLE MODEL FOR THE REALLOCATION OF SCHOOLING INVESTMENTS AMONG AND WITHIN DIVISIONS, 1959-60

Division	Investment Level: Divisional				Federal				Total		Federal Assistance	
	Actual[a]	Efficient[b]	Added (equity)[c]	Total	Actual[a]	Efficient	Added (equity)[c]	Total	Actual[a]	Efficient	Actual	Equitable
	Dol./Student				Dol./Student				Dol./Student		Pct.	
New England	590	532	- 67	465	74	49	+ 67	116	664	581	11.1	20.0
Middle Atlantic	691	532	- 25	507	38	49	+ 25	74	729	581	5.2	12.7
East Northcentral	567	532	- 8	524	37	49	+ 8	57	602	581	6.3	9.8
West Northcentral	530	532	-118	414	37	49	+118	167	567	581	6.5	28.7
South Atlantic	397	532	+ 17	549	48	49	- 17	32	445	581	10.8	5.5
East Southcentral	328	532	-101	431	31	49	+101	150	359	581	8.6	25.8
West Southcentral	452	532	- 50	482	36	49	+ 50	99	488	581	7.4	17.0
Mountain	511	532	+ 67	599	61	49	- 67	- 18	572	581	10.7	- 3.1
Pacific	588	532	+143	675	103	49	-143	- 94	691	581	14.9	-16.2
TOTAL	532	532	0	532[d]	49	49	0	49[d]	581	581	8.4	8.4

[a]Taken from Appendix A, Table X.

[b]Computed by Equation (3).

[c]Computed by Equation (5).

[d]Because of errors in rounding, the equitable values across divisions may not weight to the exact actual U. S. level.

investment in the Western Divisions not only should be smaller but a much larger share should be incurred by the divisions themselves, yielding federal assistance negative in both the Pacific and Mountain Divisions. On the other hand, the model dictates that the lower investment in the Northeast Divisions should be financed through substantially greater proportions of federal funds and less from divisional sources.

In the East Northcentral Division, the slightly higher level of total investment should be comprised of a slightly higher percentage of federal funds. In the West Northcentral Division, the greater total investment was made possible through much greater federal assistance. In the East and West Southcentral Divisions, the larger level of total investment should come from increases in both divisional and federal sources but with greater percentage increases in federal funds. The efficient-equitable model dictates that the greater investment level in the South Atlantic Division be financed through increases in divisional funds only.

Summary

The analysis of this chapter considered the relative returns to schooling investments in reallocating schooling expenditures among and within divisions. The reallocation among divisions, which employed an over-all efficiency criterion, dictated that larger investments in schooling be made in the Southern Divisions at the expense of smaller schooling investments in the Middle Atlantic and Pacific Divisions. The equitable reallocation of the share of the schooling investment within a particular division from divisional versus federal funds dictated that more federal funds be made available to divisions which lose benefits

from schooling investment through interdivisional migration. Conversely, divisions gaining the benefits from the schooling investments of other divisions should receive less federal funds with the Western Divisions incurring an actual outflow of divisional funds because of very high net immigration rates of schooling benefits.

Through this chapter, the analysis has assumed that average federal assistance among the nine divisions remains at the actual 1959-60 level -- 8.4 percent. However, efficient and equitable level of investment within all divisions could be accomplished with any level of federal assistance. One possible model dictates that all schooling funds be derived from federal sources with equal investments per student accruing to all divisions. A model consisting of 100 percent federal funds would not be concerned with the disassociation of schooling costs and benefits or with differing abilities to invest in schooling among regions.

This chapter then concludes the analysis of two dimensions of social investment in schooling -- the over-all profitability of schooling investment from a national point of view and the disassociation of schooling costs and benefits among U. S. Census Divisions. In the following chapter, the ability dimension is combined with the dimensions of this chapter to develop an Optimal Model for financing United States schooling investments.

CHAPTER VI

SUMMARY AND CONCLUSIONS

In this study three dimensions of financing United States schooling investment were analyzed: the ability to invest, the profitability of investment and the geographic disassociation of costs and the resulting benefits. The ability model of Chapter II equalized efforts to invest in schooling among the nine census divisions. Effort to invest was measured by a comparison of actual 1959-60 investment levels with computed investment levels adjusted for differences in ability. The ability model dictated that more investment be made by divisions showing less effort to invest than the national norm (Pacific, East Northcentral, New England, East Southcentral and South Atlantic Divisions) and less investment be made by divisions showing greater than average efforts in financing schooling investments (Middle Atlantic, Mountain, West Northcentral and West Southcentral Divisions). In total, the ability model dictated that 2.7 percent of United States investment in schooling in 1959-60 be reallocated among the nine divisions.

In Chapter III, the study of the disassociation of schooling costs and benefits was inititated by analyzing the relationship between age and schooling and the probability of interdivisional mobility. Schooling had a highly significant positive effect on interdivisional mobility whereas age, after considering the schooling-age interaction, was found to have an insignificant direct effect on mobility. It was

found that interdivisional mobility favored the young and well-educated. During 1955-60, 6.2 percent of all persons between the age of 25 and 64 years changed division of residence.

In Chapter IV an internal rate of return of 13.0 percent was computed for all 1959-60 United States schooling investments ($36.8 billion). Benefits derived from the 1959-60 schooling investment discounted at six percent to the year of finishing the marginal level of schooling totaled $96.6 billion yielding a benefit-cost ratio of 2.63. Among major schooling levels, absolute benefits per student were greatest for college ($4763 per student) and lowest for elementary schooling ($1880 per student). However, both the internal rate of return and the benefit-cost ratio were highest for United States investment in elementary schooling. The internal rate of return to United States investment in elementary schooling was 14.6 percent as compared to 13.8 and 7.0 percent for investment in high school and college, respectively.

Among the four census regions, the level of investment was inversely related to the rate of return. In the South, where schooling investment was lowest ($664 per student), the internal rate of return was highest among all regions (14.6 percent). On the other hand, in the West where the investment was $1109 per student, the resulting internal rate of return was lowest of any region (11.0 percent). A regression of the regional internal rates of return on regional direct costs per student suggested that an increase of $100 in direct investment per student decreased the rate of return by 1.19 percentage points.

The disassociation of schooling costs and benefits among divisions was studied further in Chapter IV. Divisional benefits from schooling investment were adjusted for potential net migration rates throughout

the expected lifespan of persons in school in 1959-60 to find the net gains from interdivisional migration of schooling benefits. Divisions losing benefits from net outmigration of schooling recipients realized rates of return from their divisional investment that were lower from their divisional than from the national point of view. Divisions gaining in benefits resulting from inmigration realized rates of return from their divisional investment which were greater from their divisional than from the national point of view. The greatest percentage loss of schooling benefits was incurred by the West Northcentral Division (21.1 percent) whereas the greatest percentage gain was reaped by the Pacific Division (31.0 percent).

The marginal efficiency of schooling capital curve of Chapter V has implications for the level of future schooling investment in the United States. The internal rate of return to the 1959-60 level of investment of $893 per student was computed to be approximately 12 percent.[1] Whether United States schooling investments should be increased over the 1959-60 level depends on what is the appropriate rate of social discount. Given the constraint of the public's ability to finance social services, the approximate social discount rate depends on the productivity of investing in other social services. If six percent is the proper (equilibrium) rate of social discount, then United States schooling investment should be increased greatly as illustrated in Figure 5 of Chapter V. At six percent, the equilibrium level of direct schooling investment would total $1002 per student -- a 72.5 percent

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[1]The internal rate of return to United States schooling investment was computed to be 13.0 percent using Equation (2) of Chapter IV and 12.2 percent using Equation (3) of Chapter IV.

increase from the 1959-60 level. But recent high interest rates in the United States suggest that the discount rate of six percent for future investments is too low. A social discount rate of 10 percent may be more realistic. A social discount rate of 10 percent indicates that the efficient level of direct schooling investment would be $766 per student -- an increase of 31.8 percent over the 1959-60 level. Because of inflation, the amount would be considerably larger if expressed in 1970 dollars.

Optimal Model

The Optimal Model presented in Table X represents a combination of the efficient-equity model of Chapter V and the ability model discussed in Chapter II. It summarizes the results of the entire study. The ability criterion equalized the percentage of personal income expended in financing schooling investment in all divisions -- adjusted for differences in the percentage of the population enrolled in school, and non-public schooling enrollment as a percent of public school enrollment. The efficient-equitable model first equalized the national rate of return among divisions (the efficiency criterion); then, the equity criterion realigned <u>divisional</u> and <u>federal</u> investments within <u>each</u> division on the basis of the proportion of benefits accruing within the investing division.

The basic assumption of the Optimal Model is that schooling appropriations within a division should be geared to ability to invest adjusted for net spillovers of benefits from the investment. In computing optimal divisional appropriations, the ability criterion is first implemented. These levels of divisional appropriation representing

TABLE X

AN OPTIMAL MODEL FOR THE REALLOCATION OF U. S. PUBLIC SCHOOLING INVESTMENT, BY DIVISIONS, 1959-60

	Divisional Appropriations[a]				Divisional Investment[a]			
	Under Ability Criterion[b]	Effect of Net Spillovers[c]	Total	Change from Actual Level	Net Influx from Other Divisions	Total	Federal Investment	Total Investment
	Dol./Student							
New England	617	- 67	550	- 40	- 18	532	49	581
Middle Atlantic	649	- 25	624	- 67	- 92	532	49	581
East Northcentral	584	- 8	576	+ 11	- 44	532	49	581
West Northcentral	515	-118	397	-133	+135	532	49	581
South Atlantic	448	+ 17	465	+ 68	+ 67	532	49	581
East Southcentral	369	-101	268	- 60	+264	532	49	581
West Southcentral	439	- 50	389	- 63	+ 43	532	49	581
Mountain	491	+ 67	558	+ 47	- 26	532	49	581
Pacific	501	+143	744	+156	-212	532	49	581
Total	532	0	532	0	0	532	49	581

[a]Divisional expenditures represent schooling funds derived within the division. Divisional investment represent funds actually invested within the division. Expenditures and investments differ by the net influx of funds to the division with divisions having optimal expenditures below the optimum level of investment receiving a net influx of funds from divisions where the optimum expenditure is above the optimum level of investment. The transfer of funds among divisions would be implemented by the federal government. Under this model average federal assistance, as defined as outside funds as a percent of all funds, is the same as the actual level since the average net influx is zero but with much greater variation in federal assistance among divisions. For instance, outside assistance in the East Southcentral Divisions would total 53.9 percent of total investment. On the other hand, outside assistance to the Pacific Division would comprise -28.1 percent of the optimal investment level of $581 per student.

[b]Taken from Table II, Chapter II.

[c]Represent the change for equity part of Equation (5), Chapter V.

equal efforts among divisions, are then adjusted for the equity considerations of Chapter V. Therefore, the optimal levels of funds appropriated within a division represent levels equal in "effort to invest" adjusted for spillovers of schooling benefits. If net spillovers of schooling benefits equal zero in a division, the ability model of Chapter II is also an optimal model. Conversely, if actual "effort to invest" was equal in all divisions despite the occurrence of spillovers, the equitable criterion of Chapter V would yield an optimal level of divisional schooling appropriations.

The highest level of optimal appropriations by a division for schooling was in the Pacific Division ($744 per student), representing an increase over the actual 1959-60 appropriation level of 26.5 percent -- the largest of any division. Divisional appropriations were lowest in the East Southcentral Division ($268 per student) under the Optimal Model -- a decrease of 30.8 percent from the actual appropriation level. The West Northcentral Division's optimal level of schooling appropriations ($397 per student) represented a 25.1 percent decrease from the 1959-60 level. The increase in the Pacific Division's appropriations results partially from underachievement in financing schooling appropriations based on the "effort to invest" but mainly from the large volume of spillins of schooling benefits. On the other hand, the decrease in appropriations in the West Northcentral Division resulted from overachievement on the basis of "effort to invest" and the large volume of spillouts of benefits from schooling investment. In total, the Optimal Model dictates that 5.9 percent of divisional investment in schooling be reallocated among divisions as compared to 2.7 percent in the ability model and 4.7 percent under the efficient-equitable model.

In reallocating divisional appropriations under the Optimal Model, a pool of $1.29 billion of divisional funds (representing 5.9 percent of the $21.9 billion of division funds in 1959-60) would need to be channeled through the federal government.

The efficient level of investment from all sources within each division is $581 per student with $532 being the average derived from each division (see Table X). The average level of federal (outside) assistance is $49 per student -- the actual 1959-60 level. The efficiency criterion dictates that divisions with high optimal appropriations subsidize divisions with low appropriations. Appropriations in the West Northcentral and all three Southern Divisions were supplemented by funds from the Northeast Divisions, East Northcentral Division and the Western Divisions.

The weak relationship between underachievement, on the basis of "effort to invest," and net spillouts of schooling benefits provides no support for the hypothesis that the lack of effort to invest in schooling is related to the loss of benefits through spillouts to other divisions. Although in four of the nine divisions (New England, East Northcentral, East Southcentral, and Mountain Divisions) there was a positive relationship between underachievement (or overachievement) in terms of "effort to invest" and net spillouts (or spillins) of schooling benefits, over all divisions the correlation between a division's effort to invest and spillover of schooling benefits was an insignificant .05.

Implementation of the Optimal Model

To be useful the model must help to make future public decisions concerning schooling investments. To implement the ability criterion,

policy makers should gear the level of appropriations by states to the percentage of personal income spent on schooling adjusted for differences in the proportion of the population enrolled in school. Data are available on an annual basis by states to make the necessary calculations.

Implementation of the spillover dimension in policy decisions is not easily accomplished because of the lack of annual data on migration and the dollar value of net spillovers. What is needed is a variable that is available annually by states which is closely correlated with net spillovers of schooling benefits. Although annual migration data are not available by states, it is likely that migration patterns do not change markedly from year to year. Thus, census divisional migration data such as analyzed in Chapter III may be used in decisions concerning spillovers by states. Both groups of data are available by states aggregated over all age-schooling groups. The investment formula can be revised after each census.

A simplified method can be used to predict spillovers of schooling benefits of a state based on the state's net migration rate. Equation (1) relates the aggregate net migration rates (X_1) of Chapter III, Table IV to the effects on the divisional rate of return of net spillovers of schooling benefits (Y):

$$Y = -.283 + .285X_1 \qquad (1)$$

$$R^2 = .88$$

The value of Y corresponds with the equity adjustment of Chapter V, Equation (5) -- $[(R^N - R^D) - (R_j^N - R_j^D)]$. The correlation coefficient between Y and X_1 is .94 indicating a strong association between

divisional net migration rates and the effects on divisional rates of return from net spillovers of benefits from schooling.

Thus, to implement the Optimal Model for investing in schooling by states, policy makers could:

(1) Implement the ability regression in Chapter II, and

(2) Adjust the "equal effort" levels from the ability regression for effect of spillovers by implementing Equation (1) above.

The equity adjustment consists of multiplying the value Y of Equation (1) by $84 per student as indicated in Equation (5) of Chapter V. Thus, if a state's achievement equals the national norm in effort to invest but has spillouts of people yielding a negative Y of Equation (1) of 1.0 percentage point, then state and local funds from the state must be reduced by $84 per student to be optimal.

Federal assistance in the Optimal Model is held at the 1959-60 level -- 8.4 percent as a national average. To implement the model, the redistribution of divisional funds among the division and state would be channeled through the federal government with divisions and states experiencing spillouts of schooling benefits gaining funds from divisions and states that incurred spillins.

Schooling investment in 1959-60 in the state of Oklahoma is used to illustrate the implementation of the Optimal Model as follows:

State and Local Funds	
Actual (Dols. per student)	429
Under Ability Criterion (Dols. per student)	431
Effects of Net Spillovers (Dols. per student)	-101
Optimal Level (Dols. per student)	335
Funds from Divisional Pool (Dols per student)	197

Federal Funds (Dols. per student) 49

Total Investment in Oklahoma (Dols. per student) 581

The actual 1959-60 schooling investment from state and local sources in Oklahoma was $429 per student aggregated over all levels of schooling. The ability regression suggests that for Oklahoma's effort to invest to be equal to the national norm, the state should have invested $436 per student -- representing an underachievement of 1.6 percent in terms of effort to invest in schooling. During the decade 1955-60, Oklahoma experienced a net outmigration rate of 4.3 percent which suggests that Oklahoma's spillouts of schooling benefits result in its own rate of return being 1.2 percentage points below the national rate of return to total schooling investment in Oklahoma.[2] Therefore, state plus local expenditures should be decreased by $101 to offset the spillouts. The optimal level of state and local expenditures in Oklahoma in 1959-60 was $335 -- a decrease of 22 percent from the actual level. State and local funds in Oklahoma represent 57.7 percent of total investment funds under the Optimal Model.

A major technical limitation of the model is that it does not show how to allocate schooling funds within states. Certainly, a model which allocates funds within a state derived from local and state revenues is worthy of subsequent research. Aside from the technical problems of implementing the Optimal Model, the public may not be in favor of the reallocation, and may choose to forego the gains for fear of losing

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[2]This rate is taken from Bowles and Tarver and represents one-half of the 1950-60 migration rate for all age groups. In Equation (1) the migration rate by divisions, (X_1), included migration of 25-64 years old only. However, the correlation between the two migration rates is extremely high.

local control of schools. And states which are to incur an outflow of funds under such a plan may not be willing to sacrifice such funds. In short, the political problems in implementing the plan in a period of already great controversy over who should control the nation's schools may overshadow any technical difficulties.

Limitations

Aside from the problems of implementing the Optimal Model, some limitations in the basic structure of the study are apparent. These limitations are embedded in the assumptions used to calculate schooling benefits and net spillovers of schooling benefits by divisions.

The limitations in calculating benefits from cross-sectional data have been discussed at length by many authors.[3] In calculating benefits from cross-sectional data, the lifespan earning differential of persons receiving schooling levels k and (k-1) in 1959-60 are dictated by differences in 1959 earnings of the two schooling levels throughout all age groups. In other words, it is implied that the demand-supply relationship for all levels of schooling will remain constant at the 1959 level throughout the lifespan of persons enrolled in school in 1959-60. In fact, future supply-demand relationship for any schooling level or for schooling in general may shift, resulting in smaller or larger earning differentials than those indicated from the 1959 cross-sectional statistics.

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[3]For an excellent discussion of such limitations see: Blaug, Martin, "The Rate of Return on Investment in Education in Great Britain," The Manchester School, Vol. XXXIII No. 3, September, 1965, pp. 205-261. Although there are limitations to using cross-sectional data, using such data does have computational advantages over life-cycle data. Also cross-sectional data are free from the influence of the trade cycle and implicitly provide estimates in money of constant purchasing power.

Although the use of cross-sectional earnings data rather than time series data may effect the over-all rate of return to United States schooling investment, it is not likely to effect markedly the relative returns from a national point of view to investment among regions and divisions. However, possible deviations from the assumed static structure of net migration among divisions will effect spillovers of schooling benefits, and in turn, alter the optimal divisional expenditures shown in Table X. Whether past and future patterns of interdivisional and interstate migration coincide depends largely on future interdivisional and interstate industrialization and growth. If future economic growth favors divisions and states already wealthy, the reallocation of schooling investments under the Optimal Model may not be large enough to adequately compensate divisions and states losing schooling benefits. If future job creation is less concentrated than in the late 1950's, less persons, especially the young and well educated, will leave the state or divisions after being educated. Thus, less net spillovers of schooling benefits will occur and less reallocation of schooling investments will be warranted. There are some indications that a policy of less geographic concentration of jobs will be adopted for the future. Such a national policy of job creation that reduces interstate migration would to some extent substitute for a policy of redistribution of funds for education.

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APPENDIX A

THE SOCIAL COSTS OF SCHOOLING

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THE SOCIAL COSTS OF SCHOOLING

The social cost of schooling is comprised of two components: direct public expenditures (direct costs) and earnings foregone by students (indirect costs). In this appendix these two components of total schooling costs are calculated for U. S. Census Regions and Divisions for the elementary, high school and college levels of schooling for the 1959-60 school year.

Direct Costs

Direct schooling costs are comprised of current and fixed annual public expenditures for all levels of schooling. Current expenditures are comprised of variable costs such as teachers' salaries, free textbooks, etc., whereas fixed costs are made up of repair and maintnance, interest on depreciation and obsolescense of school capital. Table XI presents direct schooling costs by major level of schooling by U. S. Census Regions and Divisions. Current elementary and secondary schooling costs were computed from data of current expenditures per pupil in average daily attendance from the Statistical Abstract of the United States, 1962. The combined current expenditures for elementary and secondary schooling were taken directly from the Statistical Abstract and then divided into a separate estimate for each of the two levels by applying the factors .93 (elementary) and 1.21 (secondary) to the

combined current expenditures. To obtain these factors, it was estimated that one secondary school student costs as much to educate as 1.3 elementary school students. This estimate was taken from the Cost of Education Index published annually in School Management. Using this figure, it was possible to allocate aggregate current expenditures between elementary and secondary schooling, and obtain the adjustment factors by finding what fraction the separate averages are of the average calculated on a combined basis. This was done for the United States and the four U. S. Regions used in Statistics of State School Systems, 1959-60. Since the factors were approximately the same for each region and the United States, the factors of .93 for elementary expenditures and 1.21 for secondary expenditures were used for each region and division.[1]

To obtain total expenditures per pupil in elementary and secondary school, a charge of 10 percent of the value of school property for each of the two schooling levels was used as the fixed cost. The 10 percent figure includes: (1) three percent of the property value to account for depreciation and obsolescense,[2] (2) six percent for interest charges, and (3) one percent for maintenance and repair. The value of school property by regional and divisional location is related directly to the level of current expenditures by the following equation:

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[1]For the actual derivation of the adjustment factors of .93 and 1.21 see: Redfern, J. Martin, Rates of Return to Investment in Schooling, Farm and Nonfarm Sectors, (unpub. Ph.D. dissertation, Oklahoma State University, 1970), Appendix A.

[2]The three percent for depreciation and obsolescense comes from the study by Robert Rude, "Assets of Private Nonprofit Institutions in the United States, 1890-1948," cited by T. W. Schultz "Capital Formation by Education," Journal of Political Economy, Vol. LXVIII (December, 1960) pp. 571-583.

$$Y = -59.68 + 3.05X \qquad (2)$$

$$R^2 = .73$$

where:

Y = predicted value of school property.

X = current expenditures per pupil in ADA.

The value of school property was not available for all states in 1959-60; therefore, Equation (1) is used to estimate not only all states' value of school property, but the aggregate of states for regional and divisional estimates.[3]

Current expenditures for college schooling for 1959-60 (Table XI) were also obtained from the Statistical Abstract of the United States, 1961 and 1963. Total expenditures for college schooling was calculated by adding 10 percent of the book value of grounds, buildings, equipment, and unexpended plant funds to current expenditures. This 10 percent is comprised of the same components in the same proportion as in the fixed costs of elementary and secondary schooling.

The direct public expenditures for the three major levels of schooling were divided into those that accrued to the region or division (state and local expenditures) and those expended by the Federal Government. Regional or divisional expenditures plus federal expenditures comprise the total United States expenditure. For elementary and secondary schooling in 1959-60, federal revenues accounted for 4.4 percent of current expenditures; that is, schooling costs accruing to the regions or divisions averaged 95.6 percent of the total United States

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[3]For the data on the value of school property, see Redfern, Appendix B.

TABLE XI

DIRECT SOCIAL COST OF FORMAL SCHOOLING BY MAJOR LEVEL OF SCHOOLING BY REGIONS AND DIVISIONS, UNITED STATES, 1959-60

	Northeast			Northcentral			South				West			
	Total	New England	Middle Atlantic	Total	East North Central	West North Central	Total	South Atlantic	East South Central	West South Central	Total	Mountain	Pacific	United States
	Dol./Student													
Elementary														
Current Expenditures[a]	439	368	461	363	372	342	264	262	216	302	406	350	426	354
Total Expenditures, From All Sources[b]	567	474	596	467	479	440	338	336	276	388	523	451	550	456
Total Expenditures, From State and Local Sources[c]	550	451	582	452	466	421	316	312	256	366	485	413	511	434
Secondary														
Current Expenditures	571	479	600	472	484	445	344	341	281	393	528	455	554	465
Total Expenditures, From All Sources[b]	740	619	777	610	626	575	442	439	361	507	684	588	717	601
Total Expenditures, From State and Local Sources[c]	711	589	759	590	608	550	413	408	335	478	633	538	666	571
College														
Current Expenditures	1689	2025	1563	1559	1599	1476	1404	1595	1252	1249	1520	1390	1562	1542
Total Expenditures, From All Sources[b]	2119	2527	1966	1966	2004	1887	1825	2053	1633	1646	1854	1754	1886	1945
Total Expenditures, From State and Local Sources[c]	1662	1849	1592	1612	1611	1613	1498	1591	1411	1430	1152	1419	1066	1505
Total														
From All Sources	713	664	729	591	602	567	439	445	359	488	660	572	691	581
From State and Local Sources	667	590	691	554	565	530	398	397	328	452	568	511	588	532
Federal Assistance (Pct.)	6.5	11.1	5.2	6.3	6.1	6.5	9.3	10.8	8.6	7.4	13.4	10.7	14.9	8.4

[a] Current expenditures represent 93 percent and 121 percent of the combined current expenditures for elementary and secondary schooling, respectively, for each division. The combined expenditure figure was taken directly from: U. S. Department of Commerce, Bureau of the Census, The Statistical Abstract of the United States, 1962 (Washington, D. C.: 1962), Table 141.

[b] Represents current expenditures plus 10 percent of the value of land, buildings, equipment and unexpanded plant funds as a charge for capital which includes: 6 percent for interest, 3 percent for depreciation and obselescence and 1 percent of repairs and maintenance. The value of the fixed capital for elementary and secondary schooling was computed from the regression:

$Y = -59.68 + 3.05 X$

where:

Y = value of fixed capital

X = current expenditures per pupil.

Basic data for the regression was taken from: U. S. Department of Health, Education and Welfare, Office of Education, Statistics of States School System, 1959-60 (Washington, D. C.: 1960). The value of fixed capital for college schooling was taken from: U. S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1963, Table 181.

[c] Excludes expenditures from federal sources. Sources of elementary and secondary schooling revenues were taken from U. S. Department of Health, Education and Welfare, Office of Education, Digest of Educational Statistics, 1962 (Washington, D. C.: 1962), Table 32. Percentage sources of revenue for college schooling are from: Digest of Educational Statistics, 1966 (Washington, D. C.: 1966), Table 107, and are for the 1961-62 school year.

current expenditures. Federal assistance for college schooling averaged 22.6 percent of total expenditures.[4] Among regions, Federal expenditures as a percent of total expenditures aggregated over the three major schooling levels were highest (13.4 percent) in the Western Region and lowest (6.3 percent) in the Northcentral Region. Among the nine divisions, federal assistance across all schooling levels ranged from 14.9 percent in the Pacific to 5.2 percent in the Middle Atlantic Division.

Total direct costs of schooling were highest in the Northeast Region and lowest in the South over all three schooling levels. Among divisions, direct schooling expenditures were highest in the Middle Atlantic and lowest in the East Southcentral Division. Aggregated over the three schooling levels, total direct expenditures among regions ranged from $713 per student in the Northeast to $439 per student in the Southern Region. Among divisions, total direct expenditures per student ranged from $729 in the Middle Atlantic to $329 in the East Southcentral Division. Direct expenditures for the United States totaled $354, $465, and $1542 per elementary, high school, and college student, respectively, and $581 per student aggregated over all levels of schooling. Federal expenditures comprised 8.4 percent of the total direct schooling expenditures in the United States in 1959-60.

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[4] College expenditures from federal sources were calculated by using the percentage of total educational and general income represented by funds from the Federal Government in 1961-62 including research and other funds. Data for this calculation from: U. S. Department of Health, Education and Welfare, Digest of Educational Statistics, 1966 (Washington, D. C.: 1966), Table 107.

Indirect Costs

Indirect costs of schooling are comprised on earnings foregone by students plus the private costs of school supplies, tuition, etc. Here, private costs were assumed to be equal to student earnings (earnings not foregone by students) and foregone earnings by students were taken as equal to the earnings of people not enrolled in school of the same age and previous schooling level. The foregone earnings of students are computed from the age-earnings profiles of Appendix B, Table XV and represent the mean value of wages and salaries plus self-employment income of people not enrolled in school within the same age-previous schooling bracket of the student in question.

The validity of the assumption that private costs of schooling are equal to the part-time earnings of students during school and summer and vacation earnings varies with the level of school. This assumption, in effect, implies that there are no private costs of schooling for the first six years since earnings are considered to be zero (data is not available) before age 14.[5] Certainly private costs of books and supplies, although small in relation to total social costs, do exist but estimates of private costs by regions and divisions are difficult, if not impossible, to obtain. As Hanoch points out, the private costs of schooling and average earnings of students do move in the same direction as the level of schooling increases.[6] This is in itself some small consolation for the assumption. However, a conclusion that the absolute magnitudes of the part-time earnings of students and the private costs

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[5]The ages at entry into each schooling level and the workforce are those used by Hanoch, p. 315.

[6]Hanoch, p. 320.

of schooling are equal throughout all schooling levels is more difficult to reach.

The assumption that foregone earnings of students are equal to the earnings of non-students within the same age and previous schooling group abstracts from differences between student and non-student groups in factors associated with earnings such as I.Q. and family background. In short, the assumption that private schooling costs are equal to part-time earnings of students tends to underestimate private schooling costs in the elementary grades, whereas the assumption that earnings foregone by students are equal to the earnings of non-students tends to underestimate the foregone indirect costs of schooling.

Table XII presents estimates of the indirect costs of schooling by major level of schooling for each region and division. The indirect costs for all divisions within a given region are assumed to be equal since earnings data were not available to compute divisional age-earnings profiles. Therefore, the age-earnings profiles by U. S. Census Regions are assumed to apply to all divisions within the particular region. Indirect costs were highest over all schooling levels in the Northeast ($396) and lowest in the South ($225). For the United States, average indirect costs, in the form of foregone earnings, were $312 per student.

Table XIII presents total schooling costs (direct plus indirect expenditures) by regions and divisions and distinguishes regional and divisional costs (state and local expenditures plus all indirect costs) from total costs from all sources. Total costs ranged from $1125 per student in the Middle Atlantic Division to $584 per student in the East Southcentral Division. Average total costs per pupil in the

TABLE XII

DIRECT SOCIAL COST OF FORMAL SCHOOLING BY MAJOR LEVEL OF SCHOOLING BY REGIONS AND DIVISIONS, UNITED STATES, 1959-60

	Elementary	Secondary	College	Total
	Dol./Student			
Northeast	81	813	2088	396
Northcentral	80	578	2073	314
South	60	432	1638	225
West	88	661	2074	364
United States	75	603	1959	312

Source: U. S. Department of Commerce, Bureau of the Census, One-In-One Thousand Sample of the 1960 Census of Population (Washington, D. C.: 1964).

TABLE XIII

TOTAL COSTS OF FORMAL SCHOOLING BY REGIONS AND DIVISIONS, UNITED STATES, 1959-60

Region and Division	Total		Per Pupil		Federal Assistance as Percent of Total Cost
	United States	Divisional	United States	Divisional	
	----- Mil. Dol. ----		------- Dol. -------		Pct.
Northeast	10584.0	10138.1	1109	1063	4.2
New England	2452.8	2281.6	1060	986	7.0
Middle Atlantic	8131.2	7856.5	1125	1087	3.4
Northcentral	10762.1	10322.4	905	868	4.1
East Northcentral	7607.9	7300.6	916	879	4.0
West Northcentral	3154.2	3021.8	881	844	4.2
South	8788.6	8253.2	664	623	6.2
South Atlantic	4110.5	3816.0	670	622	7.2
East Southcentral	1757.9	1664.6	584	553	5.3
West Southcentral	2920.2	2772.6	713	677	5.0
West	6616.1	6021.8	1024	932	9.0
Mountain	1592.4	1488.6	936	875	6.5
Pacific	5023.7	4533.2	1055	952	9.8
United States	36750.8	34735.5	893	844	5.5

Source: U. S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States 1962 (Washington, D. C.: 1962); U. S. Department of Health, Education and Welfare, Office of Education, Digest of Educational Statistics, 1962 and 1967 (Washington, D. C.: 1962 and 1967) and One-In-One Thousand Sample of the Census of Population, 1960 (Washington, D. C.: 1964).

United States in 1951 was $893 comprised of 35 percent indirect costs and 65 percent direct costs. Federal assistance as a percent of total costs was highest in the Pacific Division (9.8 percent) and lowest in the Middle Atlantic Division (3.4 percent).

APPENDIX B

SUPPLEMENTAL TABLES

TABLE XIV

ENROLLMENT BY LEVEL OF FORMAL SCHOOLING,
BY REGIONS AND DIVISIONS, 1960

Region and Division	Years of Schooling							Total
	Elementary			High School		College		
	1-4	5-7	8	1-3	4	1-3	4	
	- Thousand -							
Northeast	3412.2	2393.2	755.3	1760.0	578.8	514.5	127.7	9541.7
New England	824.0	578.0	182.4	417.3	137.2	140.3	34.8	2314.0
Middle Atlantic	2588.2	1815.2	572.9	1342.7	441.6	374.2	92.9	7227.7
Northcentral	4391.3	3207.9	875.4	2021.7	664.4	585.7	139.6	11885.9
East Northcentral	3093.7	2259.9	616.7	1388.9	456.4	395.7	94.3	8305.6
West Northcentral	1297.6	947.9	258.7	632.8	208.0	190.0	45.3	3580.3
South	5123.9	3507.1	978.2	2285.6	657.3	556.8	131.6	13240.5
South Atlantic	2378.0	1627.6	454.0	1063.2	305.7	247.9	58.6	6135.0
East Southcentral	1178.0	806.3	224.9	511.1	147.0	115.5	27.3	3010.1
West Southcentral	1567.9	1073.2	299.3	711.3	204.6	193.4	45.7	4095.4
West	2421.2	1643.2	492.0	1027.2	390.3	403.1	86.1	6463.1
Mountain	647.9	439.7	131.7	262.0	99.6	99.2	21.2	1701.3
Pacific	1773.3	1203.5	360.3	765.2	290.7	303.9	64.9	4761.8
United States	15348.6	10751.3	3100.9	7094.5	2290.8	2060.1	485.0	41131.2

Source: U. S. Department of Commerce, Bureau of the Census, Census of the Population, 1960, Vol. I, Characteristics of the Population, Part I, U. S. Summary (Washington, D. C., 1962), Tables 240 and 114.

TABLE XV

AVERAGE EARNINGS BY AGE AND YEAR OF SCHOOL COMPLETED, TOTAL POPULATION, 1959

Age	Years of School Completed							
	Elementary				High School		College	
	0	1-4	5-7	8	1-2	4	1-3	4
				-Northeast-				
14-15[a]	8	136	350					
16-17	11	181	467	725				
18-19	490	1,211	1,155	1,046	1,081			
20-21	921	1,393	1,719	1,435	1,510	1,972		
22-24	926	1,425	1,920	1,977	1,991	2,297	2,556	3,593
25-29	1,054	1,592	2,120	2,317	2,368	2,427	2,912	4,527
30-34	1,118	1,833	2,382	2,765	2,783	2,870	3,626	5,361
35-44	1,350	2.070	2,492	2,836	3,026	3,090	4,017	6,321
45-54	1,433	1,857	2,366	2,713	3,049	3,210	4,380	6,585
55-64	1,048	1,329	1,930	2,185	2,774	2,970	4,068	6,588
65-74	760	912	1,355	1,502	2,034	2,210	3,479	6,255
				-Northcentral-				
14-15[a]	65	73	386					
16-17	86	97	514	513				
18-19	484	129	671	839	776			
20-21	563	1,451	1,165	1,362	1,372	1,980		
22-24	963	2,337	2,040	2,061	2,008	2,378	2,461	3,382
25-29	884	2,687	2,407	2,396	2,442	2,531	2,811	3,977
30-34	1,220	2,331	2,539	2,506	2,910	2,863	3,757	5,182
35-44	1,280	2,201	2,663	2,611	3,090	3,079	4,139	6,053
45-54	1,380	1,963	2,407	2,480	3,151	3,214	4,243	6,372
55-64	947	1,273	1,820	2,019	2,852	3,102	3,700	5,570
65-74	664	861	1,199	1,324	2,215	2,448	2,831	4,334
				-South-				
14-15[a]	58	167	293					
16-17	77	223	390	343				
18-19	179	531	606	562	740			
20-21	391	783	954	876	1,016	1,514		
22-24	509	1,010	1,334	1,295	1,426	1,941	2,160	3,181
25-29	679	1,203	1,517	1,680	1,791	2,211	2,841	3,741
30-34	747	1,394	1,684	1,926	2,243	2,585	3,472	4,488
35-44	864	1,339	1,720	1,978	2,384	2,841	3,847	5,218
45-54	800	1,203	1,638	1,896	2,343	2,935	3,896	5,309
55-64	547	860	1,326	1,592	1,969	2,777	3,403	4,716
65-74	301	565	878	1,174	1,449	2,009	2,535	2,911

TABLE XV (Continued)

Age	Years of School Completed							
	Elementary				High School		College	
	0	1-4	5-7	8	1-3	4	1-3	4
	-West-[b]							
14-15[a]	120	205	407					
16-17	160	273	542	574				
18-19	403	606	731	732	890			
20-21	718	1,019	1,223	1,250	1,386	1,899		
22-24	802	1,328	1,601	1,799	2,025	2,386	2,892	3,501
25-29	1,123	1,634	1,986	2,375	2,571	2,624	3,268	4,187
30-34	1,699	1,836	2,263	2,874	3,137	3,124	3,838	5,186
35-44	1,292	1,900	2,457	3,067	3,285	3,419	4,302	5,601
45-54	1,157	1,758	2,503	2,889	3,200	3,485	4,326	5,653
55-64	872	1,316	1,897	2,238	2,666	3,175	3,969	4,768
65-74	739	877	1,317	1,525	1,864	2,142	2,618	3,451

[a]Represents 75 percent of the income of the 16-17 year age group.

[b]Earnings figures through age group 25-29 years for the three lowest schooling groups are based on the adjusted income of eight years of education. These data hold the same relationship to eight years of education for the corresponding age group as do the U. S. earnings data.

Source: U. S. Department of Commerce, Bureau of the Census, One-In-One Thousand Sample of the 1960 Census of Population. (Washington, D. C.: 1964).

TABLE XVI

NET MIGRATION RATES OF THE POPULATION 25-64 YEARS OF AGE, BY DIVISIONS, 1955-60

Age	Years of Schooling							Total
	Elementary			High School		College		
	0-4	5-7	8	1-3	4	1-3	4	
				-New England-				
25-29	1.42	.70	.23	- .60	- .68	-3.50	-7.62	-1.82
30-34	.77	.06	- .64	-1.10	- .88	- .19	-2.08	- .90
35-39	.71	.06	- .74	-1.03	-1.06	- .73	- .73	- .71
40-44	.41	- .51	- .80	-1.04	-1.23	-1.10	- .97	- .84
45-49	.78	- .36	- .70	-1.05	- .92	-1.04	- .03	- .74
50-54	.11	- .30	- .86	-1.20	-1.08	- .89	- .18	- .81
55-59	- .24	- .41	- .86	-1.03	-1.55	-1.07	- .83	- .92
60-64	- .93	- .93	- .91	-1.26	-1.82	-1.98	- .94	-1.21
Total	- .07	- .34	- .74	-1.04	-1.06	-1.30	-1.62	- .97
				-Middle Atlantic-				
25-29	1.47	2.37	.79	- .15	-1.05	-1.93	- .29	- .53
30-34	.95	.35	- .46	-1.48	-2.21	-3.50	-1.48	-1.70
35-39	.75	.41	- .81	-1.40	-2.16	-2.95	-2.53	-1.71
40-44	.97	- .27	- .80	-1.30	-1.85	-2.85	-2.38	-1.46
45-49	.58	- .36	- .93	-1.38	-2.02	-2.27	-2.16	-1.35
50-54	- .29	- 48	- .96	-1.32	-1.88	-2.09	-1.88	-1.24
55-59	- .64	- .82	-1.19	-1.76	-2.33	-2.29	-1.96	-1.46
60-64	- .95	-1.21	-1.83	-2.66	-2.24	-3.57	-3.25	-2.05
Total	- .14	- .37	- .98	-1.35	-1.95	-2.67	-1.85	-1.44
				-East Northcentral-				
25-29	4.73	4.72	2.87	.66	1.50	2.16	.61	1.59
30-34	2.41	.70	.05	-1.68	-1.88	-2.82	-2.45	-1.56
35-39	1.56	.60	- .56	-1.86	-2.15	-3.11	-3.28	-1.84
40-44	1.56	.39	- .55	-1.49	-1.93	-2.76	-2.45	-1.46
45-49	1.45	.22	- .64	-1.35	-1.84	-2.54	-1.71	-1.21
50-54	.46	- .37	- .89	-1.59	-2.06	-2.22	-1.51	-1.31
55-59	.03	- .67	-1.18	-1.98	-2.44	-2.71	-1.98	-1.51
60-64	- .52	-3.19	-1.79	-2.74	-3.62	-3.07	-3.39	-2.48
Total	.81	- .34	- .68	-1.42	-1.45	-2.03	-1.93	-1.20

TABLE XVI (Continued)

Age	Years of Schooling							Total
	Elementary			High School		College		
	0-4	5-7	8	1-3	4	1-3	4	
				-West Northcentral-				
25-29	-1.01	-2.70	-2.88	-4.25	-2.52	-4.96	-8.88	-3.89
30-34	- .33	-2.32	-2.92	-3.87	-3.92	-5.36	-7.37	-4.20
35-39	-1.40	-2.33	-2.41	-3.53	-3.29	-4.21	-6.72	-3.54
40-44	-1.13	-1.43	-1.99	-2.96	-2.85	-3.39	-4.96	-2.77
45-49	- .88	-1.09	-1.50	-2.42	-2.53	-3.04	-3.39	-2.18
50-54	- .66	-1.32	-1.37	-1.88	-2.24	-2.95	-3.02	-1.90
55-59	- .39	-1.30	-1.17	-2.06	-2.15	-2.29	-2.39	-1.62
60-64	- .88	-4.64	-1.19	-1.77	-2.48	-2.98	-2.36	-2.28
Total	- .78	-2.22	-1.73	-2.94	-2.92	-3.85	-5.68	-2.86
				-South Atlantic-				
25-29	- .57	-1.02	-2.34	-1.32	-1.16	-2.63	-1.31	-1.41
30-34	- .11	- .37	- .04	1.09	2.78	2.79	1.88	1.39
35-39	- .20	- .51	.87	1.95	3.19	3.76	3.12	1.86
40-44	- .14	.10	1.42	2.41	3.73	3.93	3.51	2.10
45-49	- .09	.17	2.48	2.87	4.20	4.15	3.32	2.19
50-54	.05	.56	3.61	3.57	5.48	4.70	3.66	2.67
55-59	.41	1.32	5.38	5.38	7.70	5.80	4.07	3.60
60-64	1.11	2.85	9.26	8.71	11.42	8.70	8.10	5.94
Total	.15	.36	2.62	2.21	3.15	3.21	2.60	1.98
				-East Southcentral-				
25-29	-4.34	-6.10	-6.24	-5.33	-5.07	-7.03	-13.07	-6.18
30-34	-3.14	-2.73	-3.40	-2.70	-2.54	-2.62	-5.94	-3.04
35-39	-1.96	-2.08	-2.28	-2.19	-1.37	-2.04	-2.91	-2.00
40-44	-2.16	-2.17	-1.99	-1.54	- .89	-2.18	-3.66	-1.84
45-49	-1.87	-1.92	-1.64	-1.25	- .97	-1.11	-2.47	-1.56
50-54	-1.15	-1.22	-1.29	-1.04	-1.36	-1.25	-1.97	-1.25
55-59	-1.10	-1.13	- .91	- .78	-1.24	-1.72	- .84	-1.06
60-64	- .78	-1.05	- .80	- .60	- .87	- .74	- .21	- .81
Total	-1.77	-2.16	-2.22	-2.24	-2.20	-2.75	-4.99	-2.36

TABLE XVI (Continued)

Age	Years of Schooling							Total
	Elementary			High School		College		
	0-4	5-7	8	1-3	4	1-3	4	
				-West Southcentral-				
25-29	-3.36	-2.88	-3.35	-3.16	-4.15	-5.98	-8.25	-4.39
30-34	-2.74	-1.58	-1.76	-1.22	- .31	-1.53	-3.99	-1.49
35-39	-1.98	-1.19	-1.04	- .97	- .23	-1.51	-2.10	-1.05
40-44	-1.62	-1.08	- .65	- .45	-1.22	-1.25	-1.81	-1.06
45-49	-1.26	- .80	- .80	- .58	- .43	- .81	-1.65	- .80
50-54	-1.01	- .46	- .52	- .30	- .07	- .37	- .69	- .46
55-59	- .82	- .18	- .03	.00	.08	.15	- .40	- .20
60-64	- .43	.02	.14	.08	.14	.13	.06	- .02
Total	-1.44	- .91	- .87	- .98	-1.12	-1.86	-3.17	-1.31
				-Mountain-				
25-29	.33	.96	2.33	4.16	4.80	9.54	5.92	5.02
30-34	.56	1.97	5.66	6.93	7.96	7.80	5.93	6.70
35-39	1.92	3.62	5.02	6.94	7.44	7.32	6.92	6.65
40-44	2.39	3.14	4.21	4.98	6.40	5.16	5.15	5.22
45-49	1.59	2.08	4.62	4.94	5.28	4.46	4.42	4.50
50-54	.21	1.72	4.30	4.49	4.58	3.33	3.85	3.75
55-59	1.07	1.59	3.66	3.26	4.28	4.72	4.11	3.36
60-64	1.44	2.80	3.82	3.08	4.28	3.63	3.37	3.34
Total	1.19	2.24	4.22	5.10	6.08	6.26	5.36	5.05
				-Pacific-				
25-29	13.33	14.54	11.83	8.95	6.95	9.41	23.77	10.37
30-34	10.19	9.55	8.93	8.28	7.83	7.95	12.94	8.80
35-39	7.94	7.24	7.99	7.11	6.01	5.56	8.91	6.75
40-44	7.02	6.10	6.42	5.47	4.65	4.94	6.20	5.34
45-49	4.87	5.11	4.86	4.20	3.51	4.15	4.91	4.22
50-54	4.60	4.21	4.01	3.38	3.09	3.87	3.75	3.67
55-59	3.70	3.80	3.24	3.19	3.00	3.11	3.64	3.31
60-64	3.79	13.14	3.38	3.05	3.32	3.30	3.72	4.81
Total	5.67	7.25	5.38	5.76	5.30	5.77	9.65	6.07

[a]Net migration figures represent [(1960 population/1955 population)-1.00].

Source: U. S. Department of Commerce, Bureau of the Census, Census of Population, 1960, Subject Report, Lifetime and Recent Migration, PC(2)2P (Washington, D. C.: 1964), Table 8.

TABLE XVII

DIVISIONAL MIGRATION ADJUSTMENT FACTORS FOR REGIONAL AGE-EARNINGS PROFILES, 1959

	Years of Schooling						
	Elementary			High School		College	
Age	1-4	5-7	8	1-3	4	1-3	4
				-New England-			
14-15	1.0001	1.0006					
16-17	1.0003	1.0018	1.0014				
18-19	1.0005	1.0030	1.0042	.9981			
20-21	1.0008	1.0048	1.0081	.9927	.9964		
22-24	1.0014	1.0084	1.0156	.9822	.9892	.9966	.9945
25-29	1.0100	1.0138	1.0196	.9751	.9814	.9658	.9489
30-34	1.0201	1.0169	1.0167	.9661	.9732	.9506	.9059
35-44	1.0291	1.0151	1.0066	.9512	.9581	.9408	.9060
45-54	1.0391	1.0101	.9916	.9297	.9366	.9223	.9135
55-64	1.0371	1.0006	.9751	.9072	.9096	.8978	.9035
65-74	1.0251	.9876	.9571	.8842	.8756	.8678	.8855
				-Middle Atlantic-			
14-15	1.0001	1.0001					
16-17	1.0003	1.0003	1.0003				
18-19	1.0005	1.0005	1.0009	.9995			
20-21	1.0008	1.0010	1.0024	.9974	.9978		
22-24	1.0014	1.0022	1.0060	.9926	.9934	.9936	.9956
25-29	1.0103	1.0167	1.0120	.9901	.9849	.9790	.9916
30-34	1.0218	1.0282	1.0125	.9778	.9675	.9504	.9814
35-44	1.0341	1.0301	1.0027	.9565	.9087	.9074	.9509
45-54	1.0441	1.0266	.9852	.9295	.8382	.8569	.9059
55-64	1.0411	1.0126	.9607	.8990	.7907	.8074	.8699
65-74	1.0321	.9926	.9307	.8650	.7347	.7514	.8179

TABLE XVII (Continued)

	Years of Schooling						
	Elementary			High School		College	
Age	1-4	5-7	8	1-3	4	1-3	4
			-East Northcentral-				
14-15	1.0013	1.0005					
16-17	1.0039	1.0015	1.0010				
18-19	1.0065	1.0030	1.0030	1.0021			
20-21	1.0098	1.0043	1.0051	1.0075	1.0034		
22-24	1.0158	1.0067	1.0099	1.0141	1.0136	1.0047	1.0045
25-29	1.0463	1.0357	1.0286	1.0213	1.0260	1.0141	1.0081
30-34	1.0797	1.0587	1.0403	1.0140	1.0209	1.0317	.9958
35-44	1.1048	1.0665	1.0355	.9959	.9935	1.0235	.9575
45-54	1.1298	1.0705	1.0230	.9699	.9540	.9705	.9130
55-64	1.1368	1.0505	1.0010	.9319	.9090	.9185	.8705
65-74	1.1318	1.0125	.9720	.8849	.8580	.8615	.8175
			-West Northcentral-				
14-15	.9983	.9952					
16-17	.9749	.9856	.9962				
18-19	.9915	.9760	.9886	.9936			
20-21	.9866	.9623	.9778	.9754	.9882		
22-24	.9770	.9356	.9568	.9400	.9528	.9845	.9771
25-29	.9678	.9105	.9324	.9027	.9260	.9235	.9240
30-34	.9620	.8859	.9034	.8626	.8626	.8714	.8445
35-44	.9483	.8577	.8703	.8152	.8470	.8120	.7566
45-54	.9283	.8267	.8373	.7617	.7930	.7440	.6661
55-64	.9148	.7852	.8143	.7212	.7460	.6930	.6106
65-74	.9028	.7262	.7913	.6832	.7000	.6510	.5636
			-South Atlantic-				
14-15	.9998	.9995					
16-17	.9994	.9985	.9964				
18-19	.9990	.9975	.9892	.9970			
20-21	.9978	.9968	.9839	.9925	.9979		

TABLE XVII (Continued)

Age	Years of Schooling						
	Elementary			High School		College	
	1-4	5-7	8	1-3	4	1-3	4
				-South Atlantic (Cont.)-			
22-24	.9948	.9962	.9788	.9895	.9916	.9979	.9983
25-29	.9909	.9900	.9630	.9802	.9826	.9781	.9905
30-34	.9877	.9839	.9533	.9816	.9945	.9851	.9967
35-44	1.0287	.9805	.9646	1.0080	1.0400	1.0352	1.0373
45-54	1.0467	.9820	1.0066	1.0620	1.1230	1.1177	1.1053
55-64	1.0562	1.0060	1.1101	1.1645	1.2670	1.2342	1.2008
65-74	1.0712	1.0470	1.2561	1.3055	1.4580	1.3792	1.3218
				-East Southcentral-			
14-15	.9910	.9890					
16-17	.9730	.9670	.9887				
18-19	.9550	.9450	.9661	.9886			
20-21	.9275	.9114	.9316	.9536	.9770		
22-24	.8720	.8436	.8620	.8828	.9080	.9713	.9479
25-29	.8274	.7844	.8013	.8271	.8547	.8716	.8696
30-34	.7911	.7438	.7742	.7895	.8192	.8278	.7829
35-44	.7580	.7120	.7518	.7602	.7980	.7964	.7274
45-54	.7225	.6755	.7163	.7302	.7755	.7639	.6729
55-64	.6985	.6490	.6933	.7122	.7535	.7399	.6454
65-74	.6805	.6270	.6763	.6992	.7325	.7149	.6344
				-West Southcentral-			
14-15	.9952	.9969					
16-17	.9856	.9907	.9971				
18-19	.9760	.9845	.9913	.9967			
20-21	.9628	.9761	.9844	.9877	.9935		
22-24	.9376	.9602	.9684	.9706	.9740	.9892	.9816
25-29	.9088	.9378	.9433	.9460	.9426	.9316	.9486
30-34	.8787	.9168	.9200	.9262	.9242	.8983	.8916
35-44	.8497	.8994	.9024	.9144	.9150	.8836	.8561

TABLE XVII (Continued)

	Years of Schooling						
	Elementary			High School		College	
Age	1-4	5-7	8	1-3	4	1-3	4
			-West Southcentral (Cont.)-				
45-54	.8202	.8824	.8849	.9034	.9045	.8691	.8251
55-64	.8022	.8754	.8774	.8989	.9010	.8621	.8111
65-74	.7892	.8734	.8754	.8979	.8990	.8379	.8061
				-Mountain-			
14-15	1.0017	1.0031					
16-17	1.0051	1.0093	1.0058				
18-19	1.0085	1.0155	1.0174	1.0070			
20-21	1.0121	1.0221	1.0298	1.0220	1.0095		
22-24	1.0178	1.0326	1.0496	1.0460	1.0380	1.0098	1.0084
25-29	1.0215	1.0418	1.0703	1.0789	1.0763	1.0867	1.0438
30-34	1.0260	1.0573	1.1136	1.1366	1.1432	1.1717	1.1031
35-44	1.0497	1.0991	1.1822	1.2235	1.2440	1.2654	1.1869
45-54	1.0802	1.1521	1.2638	1.3300	1.3620	1.3669	1.2879
55-64	1.1017	1.1931	1.3458	1.4085	1.4525	1.4474	1.3664
65-74	1.1267	1.2371	1.4208	1.4715	1.5355	1.5304	1.4414
				-Pacific-			
14-15	1.0214	1.0274					
16-17	1.0642	1.0822	1.0203				
18-19	1.1070	1.1370	1.0609	1.0218			
20-21	1.1686	1.2158	1.0990	1.0845	1.0376		
22-24	1.2892	1.3700	1.2133	1.2072	1.1504	1.0409	1.0685
25-29	1.4092	1.5087	1.3225	1.3018	1.2297	1.1791	1.2110
30-34	1.5032	1.6242	1.4233	1.3871	1.3046	1.2644	1.3837
35-44	1.6190	1.7289	1.5314	1.4831	1.3895	1.3487	1.5110
45-54	1.7415	1.8419	1.6484	1.5836	1.4860	1.4362	1.6300
55-64	1.8260	1.9729	1.7259	1.6521	1.5605	1.5032	1.7105
65-74	1.9000	2.1419	1.7919	1.7141	1.6235	1.5672	1.7845

[a]Migration factors were computed as γ in Equation (4) in Chapter IV. Factors for 1-4 years of schooling were used to adjust the age-earnings profiles of persons with no schooling as well as the profile for persons with 1-4 years of schooling.

VITA

2

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