

SOCIAL AND PRIVATE RETURNS TO INVESTMENT
IN SCHOOLING BY RACE-SEX GROUPS AND
URBAN-RURAL RESIDENCE

By

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PREFACE

This study was concerned with an evaluation of the social and private returns to investment in schooling by race-sex groups and by urban-rural place of residence. Part of the estimates were based on results of a sample of low income household heads residing in open country in the South. The overall objective of the study was to estimate and analyze returns to investment in schooling. Analyses were made using rates of return estimates together with the associated estimates of benefit-cost ratios, discounted costs, and discounted earnings differentials.

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CHAPTER I

INTRODUCTION

This study investigates the returns to education for different groups of individuals in the United States. Education has been focused upon as a source of growth in the total capital stock of countries -- both conventional capital and human capital. Thus, education is seen as an important part of the growth process and also as an instrument variable to be used, along with other instrument variables, to obtain certain national goals framed in terms of employment, income distribution and increments in national income.

In addition to this macro aspect of education, there is a micro aspect which stems from the extra value which extra education provides to the private individual who obtains it. There are many different types of education available for private individuals and society to invest in. Examples of some of these types are general education, vocational education, on-the-job training, and the Job Corps.

This study is concerned with general education: elementary and secondary day schools, and conventional two year and four year colleges and universities. The two racial groupings -- white and nonwhite -- and four residence groups -- urban, rural, rural nonfarm, and rural farm -- used in this study, allow the examination of the differences in returns to schooling between races and resident groups. In addition, sample data were obtained on open country residents living in low income

counties situated in the South. Many of the sampled household heads were in a low income situation such that they comprised part of the group of people living in rural poverty. Education has been stressed by some observers as an important means to be used by society as a practical way of increasing earnings and living standards of the economically disadvantaged. In 1965 there were 14 million rural poor people in the United States. Unemployment and underemployment are major problems in rural America. Whereas the rate of unemployment nationally was four percent, the rate in rural areas was much higher. Among rural farm residents, the rate of underemployment was 37 percent.¹ The importance of education as a means to productive employment for the individual is not always apparent, but illiteracy is clearly a handicap. In 1960, more than 700,000 adults in rural America had no schooling at all and 3.1 million rural adults had less than five years of schooling and were classified as functional illiterates.²

These data suggest that human capital analysis and empirical estimates are relevant to persons comprising the low income, rural residence group.

Need for Study

It is apparent in the review of literature presented later that there does not exist, but there is a need for, a systematic presentation of private rate of return estimates to general education in the United States for males and females, whites and nonwhites, and urban and rural

¹Report by the President's Advisory Commission on Rural Poverty, The People Left Behind (Washington, 1967), p. 25.

²Ibid., p. 41.

residents.³ An additional group for whom the returns to schooling are needed is residents of low income rural areas. Private rates of return for them will provide valuable clues to the impact of schooling on their income positions in the past and in the future.

There is an upward trend in the financial support provided by State governments and the Federal government to local school systems. Public funds to support education can be most efficiently allocated among schooling and other uses if measures are available of rates of return on investment. Social rates of return have not been computed from 1959 census data prior to this study. The social rate of return on schooling, computed in this study, suggests which sectors, groups and schooling levels can most efficiently use additional public funds for schooling.

Some rates of return to schooling have previously been estimated by others. They vary as to the group of persons being considered, the year to which the data refer, and the number of levels of schooling for which estimates are calculated. Those estimates considered to be most relevant are presented in the latter part of Chapter III. Various researchers have used different assumptions in calculating estimates of the returns to schooling. There is a need for rate of return estimates for several population groups which are calculated on the same basis. This study meets this need for several important population groups.

Also, more studies are needed to supplement and confirm published returns to schooling estimates. If new studies calculate estimates which are significantly different from already published estimates, then a useful task is to suggest reasons for the differences. This will

³T. W. Schultz, "The Rate of Return in Allocating Investment Resources to Education", Journal of Human Resources, II (1967), p. 295.

allow all return to schooling estimates to be placed on a firmer foundation.

Schooling alone is obviously not the only factor which explains an individual's earnings, and there is a need to take as many other factors into account as possible. Age, race, sex, place of residence, and unemployment are taken into account in this study, together with quantity of schooling, in calculating rates of return. The effects on returns of other factors including mortality, taxes, secular growth in incomes, ability and attitudes are also examined.

Objectives of Study

The overall objective of the study is to meet the research needs set forth in the section above. Specific objectives within the study are listed below:

1. Estimate the private rate of return to investment in schooling for specific groups including white and nonwhite, male and female, and urban and rural. "Private" is here defined to include the measurable costs and returns of schooling incurred directly by the individual and his family. The cost and returns were calculated from secondary data.
2. Estimate the social rate of return to investment in schooling for the same groups as in objective 1. "Social" is here defined to include measurable costs and returns to society, including the individual, community, state and nation.
3. Examine the effect on estimates of private and social rates of return to investment in schooling of several factors hypothesized to influence earnings. The factors are mortality, total taxes, secular growth in earnings, ability and attitude.

4. Estimate the private and social rates of return to investment in schooling for the rural residents of 29 low income counties in the South. Data were obtained by means of personal interview questionnaires.

Outline of Following Chapters

Chapter II presents a discussion of the theory of human capital with particular reference to the estimation of returns to schooling. In Chapter III, published studies relating years of schooling achieved by individuals to their earnings are reviewed. The review attempts to present the several ways in which the returns to schooling have been considered. It also presents returns to schooling estimates which consider the race and place of residence factors.

Chapter IV describes the assumptions that were used to calculate estimates of private and social rates of return from the available data. In addition, the calculation procedure is explained.

Chapter V presents age-earnings profiles. Private and social rates of return estimates to different population groups in the United States are presented and analyzed in Chapter VI. Chapter VII examines the earnings and schooling of a group of rural residents in the 29 low income counties in the South.

The summary and conclusions are presented in the last chapter.

CHAPTER II

THE THEORY OF HUMAN CAPITAL

Human capital arises from investment of public and private funds in schooling and other education of persons. This investment generates more earnings than the human agent would receive without the investment. Education is not restricted to formal schooling alone; it includes any process which brings about an increase in knowledge of the individual. The list includes formalized processes such as adult education, on-the-job training, and formal schooling, and also less formalized processes such as watching television and learning from parents.

The individual who appraises education in human capital terms will attempt to assess the extra value that he will receive from education in terms of extra earnings over his lifetime and compare this value with the cost of education. Thus, the worth of investing in education can be appraised in much the same way that a corporate decision maker assesses the worth of a proposed capital investment to the corporation.

Decision Criteria

An investment is examined, first, with respect to the amount of returns which will be realized and, second, as to how it compares with alternative investments. Two criteria that are commonly used to examine these are present value and the internal rate of return. Present value is the dollar sum of net returns discounted to a base year with

an appropriate rate. The internal rate of return is expressed as a percentage, and it is the discount rate which equates discounted costs of the investment to discounted net returns. In Financial Analysis of Investment Alternatives it is pointed out that to choose between investment alternatives using these investment criteria, the decision maker needs to estimate the magnitudes of such things as the necessary initial investment, service lives, salvage values, operating costs, revenues, and the cost of money and taxes.¹ When using the criteria for investment in schooling, both operating costs and salvage values are assumed to be zero.

The Present Value of an Investment

A simple investment problem would be one where the cost of purchase (C_0) would be incurred in the first time period, $t = 0$. Net returns (R_t) start in time period $t = 0$ and continue throughout the payoff period to $t = n$. The present value (PV) of the net returns stream may be calculated using the formula:

$$PV = \sum_{t=0}^n \frac{R_t}{(1+r)^t}$$

The discount rate, r , may be set by the decision maker. The larger the discount rate, the smaller will be the present value and the less favorable will the investment appear in relation to acquisition cost.

Where investment has already been made in a certain quantity of schooling, an extra investment in more schooling might be considered. With such additional investments in schooling, the main problem is that of isolating the part of total returns generated by the additional

¹Raymond R. Mayer, Financial Analysis of Investment Alternatives (Boston, 1966), p. 89.

investment. Total returns are generated by the first and second investments together.

The Internal Rate of Return

The internal rate of return of a particular investment is the rate of discount which equates the net returns from the investment with investment costs. Investment costs of schooling are normally incurred over several years. The formula is:

$$\sum_{t=0}^k \frac{C_t}{(1+r)^t} = \sum_{t=0}^n \frac{R_t}{(1+r)^t}$$

C_t = cost of investment in year t ,

R_t = net returns from investment in year t ,

k = last year in which investment costs are incurred,

n = last year in which investment returns are present,

r = internal rate of return.

In order to appraise an investment using the rate of return criterion, the decision maker compares the rate of return with his opportunity cost of capital. His opportunity cost may be the market rate for borrowing money, or it may be the rate of return on an alternative investment.

Private and Social Rates of Return

A distinction is made between private and social returns to schooling. Since the rate-of-return investment criterion is used extensively in this study, the distinction is expressed in terms of private and social rates of return. For the former, the standard method is to observe, for a particular year, and for different age cohorts, the net earnings differentials after tax that are associated with various amounts of education received, and then to calculate the internal rate of return

which would equate the present value of these expected differentials, properly adjusted for income-determining factors other than education, to the private cost incurred in obtaining additional education.

Social rates of return are derived from the private rates by allowing for the total public and private costs of schooling and by adding in earnings that are taxed away.²

Private rates of return help guide and explain private behavior. Blaug concluded, based on the data available to him in 1965, that students or their parents choose more education as if they were making a rational investment response to certain expected monetary and psychic returns; furthermore, no one had yet produced evidence that would falsify this assumption.³

With this assumption, the private rate of return to schooling can be looked upon as a tool which the individual uses to determine whether or not an extra amount of education is worthwhile. It may also be used for predicting the behavior of persons of school age as to whether or not they would be expected to continue their education or leave school and enter the labor force.

Blaug points out that when the social yield of education is calculated, it is not necessarily in order to "explain" social decisions by testing some behavioral assumption, but rather to attempt to clarify the nature of the decisions and, presumably, to affect them in some way.⁴

²Mark Blaug, "The Rate of Return on Investment in Great Britain," The Manchester School, XXXIII (1965), p. 207.

³Ibid., p. 211.

⁴Ibid.

Age-Earnings Profiles and Age-Earnings Differentials

The theoretical relationship between net earnings (R) and schooling (S) may be written as follows:

$$R = f(S, A, Z)$$

(A) represents age while (Z) represents a group of other explanatory variables hypothesized to have an effect on earnings. This group would include: race, sex, region, residence, occupation, labor force participation, ability, mortality, attitude, and taxes.

Present value of net returns may be calculated from the age-earnings profiles which show dollar earnings at different ages for a group of persons with a particular level of schooling. An age-earnings differential is obtained by subtracting one age-earnings profile from a higher one.

Two hypothetical figures are used to illustrate the relationship between profiles and differentials.

Figure 1 shows the general appearance of age-earnings profiles calculated from cross-sectional data and unadjusted for the secular increase in earnings. The more education the average individual has, the higher is his age-earnings profile.

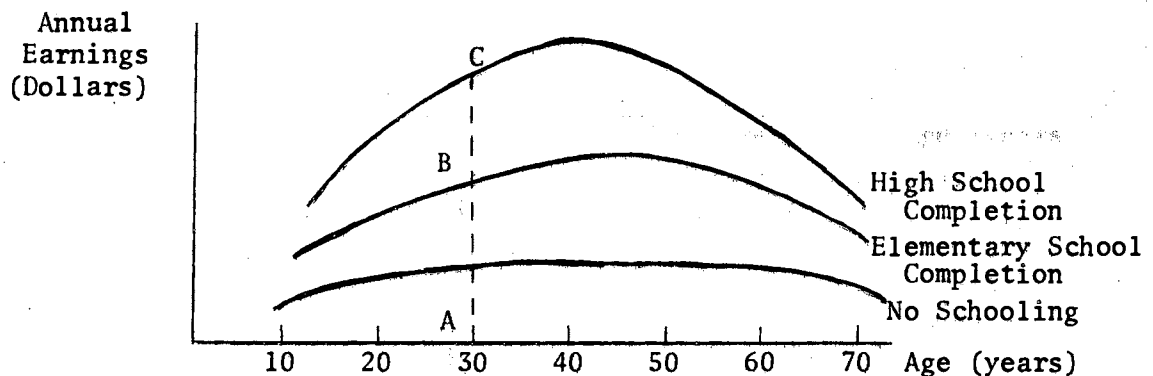


Figure 1. Hypothetical Age-Earnings Profiles

Figure 2 shows a hypothetical age-earnings differential together with the associated schooling costs.

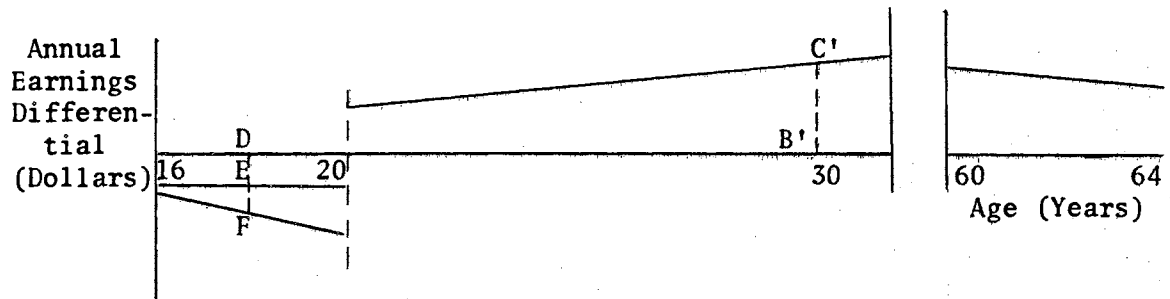


Figure 2. Hypothetical Costs and Earnings Differentials Associated with Completing High School

Figure 1 shows the lines from which the hypothetical private and social returns to 12 years of school (high school completion) over 8 years of school (elementary school completion) are calculated. It is assumed that the individual with 8 years of schooling enters the labor force at age 16. If he chooses to stay in school until he has 12 years of schooling, he will postpone entering the labor force until age 20. The extra four years of schooling result in the individual having a higher age-earnings profile. The differential between the age-earnings profile for 12 years of schooling and that for 8 years of schooling is attributed to staying in school the extra four years.

For example, at age 30 the extra amount of earnings is shown in Figure 1 by the vertical distance BC between the appropriate two profiles. This same earnings amount is shown in Figure 2 by the vertical distance B'C'. In this example, positive extra earnings are present for every year from the year that the labor force is entered (when the

individual is 20 years old) until the year that the age-earnings profiles are assumed to end (at 74 years of age).

The private and social costs corresponding to the age-earnings differential are shown in Figure 2. Schooling resource costs (the costs per student of providing teachers, physical plant, equipment, administration, etc.) are assumed to be the same for each of the four years of extra schooling. They are represented by the distance DE. Foregone earnings and other private schooling costs are assumed to increase over the four years. They are shown at one point by the amount EF. This distance represents private schooling costs. Social schooling costs, consisting of private schooling costs and schooling resource costs, are represented by the distance DF.

Objections Against Rate of Return to Schooling Calculations

Blaug has classified the various objections that have been advanced against rate-of-return calculations. He identified six classes of objections:⁵

(1) education, endowed ability, individual motivation, and social class are all intercorrelated and no one has yet succeeded in satisfactorily isolating the pure effect of education on earnings;

(2) it is assumed that people are motivated solely by consideration of the financial gains of additional school attendance, thus ignoring both the nonpecuniary attractions of certain occupations and the consumption benefits of education;

⁵Blaug, p. 212.

(3) the calculations depend on the projections of future trends from cross-sectional evidence, thus neglecting historical improvements in the quality of education as well as the effect of the secular growth of education on prospective earnings differentials;

(4) existing earnings differentials in favor of educated people reflect, not differences in their contribution to productive capacity, but rather long established social conventions in an inherently imperfect labor market; hence, rate-of-return calculations tell us nothing about the role of education in economic growth;

(5) the direct benefits of education are quantitatively less important than the indirect spillover benefits and the latter are not adequately reflected in a social rate of return which simply relates income differentials before tax to the total resource costs of education; and,

(6) social rates of return have ambiguous policy implications because educational authorities have other goals than that of maximizing the net national product.

Summary

The objections listed above indicate that both the calculations of estimates of the returns to human capital, together with the subsequent use in analysis of these estimates must be carried out with care. In particular, assumptions must be stated explicitly.

Nevertheless, having granted the validity of treating human resources in a similar manner to conventional capital and having accepted the premise that extra schooling can increase the economic value of a

particular person or group of persons, the theoretical framework presented here provides the foundation for the empirical estimates of the value of schooling presented in subsequent chapters,

CHAPTER III

REVIEW OF PUBLISHED EMPIRICAL RESULTS

This chapter presents several estimates of the economic value of education. All of the estimates are based on cross-sectional data. In some cases it is possible to obtain an estimate of how rates of return change over time by comparing cross-sectional estimates calculated at different points in time. The estimates presented from previous studies differ with respect to the number of explanatory variables used, in addition to education, when calculating income differences among education levels. Welch, for example, adjusted for age, sex, race and the ownership of capital.¹ Two procedures have been used to handle these explanatory variables. The first procedure is to divide the data on the basis of one or more explanatory variables and calculate separate estimates for each division. The second is to use multivariate analysis which allows estimates of income attributable to education to be calculated after adjustment for the effect of the other explanatory variables hypothesized to be related to income.

Returns to Schooling; Costs Not Considered

Average Income

W. Lee Hansen calculated average income by age and years of school completed. For a given age, the more education that a person has, the

¹Finis Welch, "Determinants of the Returns to Schooling in Rural Farm Areas, 1959," (unpub. Ph.D. dissertation, University of Chicago, 1966).

greater his average income. For a given level of education, average income first increases with age, then decreases with age.² A similar study was made in 1960 by Miller who calculated the mean income for males 25 years of age and over by age and years of school completed for the following years: 1939, 1946, 1949, 1956 and 1958.³

Undiscounted Lifetime Earnings

A 1956 study by Glick and Miller estimated the lifetime earnings of persons with varying amounts of education for 1949.⁴ This has been called an expected income approach, since the income figures are not discounted for time. They estimated that the lifetime income of the average male college graduate in 1949 was about \$100,000 more than that of the average male who never went beyond high school.

Discounted Lifetime Earnings

Time can be taken into account by calculating discounted lifetime earnings for different levels of education. Houthakker calculated the present value at age 14 of discounted lifetime income by years of school completed. Both present value before tax and present value after tax were calculated for four discount rates: zero, three, six and eight percent. He found that in 21 of 24 situations the contribution of additional education to the earnings stream was positive.⁵

²W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," Journal of Political Economy, LXXI (1963), pp. 128-140.

³Herman P. Miller, "Annual and Lifetime Income in Relation to Education: 1939-59," American Economic Review, L (1960), pp. 962-986.

⁴Paul C. Glick and Herman P. Miller, "Educational Levels and Potential Income," American Sociological Review, XXI (1956), pp. 307-312.

⁵H. S. Houthakker, "Education and Income," Review of Economics and Statistics, XXIII (1941), pp. 24-28.

Capitalized Earnings

Kiker⁶ notes that in addition to measuring returns, the present value of lifetime earnings can also be interpreted as measuring units of human capital defined to be the amount of education embodied in the labor force. This has been called the capitalized earnings approach. The median income differentials associated with the various levels of education are estimated and used to derive the present value of the median income differential stream of a typical individual of a given age, sex and educational level. The probability of a person being alive and in the work force at each age is used to adjust earnings downward to correct for the mortality of a given group of individuals.

Average Unadjusted Income by Education Level and by Race

Welch calculated average incomes on the basis of region and race.⁷ For the Southern region, the incomes for each race increase with each increase in the years of schooling completed. Using the data for the East South Central sub-region (which has the lowest income of all the sub-regions), the average income for whites with eight years of schooling was \$2,290; for whites with 12 years of schooling it was \$3,920. The corresponding incomes for nonwhites were 54 percent and 39 percent of the income of whites. As the amount of schooling achieved increased, the relative income position of nonwhites deteriorated from 71 percent (for no schooling) to 39 percent for 12 years of schooling. Two explanations

⁶B. F. Kiker, "Human-Capital Formation Through Investing in Education," Business and Economic Review (Bureau of Business and Economic Research, University of South Carolina), January, 1967, pp. 3-9.

⁷Welch, Table 2, p. 12.

for this might be discrimination in the labor market and a difference in the quality of schooling obtained by the two race groups.

Incomes by Education Level Standardized for Age, Region, and Occupation by Multiple Regression

Hervey used three adjustment variables to calculate the adjusted median income level for different amounts of education.⁸ A regression of median income on region, age, education, and occupation was used.⁹ Data used were based on the five percent sample of the labor force taken from the 1960 Census of Population. The data source was limited to the experienced, civilian, white males in the labor force. Eleven major occupational groups were specified along with five age groups, six groups for educational attainment, and two groups for region.

The coefficients of the five age variables, the 11 occupation variables, and the constant term, are omitted from Table I in order to concentrate on the effect of education on income. The 13-15 years of schooling class is used as the base, so that the coefficients are interpreted with respect to it. For the Non-South region, an individual with a college degree (in the 16 years and over class) is predicted to have an annual income \$429 higher than a person with some college (in the 13-15 class). The extra income from some college as opposed to a completed high school diploma (12 years of education) was relatively small for the Non-South -- it amounted to only \$8. Large annual returns, \$816

⁸Jack L. Hervey, "A Regional Analysis of the Effects of Age, Education, and Occupation on Median Income," Journal of Regional Science, 6 (1966), pp. 35-48.

⁹Two regions were designated: South and Non-South. The Southern region comprised the 16 states in the South Atlantic and South Central regions. The remaining 34 states fell in the Non-South region.

(\$824-8), are apparent from obtaining a high school diploma over finishing elementary school (8 years). The individual who goes on to college could expect annual returns of \$1,253 above earnings of the individual who attends only elementary school.

The regression coefficients obtained for the education variable given below in Table I indicate the difference in earnings of the specified group from those of persons with 13-15 years of schooling.

TABLE I
REGRESSION COEFFICIENTS, NON-SOUTH AND SOUTH, WITH MEDIAN ANNUAL INCOME THE DEPENDENT VARIABLE AND THE INDEPENDENT VARIABLES AGE, EDUCATION, AND OCCUPATION

Year of Schooling	Non-South Regression Coefficient	South Regression Coefficient
0-7	-1185.04	-1543.31
8	-823.78	-1026.93
9-11	-355.69	-507.13
12	-7.51	-36.49
13-15	0.00	0.00
16 and over	429.00	-231.98

Source: Jack L. Hervey, "A Regional Analysis of the Effects of Age, Education, and Occupation on Median Income," Journal of Regional Science, 6 (1966), Table 5, p. 43.

The respective coefficients for the South and Non-South regions were similar in magnitude and sign except for the coefficient for the 16 years and over class which had an unexpected negative sign. Hervey suggested that this might be a reflection of a lag in the returns to

education at the higher levels resulting from fewer opportunities for college graduates in the South relative to the Non-South.¹⁰

The Income Effect of Education Between Generations

One of the interesting additional benefits of schooling is due to the effect of the schooling and/or income level of the present generation on the amount of extra schooling acquired by the next generation.

Tweeten used a growth model in which the education of the children was assumed to be a linear function of the father's income and the income of the children was assumed to be a linear function of the education the children acquired. The results showed that starting from 8 years of schooling and an annual income of \$2,380, education and income will grow to 11 years of schooling and \$4,380 in the next generation.¹¹ This means that some part of the next generation's income could be considered an additional benefit of the first generation's education attainment.

Summary

The studies in this section on returns to schooling show that there is a positive relationship between earnings or income and years of schooling. Welch's study shows that nonwhites have lower earnings than whites with the same level of schooling. Hervey's study shows that the increments to extra schooling are lower for the South than the Non-South.

These studies have two deficiencies. They do not consider costs and quality of schooling so that, by themselves, they do not provide a basis for examining problems of efficient resource allocation. Also,

¹⁰Ibid., p. 42.

¹¹U. S. Department of Agriculture, ERS, The Role of Education in Alleviating Rural Poverty, Agricultural Economics Report No. 114 (Washington, 1967).

these studies do not go far enough in providing empirical evidence on the proportion of "crude" earnings which can be legitimately attributed to schooling attainment.

The Cost of Schooling

It is important to examine the costs incurred either by the individual or society to obtain the benefits of education. Cost estimates are essential for the calculation of private and social rates of return.

Three sets of cost estimates are presented below. The first two (Schultz's and Hansen's) calculate private costs and social costs; Hanoch uses a different set of assumptions to calculate only private costs.

Private costs incurred by the individual consist of three components; (1) tuition and fees paid by the individual during school attendance, (2) income foregone by the individual during school attendance, and (3) incidental school-related costs incurred by the individual (e.g. books, supplies, travel costs).

Social costs incurred by society include all three components of private costs and, in addition, the school costs incurred by society to provide teachers' salaries, buildings and equipment maintenance, administration expenses, and a charge for the use of land, buildings and equipment.

Schultz's Cost Estimates

Schultz used U. S. aggregate data to obtain his estimates. He found that for 1956 the earnings foregone by high school students in the United States were nearly \$6.6 billion while the other costs of schooling were \$4.3 billion. The corresponding costs for university and college

students were \$5.8 billion and \$4.1 billion. So for both classes of students, earnings foregone accounted for about 60 percent of the total factor costs of their education.¹²

On a per student basis, school cost per year for elementary school was \$280. It was assumed that up to the completion of grade eight at the age of 14, no private opportunity cost was involved; thus, no earnings were foregone.

The annual per student cost of high school was \$568, twice that for elementary school. Earnings foregone were \$852, about 60 percent of the total costs. If the student attended college, annual school cost was \$1,353 and earnings foregone were \$1,947. Earnings foregone were 59 percent of the total costs.¹³

Hansen's Cost Estimates

Hansen worked with 1950 Census of Population data.¹⁴ His estimates of earnings foregone were taken directly from the age-income profiles for different schooling levels. For example, at age 18 the income foregone for the person undertaking four years of college was the income that the high school graduate would obtain from ages 18 to 21. Estimates of the other cost components in addition to foregone income were derived from Schultz's estimates. Schultz estimated school-related expenditures (expenditures for books, supplies, extra clothes, and travel to and from school paid directly by the student and his family) by assuming that they were five percent of income foregone at the high school level and

¹²T. W. Schultz, The Economic Value of Education (New York, 1963), p. 28.

¹³Ibid., Table 1, p. 29.

¹⁴Hansen, p. 128.

ten percent of income foregone at the college level. Hansen used Schultz's actual figures for these school-related expenditures even though Hansen's estimates of foregone earnings based on 1950 age-income profiles were slightly lower on a per student basis than those of Schultz. Hansen's figures, exclusive of earnings foregone are presented in Table II.¹⁵ The figure of \$245 for tuition and fees was estimated from data in the 1955-56 Biennial Survey of Education. Private resource cost corresponds to private costs less foregone income. Total resource cost corresponds to social cost less foregone income.

TABLE II
AVERAGE ANNUAL PER STUDENT COSTS, EXCLUSIVE OF OPPORTUNITY
COSTS, BY AGE AND GRADE, UNITED STATES, 1949

Age	Total Resource Cost			Private Resource Cost			
	School Costs	Other Costs	Total	Tuition and Fees	Other Costs	Total	
(Dollars)			(Dollars)				
6-13	Elementary	201	---	201	---	---	---
14-17	High School	354	31	385	---	31	31
18-21	College	801	142	943	245	142	387

Source: W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," Journal of Political Economy, LXXI (1963), Table 2, p. 131.

¹⁵Ibid., Table 2, p. 131.

Hanoch's Cost Estimates

Hanoch's work was based on the One-in-One Thousand Sample of the 1960 Census of Population.¹⁶ His analysis was based on four divisions of region and race: Whites/North, Whites/South, Nonwhites/North, and Nonwhites/South. Using annual earnings, he extracted data on schooling and earnings for all males except those age 14-24 in school.

The assumption used to calculate private costs are different from those used in the previous two studies. Hanoch notes that private investment in schooling is made up of the sum of the foregone earnings and the direct private costs of schooling. The direct costs of schooling met by the student and his family are for tuition and fees, books, supplies, extra clothes, and travel to and from school where not paid by school funds. An offsetting earnings stream during the investment period is the positive earnings of students, while they are in school, resulting from part-time work during the school year and part-time or full-time work during the vacations. Since there was an apparent similarity of students' earnings and direct private costs of schooling, Hanoch made the assumption that the two amounts balance each other in each of the groups analyzed at all levels of schooling. This assumption was justified by some results of other studies that indicated a tendency for these two magnitudes to tend towards equality, especially at the college level. Becker found that the earnings of college students amount to 25 percent of the earnings of high school graduates not attending school. The remaining 75 percent are foregone earnings. These constitute 76 percent of total cost, so that total costs are about equal to total earnings

¹⁶Giora Hanoch, "Personal Earnings and Investment in Schooling," (unpub. Ph.D. dissertation, University of Chicago, 1965). The same data is used for the analysis in Chapter VI following.

of a person out of school, and direct costs are about equal to earnings during school.¹⁷ Hanoch also argues that students' earnings and direct private costs move in the same direction.

First, the higher the schooling level, the higher the private costs of schooling, and the higher the average earnings of students. In elementary school, both costs (in public schools which include a large majority of the elementary schools' students) and earnings are negligible. In high school, both increase, and usually they increase with the class attended. In college many students have sizeable earnings, especially during the summer quarter, but costs are also high. Secondly, earnings of students and average direct private costs tend to vary in the same direction between population groups. For example, nonwhites usually spend less than whites on tuition and on other direct-cost items, and they enroll in higher proportion than whites in the less expensive public schools; but their earnings are also lower due to lower wages and limited opportunities for employment.¹⁸

Hanoch also made a different assumption from that made by Hansen concerning the average age at which persons with different amounts of schooling enter the labor force. In order to estimate the average post-completion ages, the age distribution of persons enrolled in school was computed for each level of schooling completed. The integral age closest to the mean, plus one year, was selected as the age of entrance to the labor market. Hanoch estimated the ages as follows:¹⁹

Year of school completed	0-4	5-7	8	9-11	12	13-15	16	17+
Age at first year out of school	10	14	16	18	20	23	26	28

The rates of return calculated by Hanoch are presented with other estimated rates of return in the appropriate section following. The

¹⁷Ibid., p. 63. Footnote references the figures from Becker.

¹⁸Ibid., pp. 63-64.

¹⁹Ibid., p. 54.

importance of costs is enhanced in calculating the rate of return because, being at the beginning of the period over which cost and age-earnings differentials are discounted, the discounting factor reduces the undiscounted cost figures by only a small amount.

Hanoch's method of arriving at cost figures is described in detail because it is used in this study to arrive at private costs. Social cost estimates for this study were obtained using the same source as that used by Schultz, although a somewhat different approach was used.

Estimates of Rates of Return

Estimates for the United States

Hansen estimated rates of return for males in the United States for 1949. Both private rates and the corresponding social rates were estimated. Six levels of schooling were considered: no school, 8 years, 10 years, 12 years, 14 years, and 16 years of schooling. The private rate of return was very high (∞) for elementary school completion over no school. It was 15.3 percent for high school over elementary school. The rate fell to 11.6 percent for college completion over high school and 12.9 percent for college completion over elementary school. The social rates of return were lower but had the same relationship to each other as the private rates. All of them were high enough to indicate that society could rationally invest in providing these educational services on the basis of an opportunity cost of six percent. Social rates of return were as follows: 8 years over no school, 15.0; 12 years over 8 years, 11.4; 16 years over 12 years, 10.2; 16 years over 8 years, 10.5.²⁰

²⁰Hansen, p. 134.

Hanoch calculated rates of return for race-sex groups for the North (consisting of the Northeast, North Central, and West regions of the United States as defined in the Census of Population) and for the South. These estimates, in contrast to those of Hansen, were adjusted for various socio-economic factors. The assumptions used to calculate private rates (Hanoch did not attempt to calculate social rates) were different as explained in the previous section on the cost of schooling. These rates were based on 1959 data rather than 1949 data. Hanoch found that in general the rates of return to schooling for Northern whites were less than for Southern whites. For white males in the South the private rates of return were as follows: 8 years over 0 years, greater than 100 percent; 12 years over 8 years, 18.6 percent; 16 years over 12 years, 10.1 percent; 16 years over 8 years, 12.8 percent. In contrast, the returns to nonwhite males in the South were lower, although rates involving college education for nonwhites were based on too few observations to be reliable. The rate for elementary school completion over no school was 27 percent, while the rate for high school completion over elementary school was 11 percent.²¹ These figures indicate that the nonwhite male in the South -- if he could borrow funds at six percent -- would be acting rationally, in the "economic man" sense, if he invested in elementary school or high school. However, for a "typical" nonwhite male to get a college degree would not appear to be very profitable unless the true rate of return was substantially above the calculated figures (six percent for college over high school and eight percent for college over elementary school). It should be noted that these rates of return are calculated from age-earnings profiles based on

²¹Hanoch, Table 6, pp. 71-72.

people residing in the South. If there is a relatively large regional out-migration of the best trained nonwhite males with college degrees that they received in the South, the rate of return on investment in college would in fact be higher than the above estimate. Hansen's and Hanoch's estimates are summarized in Table III.

TABLE III
ESTIMATED RATES OF RETURN TO SCHOOLING
FOR MALES IN THE UNITED STATES

	Elementary School (8 years) Over No School (0 years)	High School (12 years) Over Elementary School (8 years)	College (16 years) Over High School (12 years)	College (16 years) Over Elementary School (8 years)
	(Percent)			
<u>Private Rates of Return</u>				
U. S. Males, 1949 ^a	c	15.3	11.6	12.9
White Males/South, 1959 ^b	c	18.6	10.1	12.8
Nonwhite Males/South, 1959 ^b	27.	11.	(6.)	(8.)
<u>Social Rates of Return</u>				
U. S. Males, 1949 ^a	15.0	11.4	10.2	10.5

^aHansen's estimates.

^bHanoch's estimates.

^cRate was above 100 percent.

Source: W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," Journal of Political Economy, LXXI (1963), pp. 128-140.

Giora Hanoch, "Personal Earnings and Investment in Schooling," (unpub. Ph.D. dissertation, University of Chicago, 1965).

In calculating earnings from which rates are derived, Hanoch adjusted earnings based on results of a dummy variable regression containing a set of variables hypothesized to explain total annual earnings. A subset of residence variables was included in this set; the coefficients attached to these residence variables indicate how total yearly earnings are affected by residence. Other variables included in the regression (which had an R^2 of 0.269) were years of schooling, age, race/region, and a set of other socio-economic explanatory variables not capable of being classified as one group.

Six residence classifications were used, with the residence classification Central Cities of Standard Metropolitan Statistical Areas (SMSAs) being incorporated into the regression constant term. The coefficients for both Other Urban in SMSA and Rural in SMSA are positive, indicating that the contribution to earnings of both these residence classifications is greater than for the Central Cities classification. The three other classifications -- Urban Outside SMSA, Rural Nonfarm Outside SMSA, and Rural Farm Outside SMSA -- have a negative effect on earnings relative to Central Cities. The dollar amounts are -\$318, -\$493, and -\$1,943, respectively. The sixth residence classification is the "Log of the Size of Place".²² The coefficient is positive and large enough to have an offsetting effect on the rural farm classification in particular. It can be generally concluded, however, that urban residence is related to higher earnings, and rural residence to lower earnings. Rural and urban schooling costs must be considered in addition to earnings before it can be determined whether or not rates of return to schooling as well as yearly earnings are lower for rural residents.

²²Ibid., p. 24.

Becker reached some conclusions concerning private rates of return for urban and rural persons. Using data for 1939, 1949, 1956, and 1958, his general conclusions with respect to the value of a college education were that:

The (private) rate of return to an average college entrant is considerable, of the order of 10 or 12 percent per annum; the rate is higher to urban, male college graduates and lower to college drop-outs, nonwhites, women and rural persons.²³

Becker considered ability differences explicitly. College graduates tend to be more "able" than high school graduates, apart from the effect of college education. However, ability explains only a small part of the income differentials between college and high school persons; college education explains the larger part. But ability apparently explains a larger proportion of the economic gains from high school education over grade school education.²⁴

Becker goes on to state that a similar qualification applies to the crude evidence indicating that rates on elementary school education are highest of all.²⁵

Becker's rate of return estimates are primarily private. However, one chapter is devoted to an analysis of the social gain from college education as measured by its effect on national productivity. Lower and upper limits on social rates were obtained. The lower limit derived was not much different from the corresponding private rate of return but the upper limit was almost double the latter. However, it was concluded that the evidence was insufficient to establish whether or not the social rates exceeded the return on business capital (eight percent), as the

²³Gary S. Becker, Human Capital (New York, 1964), p. 154.

²⁴Ibid., p. 155.

²⁵Ibid.

private rates for college education did, or whether the social rates might be lower than eight percent.²⁶

Estimates for Mexico

Several studies have estimated rates of return to schooling in countries other than the United States. While it is difficult to make inter-country comparisons because of the differences in schooling systems, Carnoy's figures for white urban male wage-earners in Mexico in 1963 provide supplementary estimates of private and social rates of return. Private rates appeared to be high for primary schooling, lower for secondary schooling, and high for university schooling. Social rates showed the same pattern; the highest social rate (37.5 percent) was for six years of schooling over five years of schooling; for 13 years over 12 years the rate declined to 12.4 percent and then increased to 29.5 percent for 16 years over 14 years of schooling.²⁷ The rate of return on business capital in the United States was assumed to be approximately eight percent. In Mexico, a comparable rate was 14 percent. Even with the higher rate this suggests that both elementary and university education would still be rational social investments in Mexico.

One of the additional important findings of Carnoy's study was that foregone earnings are important at young ages. They exceed annual per student institutional costs (public expenditures plus approximated per student private school costs) as early as the fourth year of primary school when the student is 10-11 years old.²⁸

²⁶Ibid.

²⁷Martin Carnoy, "Rates of Return to Schooling in Latin America," Journal of Human Resources, II (1967), Table 6, p. 366.

²⁸Ibid., p. 362.

Summary of Rate of Return to Schooling Estimates

The estimates of private rates of return presented suggest that primary and secondary schooling generally is a worthwhile private investment in the United States if the opportunity cost of money to the individual is 6-8 percent. College schooling is worthwhile for males by the same criterion. However, Hanoch's and Becker's estimates suggest that this might not be the case for nonwhite males. Becker also indicated that the rate of return to college schooling is lower for three other groups: college drop-outs, women and rural persons.

Estimates were made for all these and other groups in Chapters VI and VII of this study. Estimated lifetime earnings are generally higher for urban residents, whites and males. Becker estimated rates of return to schooling for these groups to be higher also. But the rate of return estimates made here do not always agree with Becker's estimates and conclusions. In particular, rates of return to schooling estimates for rural residents are not always smaller than corresponding estimates for urban residents.

The social rates of return estimated by Hansen are less than the corresponding private rates of return but still above 10 percent for elementary, secondary, and college schooling. It should be noted that only the earnings of the actual recipients of the schooling are taken into account by Hansen. Second-round effects which might either increase or decrease the social rate of return are not considered because they cannot be isolated and measured with sufficient accuracy.

The private rate of return estimates discussed and analyzed in Chapter VI are comparable to Hanoch's estimates, but are on a more disaggregated basis. The social rate of return estimates presented in the

same chapter had not previously been estimated with 1959 data but were calculated based on similar assumptions to those made by Hansen in his study using 1949 data.

CHAPTER IV

ASSUMPTIONS AND PROCEDURES

The two principal data requirements are earnings and schooling resource costs. Private costs of schooling are comprised mainly of earnings foregone, which are estimated from earnings. These private costs are added to schooling resource costs to provide an estimate of the social costs of schooling. The data from which earnings and foregone earnings are calculated are described and evaluated in this chapter. This is followed by an explanation of the procedure used to estimate the private rate of return. The procedure to estimate the social rate of return is the same, except for the substitution of social schooling costs for private schooling costs. The derivation of schooling resource costs (which together with private costs, including foregone earnings, make up total social schooling costs) is presented in detail.

Description of the One-in-One Thousand Sample of the 1960 Census of Population

The One-in-One Thousand Sample of the 1960 Census of Population¹ is the basic source of the earnings data used in this analysis to estimate returns to schooling for different sex, race and resident groups in the United States. It is a 0.1 percent sample.

¹U. S. Department of Commerce, Bureau of the Census, One-in-One Thousand Sample of the 1960 Census of Population (Washington, 1964).

Persons in the Sub-Sample for Whom Returns Were Calculated

There is a total of 179,563 persons in the 0.1 percent sample. The sub-sample consists of all persons except those under age 14 (for whom income data were not collected),² persons in the Armed Forces (excluded because of the large number of low-paid draftees), and persons between 14 and 34 years old in school. Persons in school were excluded because returns estimates are based on earnings of those in the labor force who have completed their schooling. Most of the estimated returns to schooling in this study are for males. There are 67,503 males in the sub-sample.³

The sub-sample includes persons not in the labor force for reasons of health, disability, and retirement. These are probably few in number except at older ages. They should be included in returns calculations because a person might become ill, disabled or retire in the future. Returns estimates are adjusted for these persons by incorporating such persons in the sub-sample based on 1959 data. Returns estimates alternatively could be corrected for this possibility in the same way that mortality may be taken into account.

²Definitions relating to the Census of Population are taken from U. S. Department of Commerce, Bureau of the Census, Census of Population, 1960, Vol. I, "Characteristics of the Population, Part I, U. S. Summary," (Washington, 1964).

³The basic population is closely, though not exactly, comparable with that used by Hanoach in his dissertation.

It is assumed that those persons who have zero earnings are unemployed. Some of these will not be in the labor force and some will be self-employed persons who made no net income on their businesses in 1959.⁴

Place of Residence

Four place of residence classifications are used. They are urban, rural, rural nonfarm, and rural farm. The rural class is comprised of the rural farm and rural nonfarm components.

The urban population comprises all persons living in urbanized areas and in places of 2,500 inhabitants or more outside urbanized areas. The rest of the persons living in the United States constitute the rural population. The different classifications of the urban population (central cities of urbanized areas, the urban fringe, and other urban) were not considered.

In the 1960 Census, the farm population consists of persons living in rural areas on places of ten or more acres from which sales of farm products amounted to \$50 or more in 1959, or on places of less than 10 acres from which sales of farm products amounted to \$250 or more in 1959. The rest of the rural population is classified as rural nonfarm.

⁴The definition of employed persons is of interest here. Employed persons comprise all civilians 14 years old and over who were either (a) "at work" -- those who did any work for pay or profit, or worked without pay for 15 hours or more on a family farm or in a family business in the calendar week to which the data on employment status relate, or (b) were "with a job but not at work".

Persons are classified as unemployed if they were 14 years old and over and not "at work" but looking for work. Persons waiting to be called back from a job from which they have been laid off or furloughed are also counted as unemployed.

Persons "not in the labor force" comprise all those 14 years and over who are not classified as members of the labor force, including persons doing only incidental unpaid family work (less than 15 hours during the week).

Income and Earnings Data

The 0.1 percent sample presents data of income received in the 1959 calendar year in five categories: wage and salary income, self-employment income, total earnings, other income, and total income.⁵

Wage or salary income is the total money earnings received from work performed as an employee before deductions are made for personal income taxes, Social Security, bond purchases, union dues, etc. Self-employment income consists of net money income from a business, farm or professional enterprise in which the person was engaged on his own account. Total earnings are the sum of the two above. It is this figure which represents best the returns to schooling. Some dollar returns to schooling are included in the "other income" category, although these are probably attributed more to nonhuman capital than to schooling. These are net rents, interest, and dividends.⁶

Sub-Sample Frequencies

The persons in the sub-sample being analyzed were grouped by race, region and place of residence. Sample frequencies are important to gauge the reliability of age-earnings profiles from which returns to schooling may be estimated. The number of white males is larger than the number of nonwhite males for all classifications so that age-earnings data for nonwhites are less reliable.

⁵The 0.1 percent sample data is stored on tape. The Bureau of the Census also publishes total income figures by age and years of schooling. The other four income categories are excluded. The published total income figures are based on a 5 percent sample.

⁶The remaining components of "other income" are Social Security benefits, pensions, veteran benefits, unemployment insurance, public assistance or other governmental payments, and periodic receipts from insurance policies or annuities.

Urban place of residence groups have higher frequencies than the rural residence groups. For the sub-sample, there were 32,227 white males with urban residence, 10,546 white males with rural nonfarm residence, and 3,799 white males with rural farm residence.

Regional estimates of the return to schooling are not presented because of the small sample frequencies resulting with a race, region, and place of residence classification. These frequencies for the South are shown in Table IV.

TABLE IV
SAMPLE FREQUENCIES FOR WHITE MALES IN THE
SOUTHERN REGION, UNITED STATES, 1959

Classification by Race, Rurality, Farm-Nonfarm	Total Frequency (Number)
White Males in Rural Farm South	1,391
White Males in Rural Nonfarm South	3,814
White Males in Rural South	5,205
Nonwhite Males in Rural Farm South	353
Nonwhite Males in Rural Nonfarm South	794
Nonwhite Males in Rural South	1,147
White Males in Urban South	7,083
Nonwhite Males in Urban South	1,642

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

Computer Print-Out of Earnings Data

The 0.1 percent sample is stored on computer tape which necessitated a program to take the data that were required and display them in the appropriate manner. The program was written to calculate average earnings for each combination of age and years of schooling classes for groups of individuals identified by sex, race, region and place of residence characteristics.

A sample page of computer print-out is shown in Table V. There are nine years of schooling across the columns and 12 age classes down the left-hand side of the print-out. Each cell in this 12 X 9 table contains three numbers: the top number represents the total number of people, the bottom number is the number of people with zero earnings, and the middle number is the average earnings for the total number of people.

The column to the right of the 17+ years of schooling column shows the total persons in each of the age classes (where cell frequencies were summed across the columns for each row). The next column shows how many of the people in each age class had no earnings. The last two columns show the mean and its standard deviation for each age class. (This mean was also calculated for all people, not just those reporting earnings.) The computer print-out sample page allows an intuitive judgment to be made of the reliability of different age-earnings profiles and of different parts of the same profile. More reliability can intuitively be placed in the middle of the tables where the frequencies are highest, away from both age extremes and years of schooling extremes. In the case of nonwhites by place of residence, the number of sample observations are few above 12 years of schooling.

TABLE V

SAMPLE COMPUTER PRINT-OUT OF EARNINGS BY AGE AND SCHOOLING GROUPS

White Males in Rural United States										Total Persons	Number Without Earnings	Mean Earnings ^a	Standard Deviation ^a
Age	Highest Grade of School Completed												
	0	1-4	5-7	8	9-11	12	13-15	16	17+				
14-15	3 ^b \$ 166 ^c 2 ^d	6 \$ 83 5	24 \$ 125 18	13 \$ 230 11	18 \$ 361 11	0 \$ 0 0	0 \$ 0 0	0 \$ 0 0	0 \$ 0 0	64	47	\$ 210	\$1,159
16-17	2 \$ 0 2	4 \$ 375 3	42 \$ 464 25	53 \$ 500 26	63 \$ 571 27	20 \$ 550 8	0 \$ 0 0	0 \$ 0 0	0 \$ 0 0	184	91	\$ 513	\$1,506
18-19	9 \$ 277 6	3 \$1,166 0	47 \$1,308 10	45 \$1,066 13	75 \$1,226 23	166 \$1,415 18	5 \$1,300 0	0 \$ 0 0	0 \$ 0 0	350	70	\$1,282	\$1,619
20-21	6 \$ 333 4	14 \$ 821 7	40 \$1,162 5	59 \$1,652 10	93 \$1,973 10	209 \$2,476 20	31 \$2,048 2	1 \$1,500 0	0 \$ 0 0	453	58	\$2,038	\$1,872
22-24	11 \$ 590 8	17 \$1,147 4	61 \$2,180 6	79 \$2,006 10	133 \$2,868 13	277 \$3,471 18	42 \$3,011 3	24 \$4,354 0	6 \$3,250 1	650	63	\$2,940	\$2,779
25-29	12 \$ 708 5	39 \$1,602 6	133 \$2,740 10	148 \$3,304 9	224 \$3,875 12	456 \$4,491 13	78 \$4,814 3	64 \$4,843 2	27 \$4,796 0	1,181	60	\$3,941	\$2,793
30-34	11 \$1,272 5	51 \$2,147 6	166 \$3,243 15	192 \$3,809 11	304 \$4,759 7	445 \$4,993 19	77 \$6,162 1	65 \$7,515 2	40 \$7,625 0	1,351	66	\$4,685	\$3,388
35-44	44 \$1,295 16	136 \$2,216 13	398 \$3,266 35	572 \$3,971 37	630 \$4,959 28	842 \$5,605 33	193 \$6,917 3	120 \$8,870 5	78 \$9,679 4	3,013	174	\$4,954	\$4,334
45-54	50 \$1,810 13	192 \$2,151 28	538 \$3,235 49	725 \$3,634 69	532 \$4,473 33	477 \$5,646 16	142 \$6,563 9	62 \$7,951 2	77 \$9,688 3	2,795	222	\$4,349	\$4,510
55-64	58 \$1,422 19	231 \$1,751 74	491 \$2,727 71	626 \$3,259 70	332 \$3,671 53	190 \$5,221 23	103 \$6,349 16	31 \$8,596 3	39 \$9,064 6	2,101	335	\$3,499	\$4,536
65-74	64 \$ 718 40	252 \$ 642 152	362 \$ 995 199	437 \$1,066 215	151 \$1,566 75	95 \$1,657 48	66 \$2,765 28	43 \$4,093 13	19 \$5,105 4	1,489	774	\$1,265	\$4,017
75+	52 \$ 115 48	144 \$ 177 119	176 \$ 335 138	215 \$ 397 166	65 \$ 738 47	29 \$ 517 25	18 \$ 638 13	8 \$ 812 5	7 \$ 214 4	714	565	\$ 362	\$2,673

^aExcludes persons with zero earnings.^bTotal number of persons.^cMean earnings (including those with zero earnings).^dNumber of persons with zero earnings.

Construction of Age-Earnings Profiles

The age-earnings profiles on the computer print-out are partially smoothed by taking the average earnings for each of the age groups and calculating from these a three-group moving average.⁷ This dampens the effect of average earnings which are unusually high or low in relation to the whole age-earnings profile. Using this three-group moving average procedure, earnings were obtained for the age groups up to the 65-74 age category. For the lower age groups -- 14-15, 16-17, 18-19, 20-21 years -- it was necessary to extrapolate back one or more age groups for some of the age-earnings profiles. This was done by taking 75 percent of the average earnings figure of the age groups immediately following. This adjustment was based on observed trends in earnings for the profiles for which data were available. In several instances where it appeared that an average earnings figure was unusually large or small in relation to corresponding figures of adjacent profiles, judgment was used to make an adjustment.

Average earnings for each of the age groups were assigned to each of the years in the group to form the age-earnings profile from which returns to schooling are calculated. It is useful to graph age-earnings profiles to see better their relationship with other profiles.

⁷Another procedure, used by Hanoach, was tried for some age-earnings profiles. Average earnings for an age group were assigned to each of the years in the group. This was done for all age groups, then a 10-year moving average was calculated for the whole age-earnings profile. One disadvantage is that average earnings cannot be calculated for the first five or last five years of the profile. A three-year moving average was used for the second through the fifth years. The first year was extrapolated. At the top end of the profile, the 10-year moving average allowed calculation of earnings up to the sixty-eighth year.

This procedure was judged to be not significantly better than the one explained in the text.

This is done by plotting earnings on the vertical axis and the age group midpoints on the horizontal axis. The earnings figure for each age group is connected with the adjacent earnings figure by straight lines.

Age-earnings profiles for groups for which place of residence is not considered are calculated for the following years of schooling: 0, 1-4, 5-7, 8, 9-11, 12, 13-15, and 16 years. Where place of residence is considered, 0 and 1-4 years of schooling were combined to form a class representing 0-4 years of schooling. This is done because of the low cell frequencies for each of the two schooling groups.

Private Costs of Schooling

Foregone Earnings and Other Private Costs of Schoolings

Private costs consist of foregone earnings plus other private schooling costs paid for directly by the student or his family. The latter consists of such items as tuition fees, supplies, and that part of transportation expenses paid for by the student. For example, the costs for four years of secondary schooling are the foregone earnings for each of the four years plus the other private costs for each of the same four years.

Using the procedure employed by Hanooh (explained in detail in Chapter III), the earnings of persons of the same age who have left school were used as an estimate of foregone earnings and other private schooling costs. In effect, this means that other private schooling costs are approximately equal to the earnings that a student would make during school vacations and by part-time work while school is in progress. Earnings of students increase as they get older but private schooling costs increase approximately in step.

Age at Which Labor Force is Entered

Table VI shows the age at which a person enters the labor force after having completed a certain number of years of schooling. If it is assumed that a child starts school at age six and continued through school without missing a year, he will enter the labor force at age 14 with 8 years of schooling, and age 18 with 12 years of schooling. These ages were used by Hansen in calculating rates of return.

An alternative procedure, used originally by Hanoch and used again in this study, is to calculate the age distribution of persons enrolled in school for each level of schooling completed. The integral age closest to the mean, plus one year, was selected as the age of entry into the labor force. Hanoch's figures for persons with college education were adjusted to have a four year age difference between high school graduates and college graduates. This adjustment allows the calculation of rate of return estimates to 16 years of schooling over 12 years of schooling on the basis of four years of costs. The net result is that persons with 8 years of schooling are assumed to enter the labor force at age 16. Persons with 12 years of schooling enter the labor force at age 20, and college graduates (16 years of schooling) enter the labor force at age 24. These ages are shown in column four of Table VI.

Social Costs of Schooling

Social returns to schooling are based on social schooling costs which consist of foregone earnings, other private schooling costs, and schooling resource costs. This section is concerned with the derivation of estimates for the latter.

TABLE VI

AGES AT WHICH STUDENTS WITH DIFFERENT AMOUNTS OF SCHOOLING
ENTER THE LABOR FORCE UNDER DIFFERENT ASSUMPTIONS

Years of Schooling Completed (1)	Age at Which Work Force is Entered ^a (2)	Average Age of People Entering Work Force ^b (3)	Adjusted Average Age of People Entering Work Force ^c (4)	Schooling Groups Corresponding to Adjusted Average Age ^d (5)
	(Years)	(Years)	(Years)	
0			8	0
1	7			
2	8	10	10	0-4
3	9		11	1-4
4	10			
5	11			
6	12	14	14	5-7
7	13			
8	14	16	16	8
9	15			
10	16	18	18	9-11
11	17			
12	18	20	20	12
13	19			
14	20	23	22	13-15
15	21			
16	22	26	24	16
17+		28	27	

^aAge at which work force is entered when student enters first grade at age six and completes each succeeding grade each year.

^bHanoch, p. 54. The age distribution of persons enrolled in school was computed for each level of schooling completed. The integral age closest to the mean, plus one year, was selected as the age of entrance into the labor market.

^cThese are the same as the ages in column (3) except for adjusting the age for college completion to 24 years and the age for 17+ years to 27.

^dColumns (4) and (5) provide the data for the returns to schooling estimates made in Chapter VI.

Expenditures of Elementary and Secondary Day Schools

Per capita schooling resource costs consist of current expenditures plus a charge for capital on a per student basis. The charge for capital may be thought of as an average fee for use by the student of a school system's equipment, buildings, and land.

The basic statistic used to estimate schooling resource cost is state current expenditures per student in average daily attendance (ADA). It has the disadvantage of being a state average, thus masking the variation of expenditures on a county or school system basis. However, the use of state current expenditures does have some important advantages. First, expenditures are correlated with measures of education quality.⁸ Second, they reflect the difference in education costs among states and among regions. And third, state expenditures can be used as a benchmark in a model which allows adjustment for race, region, and place of residence.

The elementary and secondary schooling costs used are for public schools. Total expenditures consist of current expenditures, capital outlays, and debt service. Capital outlays represent new investment in schooling physical plant and will vary from year to year. The charge for capital is not calculated from capital outlays because of this

⁸The percentage of youths who fail the Selective Service is a crude index of education quality and is correlated with region, race and low current expenditures per student. The Southern region states which have a high percentage of nonwhite residents and low school expenditures also have high failure rates on the test. Twenty-eight percent of draftees in the United States failed to meet the mental requirements for induction into the armed forces. Sixteen of the 17 Southern states (including the District of Columbia) had a higher failure rate on mental requirements than the U. S. figure. The state with the highest failure rate was Mississippi with 67.5 percent. Source: U. S. Department of Health, Education and Welfare, Office of Education, Digest of Educational Statistics, 1966 (Washington, 1966), Table 16, p. 13.

variability. Instead, it is calculated from an estimate of value of school property.

Table VII shows the percentage distribution of total expenditures for the United States and the Southeast region. The Southeast region spends a smaller fraction of total expenditures on physical plant than does the United States. For the United States, the major component of current expenditures is instructional costs (68 percent of current expenditures), followed by operation of plant (8.7 percent) and "other school services" which include pupil transportation (8.4 percent), "Other school services" are a higher percentage (11.8 percent) for the Southeast, probably because pupils are geographically more dispersed and thus require relatively more transportation services.

The Current Expenditures Cost Model

A multiple linear regression model is used to determine the influence of region, race and place of residence on current expenditures. It is assumed that costs are the same for males and females who have the same region, race and residence characteristics.

The dependent variable is state current expenditures per student in ADA.⁹ The three explanatory variables are region, percent urban and percent Negro. Percent Negro is assumed to correspond closely enough to percent nonwhite to justify the former being used to represent the latter. Region is incorporated into the equation by using three dummy variables; the first represents the Northcentral region, and the second and third represent the South and West regions, respectively. The Northeast region is incorporated into the constant term.

⁹District of Columbia was included. Alaska and Hawaii were excluded.

TABLE VII

PERCENTAGE DISTRIBUTION OF EXPENDITURES FOR PUBLIC SCHOOLS, BY
PURPOSE FOR THE UNITED STATES AND THE SOUTHEAST, 1959-60

	United States		Southeast ^a	
	Percent of Total Expendi- tures	Percent of Current Expendi- tures	Percent of Total Expendi- tures	Percent of Current Expendi- tures
	(Percent)			
Total Expenditures, All Schools	100.0		100.0	
Total Current Expenditures, Elementary and Secondary Day Schools	79.0	100.0	81.1	100.0
Administration	3.4	4.3	2.7	3.3
Instruction	53.5	67.7	56.1	69.2
Operation of Plant	6.9	8.7	5.0	6.2
Maintenance of Plant	2.7	3.4	2.6	3.2
Fixed Charges	5.8	7.3	5.0	6.2
Other School Services (attendance and health services, the school lunch program, and pupil transportation)	6.6	8.4	9.6	11.8
Current Expenditures, Other Programs	0.8		0.8	
Capital Outlay	17.0		15.6	
Interest on School Debt	3.1		2.6	

^aSoutheast region corresponds to the Southern Census region less Oklahoma and Texas.

Source: U. S. Department of Health, Education and Welfare, Office of Education, Statistics of State School Systems, 1959-60 (Washington, 1963), Table 31, p. 69.

Some expectations as to the sign and size of the regression coefficients can be obtained by examining the simple correlation coefficients. Expenditures have a correlation of 0.69 with percent urban and a correlation almost as high (-0.60) with the Southern region. The correlation between expenditures and percent Negro is -0.38, indicating that as the percentage of Negroes of the total population increases, the size of expenditures decreases. The lowest correlation coefficient in the set is between percent urban and percent Negro. The value was 0.008, indicating there was no apparent relationship between the two variables. The correlation is small between percent urban and the regions; for the South the correlation is -0.25. As expected, the correlation between percent Negro and the South is high, 0.75.

The regression equation was as follows:

$$\hat{Y} = 195.73 + 3.04X_1 - 0.62X_2 + 1.41X_3 - 61.75X_4 + 0.08X_5$$

(6.06) (-0.68) (0.06) (-2.15) (0.004)

\hat{Y} = Predicted value of current expenditures per pupil in ADA,

X_1 = Percent of state's population classified as urban,

X_2 = Percent Negro population,

X_3 = 1 if Northcentral region, = 0 otherwise,

X_4 = 1 if South region, = 0 otherwise,

X_5 = 1 if West region, = 0 otherwise.

(Computed t-values are shown beneath each coefficient.)

The t-test is significant at the one percent level for the urban variable and is significant for the South region variable at the five percent level.

The R^2 was 0.67, meaning that 67 percent of the variance in current expenditures was accounted for. The F value, the ratio of the regression mean square to the error mean square, was 17.45; and was

significant at the one percent level. This means that a high probability exists that there is correlation between the dependent variable and a linear combination of the independent variables. By comparing the difference between actual expenditures and predicted expenditures, it was possible to identify outlying observations. Two states, New York and Delaware, had actual expenditures more than \$100 greater than the predicted values. Utah had actual expenditures more than \$100 below the predicted value.

The coefficient for percent Negro was not significant. Its value of -0.62 indicates that for nonwhites, per student expenditures are \$62 less than expenditures for whites. Figures on school expenditures by race are extremely scarce, but this figure appears reasonable and was used to obtain cost figures adjusted for race.

The West and Northcentral regional coefficients are not significant. Cost estimates are similar for the Northcentral, Northeast, and West regions. Southern region costs are \$62 less. To calculate rates of return, the costs for the three Non-South regions were assumed to be equal to the Northeast region costs. An alternative formulation of the model would be to consider two regions -- South and Non-South.¹⁰

¹⁰An Alternative elementary and secondary schooling cost regression was run with value of current expenditures per pupil in ADA as the dependent variable (Y). The explanatory variables were percent urban (X_1), percent Negro (X_2), and a dummy variable for the South (X_3). The estimated equation was as follows (the computed t-values are shown beneath the coefficients):

$$\hat{Y} = 180.73 + 3.24X_1 - 1.52X_2 - 37.56X_3$$

(6.65) (-1.83) (-1.59)

Since the cost estimates derived from the equation were not used for return calculations, only six cost estimates were calculated from the above equation for purposes of comparison. They are presented in Table VIII. Compared with the cost estimates calculated from the first regression model, the estimates from the second regression model are more extreme. They are higher for white urban males and lower for non-white rural males.

Predicted current expenditures are calculated from the constant term and the five regression coefficients. The value of the constant term is \$195.73. It represents the estimated expenditures for a state in the Northeast region with a completely rural, all white population. This situation, of course, is not found in practice in the state figures.

The percent urban regression coefficient was significant. Its estimated value of +3.04 indicates that if the percent urban variable increases by one percentage point, predicted current expenditures will increase by about \$3. Thus, the difference between 20 percent rurality and 60 percent rurality is about \$120 on a yearly, per student basis.

While the statistical properties of the cost equation are not as strong as would be liked, the signs and magnitudes of the coefficients provide support for the hypothesis that current expenditures are less for rural people, nonwhites and residents of the Southern region. The model is used to generate cost estimates for race, place of residence, and regional groups in the United States. If the same unadjusted cost estimates were used for all groups, social rates of return would be overestimated for whites, urban residents and persons in the Non-South and underestimated for nonwhites, rural residents, and persons in the South.

Separate Elementary and Secondary School Costs

The estimates of current expenditures adjusted for race, residence, and region calculated from the regression equation were based on expenditures for elementary and secondary schools combined. Since rates of return to elementary schools and secondary schools are both being considered, this overall average is not appropriate. If it were used, the social rate of return for elementary schooling would be underestimated

and the social rate of return to secondary schooling would be over-estimated.

Separate elementary and secondary school expenditures were calculated by applying two adjustment factors to the current expenditures estimate calculated from the regression equation. The elementary school factor is 0.93; the secondary factor is 1.21.¹¹ This means that elementary school expenditures were 93 percent of the combined current expenditures figure, and secondary school expenditures were 21 percent greater than that figure.

Charge for Capital

Schooling resource costs comprise current expenditures plus the charge for capital. Estimates of depreciation and obsolescence for school property were obtained from Schultz.¹² A simple linear regression is used to relate the value of public school property per student in ADA to current expenditures per student in ADA. It is estimated that the charge for capital is approximately 10 percent of current expenditures. This percentage figure is applied to separate elementary and secondary school current expenditures estimates to obtain estimates of elementary

¹¹To 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 is 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 U. S., the factors of 0.93 for elementary expenditures and 1.21 for secondary expenditures were used throughout. Appendix A explains the procedure in greater detail.

¹²T. W. Schultz, "Capital Formation by Education," Journal of Political Economy LXVIII (1960), p. 578.

and secondary schooling resource costs. The charge for capital estimation is discussed in more detail in Appendix B.

Final Elementary and Secondary Schooling Resource Cost Estimates

Adjusted schooling resource cost estimates are presented in Tables VIII and IX. The adjusted current expenditures estimated derived from the regression model are shown in the left-hand columns of each table. The difference between the two tables is that in the first, the actual 1959-60 state extreme values for the urban and race variables were used. In the second the possible extreme values (i.e. zero percent and 100 percent) were used. In the former case, the state extreme values are within the range of the estimating equation and, hence, more confidence can be placed in their reliability. In the latter case, the possible extreme values show the potentially wide variation in costs between race and residence groups.

Table VIII presents rural and urban and white and nonwhite cost estimates calculated using the actual state extreme values of the 1959-60 state data. Urban residence is defined as a percent urban of 88.6. This was the highest percent urban figure and was found in New Jersey. Rural residence is represented by the lowest urban figure of 37.7 percent recorded in Mississippi. This means, of course, that the population was 62.3 percent rural. When the population is urban as defined above, current expenditures are \$154 (\$269 - \$115) greater for the urban costs compared to the rural costs.

The same procedure is used for the race variables. The actual extreme values are a high of 53.9 percent Negro (District of Columbia) and less than one percent (several states). When 53.9 percent is used to

TABLE VIII

ADJUSTED CURRENT EXPENDITURES PER STUDENT IN ADA, BY REGION, CALCULATED USING
ACTUAL EXTREME STATE VALUES^a FOR RACE AND URBAN VARIABLES

Region	Residence	Race	Adjusted Combined Current Exp. (1)	Elementary School			Secondary School			
				Current Exp. (2)	Charge for Capital (3)	Current Exp. Plus Charge for Capital (4)	Current Exp. (5)	Charge for Capital (6)	Current Exp. Plus Charge for Capital (7)	
(Dollars)										
Northeast ^b	Urban	White	465	432	43	475	563	56	619	
Northcentral and West.	Urban	Nonwhite	431	401	40	441	522	52	574	
	Rural	White	310	288	29	317	375	38	413	
	Rural	Nonwhite	277	258	26	284	335	34	369	
South	Urban	White	403	375	38	413	488	49	537	
	Urban	Nonwhite	369	343	34	377	446	45	491	
	Rural	White	248	231	23	254	300	30	330	
	Rural	Nonwhite	215	200	20	220	260	26	286	
United States ^c	Urban	White	444	458 ^d	413	41	454	537	54	591
	Urban	Nonwhite	410	376	381	38	419	496	50	546
	Rural	White	289	294	269	27	296	350	35	385
	Rural	Nonwhite	256	211	238	24	262	310	31	341
United States	All	White	387	397 ^d	360	36	396	469	47	516
	All	Nonwhite ^e	325	245	302	30	332	393	39	432

(Footnotes on following page)

TABLE VIII (Continued)

^aUrban was defined to be 88.6 percent urban. Rural was defined to be 62.3 percent rural. White was defined to be zero percent Negro. Nonwhite was defined to be 53.9 percent Negro.

^bSince the coefficients for the Northcentral and West regions were small, it was assumed that adjusted current expenditures for the Northeast, Northcentral and West regions were identical.

^cIn order to estimate costs for the United States using the regression equation incorporating the four U. S. regions, a regional adjustment factor of -21.06 was calculated by weighting each regional coefficient by the number of states in the region.

^dAdjusted combined current expenditures calculated from the alternative regression model having a South versus Non-South regional variable.

^eFor the estimates for nonwhites in the United States, it was assumed that nonwhite was represented by 100 percent Negro. This compares with the 53.9 percent Negro used for the nonwhite estimates in the preceding part of the table.

represent nonwhite, current expenditures are decreased by \$33 relative to expenditures for whites.

Table VIII shows that for different places of residence in the United States, the highest combined current expenditures estimates were for urban whites (\$444); the lowest for rural nonwhites (\$256). Corresponding cost estimates are lower for the Southern region and higher for the Non-South. Columns (2) through (4) of the table show elementary schooling costs; columns (5) through (7) show secondary schooling costs. The final schooling resource cost estimates for elementary schools, which are used to calculate social rates of return to schooling, are shown in column (4). Final schooling resource cost estimates for secondary schools are shown in column (7). The estimates indicate that urban costs are greater than rural, and white costs are greater than nonwhite.

Elementary schooling resource cost estimates for United States urban whites are \$454. They are \$262 for rural nonwhites. The corresponding secondary schooling cost estimates are \$591 and \$341.

The second set of United States cost estimates presented in Table VIII were calculated for rural and urban residents combined using the U. S. percent urban figure of 69.9 percent. Unlike the rest of the estimates in this table, the extreme possible adjustment was used for the race variable (i.e. zero percent and 100 percent) in order to examine rates of return to schooling where the effect of race on costs, as provided by the regression model, is a maximum. The schooling resource cost estimates in Table VIII are used to calculate rates of return in Chapter VI.

Table IX presents schooling resource costs for elementary and secondary schools separately when zero and 100 percent are used for extreme values for the residence and race variables. The differences in the cost

TABLE IX

ADJUSTED CURRENT EXPENDITURES PER STUDENT IN ADA, BY REGION, CALCULATED USING
EXTREME STATE VALUES^a FOR RACE AND URBAN VARIABLES

Region	Residence	Race	Adjusted Combined Current Exp. (1)	Elementary School			Secondary School		
				Current Exp. (2)	Charge for Capital (3)	Current Exp. Plus Charge for Capital (4)	Current Exp. (5)	Charge for Capital (6)	Current Exp. Plus Charge for Capital (7)
(Dollars)									
Northeast ^b	Urban	White	500	465	47	512	605	61	666
Northcentral and West	Urban	Nonwhite	438	407	41	448	530	53	583
	Rural	White	196	182	18	200	237	24	261
	Rural	Nonwhite	134	125	13	138	162	16	178
South	Urban	White	438	407	41	448	530	53	583
	Urban	Nonwhite	376	350	35	385	455	46	501
	Rural	White	134	125	13	138	162	16	178
	Rural	Nonwhite	72	67	7	74	87	9	96
United States	Urban	White	479	445	45	490	580	58	638
	Urban	Nonwhite	417	388	39	427	505	51	556
	Rural	White	175	163	16	179	212	21	233
	Rural	Nonwhite	113	105	11	116	137	14	151

^aUrban was defined to be 100 percent urban. Rural was defined to be zero percent urban. White was defined to be zero percent Negro. Nonwhite was defined to be 100 percent Negro.

^bSince the coefficients for the Northcentral and West regions were small, it was assumed that adjusted current expenditures for the Northeast, Northcentral and West regions were identical.

estimates are magnified. For the United States, elementary schooling resource cost estimates range from \$116 for rural nonwhites to \$490 for urban whites. Corresponding secondary costs are \$151 and \$638, respectively.

College Schooling Resource Costs

Table X shows schooling resource costs for institutions of higher education. These costs are comprised of expenditures for current operations plus a user fee for capital estimated at three percent of the value of plant and plant funds. The Northeast region has the highest college schooling resource costs per student; the other regions have per student costs which are lower than the United States figure of \$1,686. This latter figure was used for all U. S. calculations.

Lack of data precluded separating college costs for whites and nonwhites. Since white students comprise a large majority of all college students in the United States, the U. S. annual cost of \$1,686 is probably an adequate estimate for whites. If the average nonwhite student attends a college where the facilities are such that college schooling resource costs are less, the use of the U. S. figure of \$1,686 will result in the underestimation of the social rate of return to nonwhite college education.

TABLE X
ENROLLMENT, VALUE OF PROPERTY, AND EXPENDITURES FOR INSTITUTIONS OF HIGHER
EDUCATION IN THE UNITED STATES, BY REGIONS, 1960

Region	Total Enrollment ^a (1) (Number)	Expenditures for Current Operations (2) (\$1,000)	Value of Plant and Plant Funds ^b (3) (\$1,000)	3 Percent of Book Value (4) (\$1,000)	Total Cost (2) + (4) (5) (\$1,000)	Total Cost Per Student (5)/(1) (6) (\$)
Northeast	866,618	1,465,084	3,727,598	111,828	1,576,912	1,820
Northcentral	1,034,542	1,613,110	4,206,209	126,186	1,739,296	1,681
South	929,894	1,304,536	3,916,949	117,508	1,422,044	1,529
West	738,560	1,124,674	2,462,404	73,872	1,198,546	1,623
United States	3,582,726	5,601,376	14,612,070	438,362	6,039,738	1,686

^aFall enrollment of degree-credit students. Includes resident and extension degree-credit students, full-time and part-time.

^bGrounds, building, and equipment and unexpended plant funds.

Source: Column 1: U. S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1961 (Washington, 1961), Table 167, p. 126.

Columns 2 and 3: U. S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States, 1963 (Washington, 1963), Table 181, p. 139.

CHAPTER V

AGE-EARNINGS PROFILES BY RACE AND PLACE OF RESIDENCE

This chapter presents age-earnings and age-income profiles for different levels of schooling, based on 1960 Census of Population data. Profiles for different race, sex, and residence groups are considered.

Graphed age-earnings profiles provide a means of inspecting and comparing returns according to years of schooling attained. Three parts of the profiles are of interest. The first is the rate at which earnings increase toward their peak. The second part is the age at which earnings reach their peak. The third part of the profile of interest is the decline in earnings from their peak to the age at which the individual leaves the work force. The behavior of the earnings differential between pairs of profiles for various ages can also be important.

Age-earnings profiles were taken from the 0.1 percent sample of the 1960 Census of Population. They are for individuals 14 years of age and over who were not in school and not in the Armed Forces. Generally, the age-earnings profile will be higher the greater the amount of schooling attained. The profiles are closest in absolute dollar terms at the low ages and again at the high ages. In between, the dollar difference between pairs of profiles tends to increase to a maximum size which corresponds roughly with the highest part of the age-earnings profiles, and then tends to decrease for higher ages. Thus, the relative earnings position improves for a person with a higher amount of education

compared to someone with a lower amount -- to a certain maximum. After the point at which the maximum occurs, the difference between two earnings profiles tends to narrow.

Age-Earnings Profiles of White Males

White Males in the Urban Sector

Figure 3 shows the age-earnings profiles of white males in the urban United States for 0-4 years of schooling through 16+ years of schooling. It is the first of a set of four figures which illustrates the age-earnings profiles for white males in the United States for each of the years-of-schooling groups given in the Census. All of the age-earnings profiles in Figures 4, 5, 6, and 7 are based on age group mid-points calculated on the basis of a three-group moving average. For example, the earnings estimate for the 30-34 age group is a weighted average of the earnings estimates for the 25-29, 30-34, and 35-44 age groups.

For urban white males, peak earnings for 0-4 years of schooling are \$3,300. They are \$5,100 for 8 years of schooling, \$6,600 for 12 years of schooling, and \$10,000 for 16 years of schooling. It appears that peak earnings shift from the 35-44 to the 45-54 age group between 8 years of schooling and 9-11 years of schooling; age-earnings profiles for years of schooling below and including 8 years all have peak earnings in the lower age group.

White Males in the Rural Sector

Figure 4 shows age-earnings profiles for rural white males. These rural profiles for any given schooling level are below the corresponding urban profiles. Peak earnings for 0-4 years of schooling are \$2,000; for 8 years of schooling they are \$3,900; for 12 years of schooling

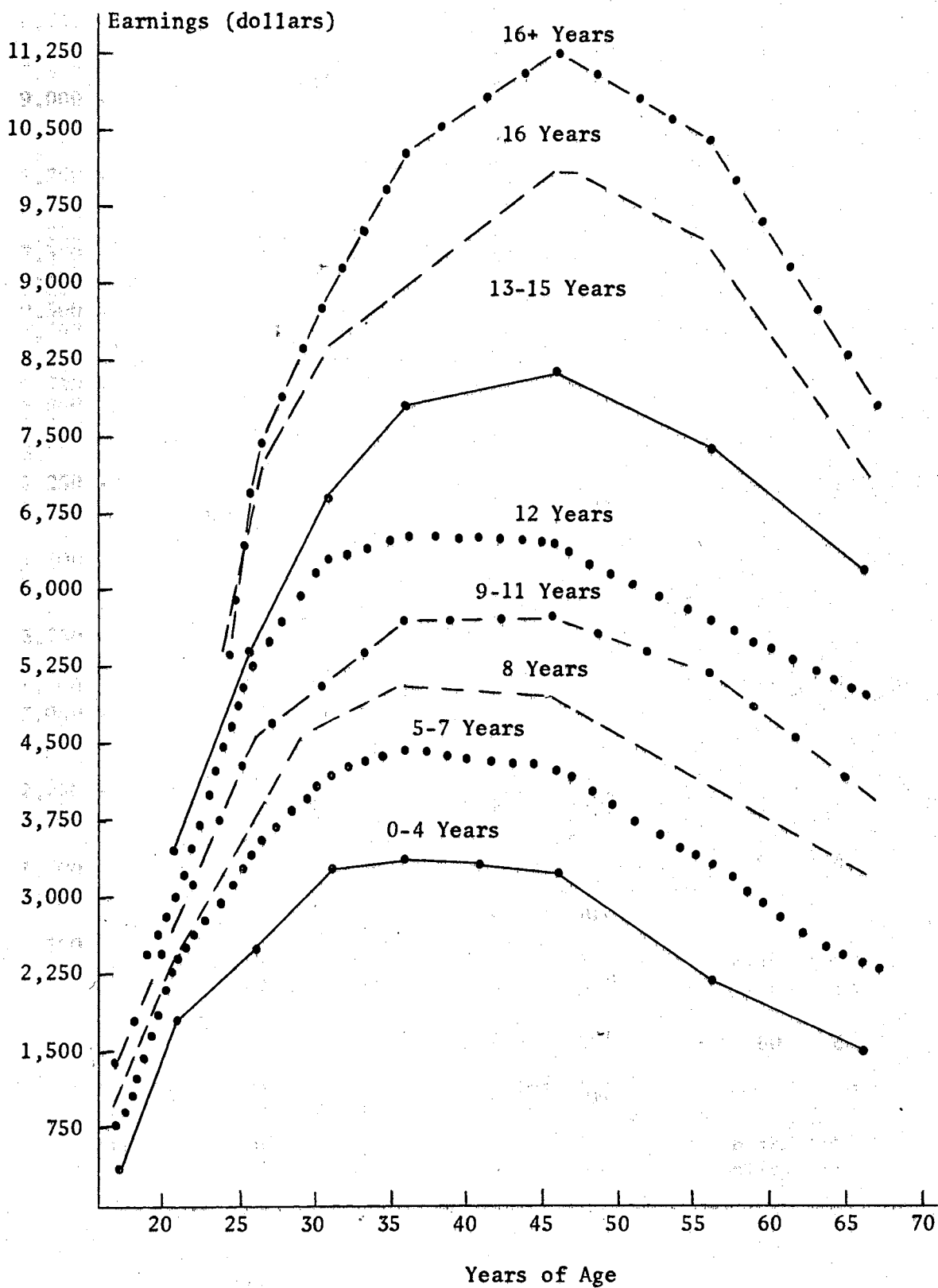


Figure 3. Age-Earnings Profiles for White Males in the Urban United States, 1959, by Years of Schooling Attained

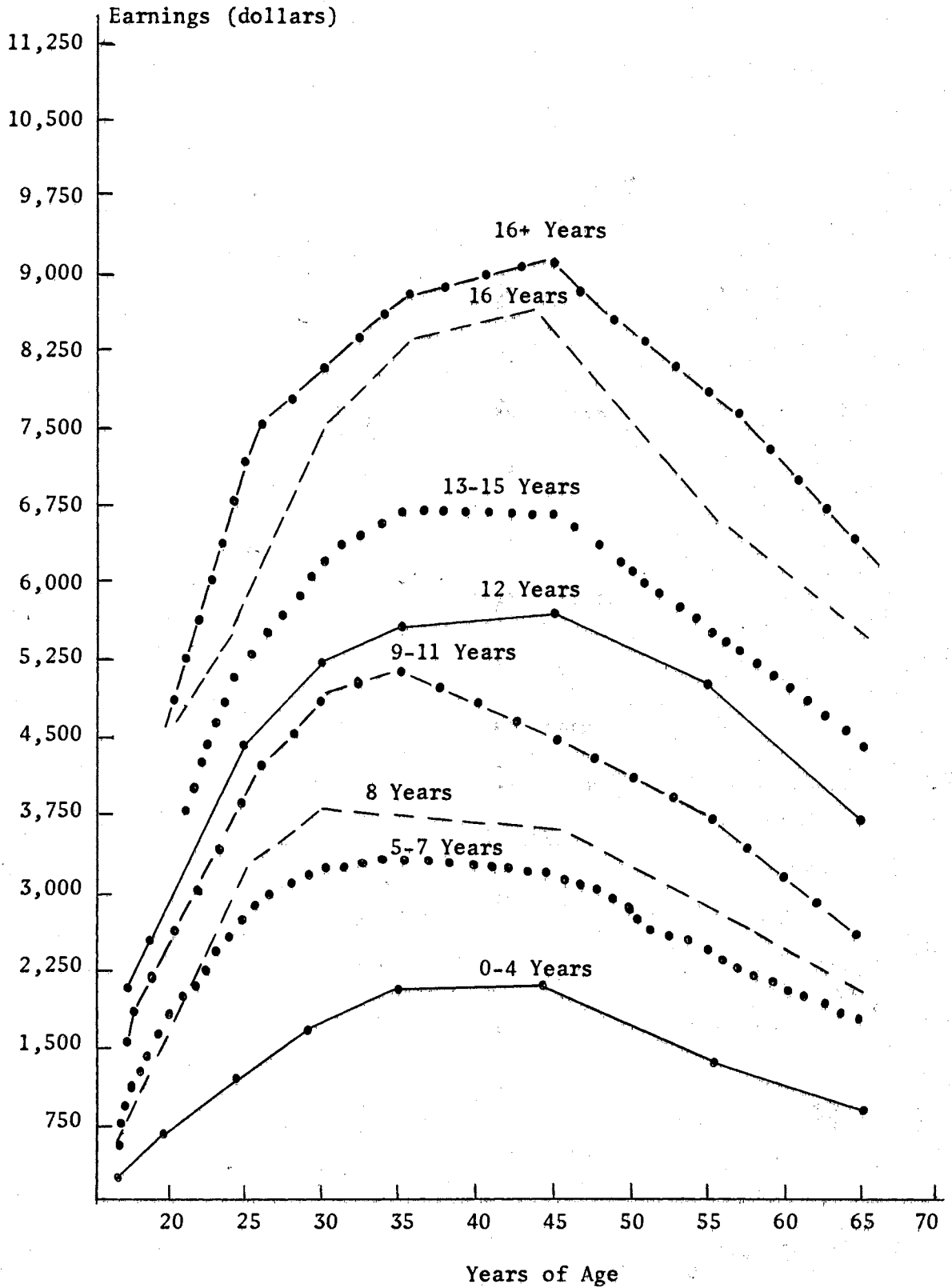


Figure 4. Age-Earnings Profiles for White Males in the Rural United States, 1959, by Years of Schooling Attained

they are \$5,600; and for 16 years of schooling they are \$8,600. Peak earnings appear to move from the 35-44 age group to the 45-54 age group between 9-11 and 12 years of schooling.

White Males in the Rural Nonfarm Sector

Age-earnings profiles for rural nonfarm white males are shown in Figure 5. Within any given schooling category, these profiles are usually above those for rural individuals presented in Figure 4, and the age-earnings profiles for rural farm residents are usually below.

White Males in the Rural Farm Sector

The age-earnings profiles for rural farm residents shown in Figure 6 are based on fewer observations than the other profiles for white males in the United States by place of residence. Judgment, together with observation of other relevant age-earnings profiles, was used to adjust some of the profiles at both the lower and higher ages where observations were very few.

White Males in the United States and the South, 8 and 12 Years of Schooling

The previous profiles for white males in the United States by place of residence were calculated as a weighted three-group average for each age group. The alternative procedure is to take the average earnings figure for an age group, assign it to each of the years in that age group and then use a 10-year moving average procedure for the whole profile. The resulting age-earnings profiles have a more continuous appearance. This procedure was used in the following figures showing age-earnings profiles for 8 and 12 years of schooling by place of residence. Figure 7 is for white males in the United States. It allows the

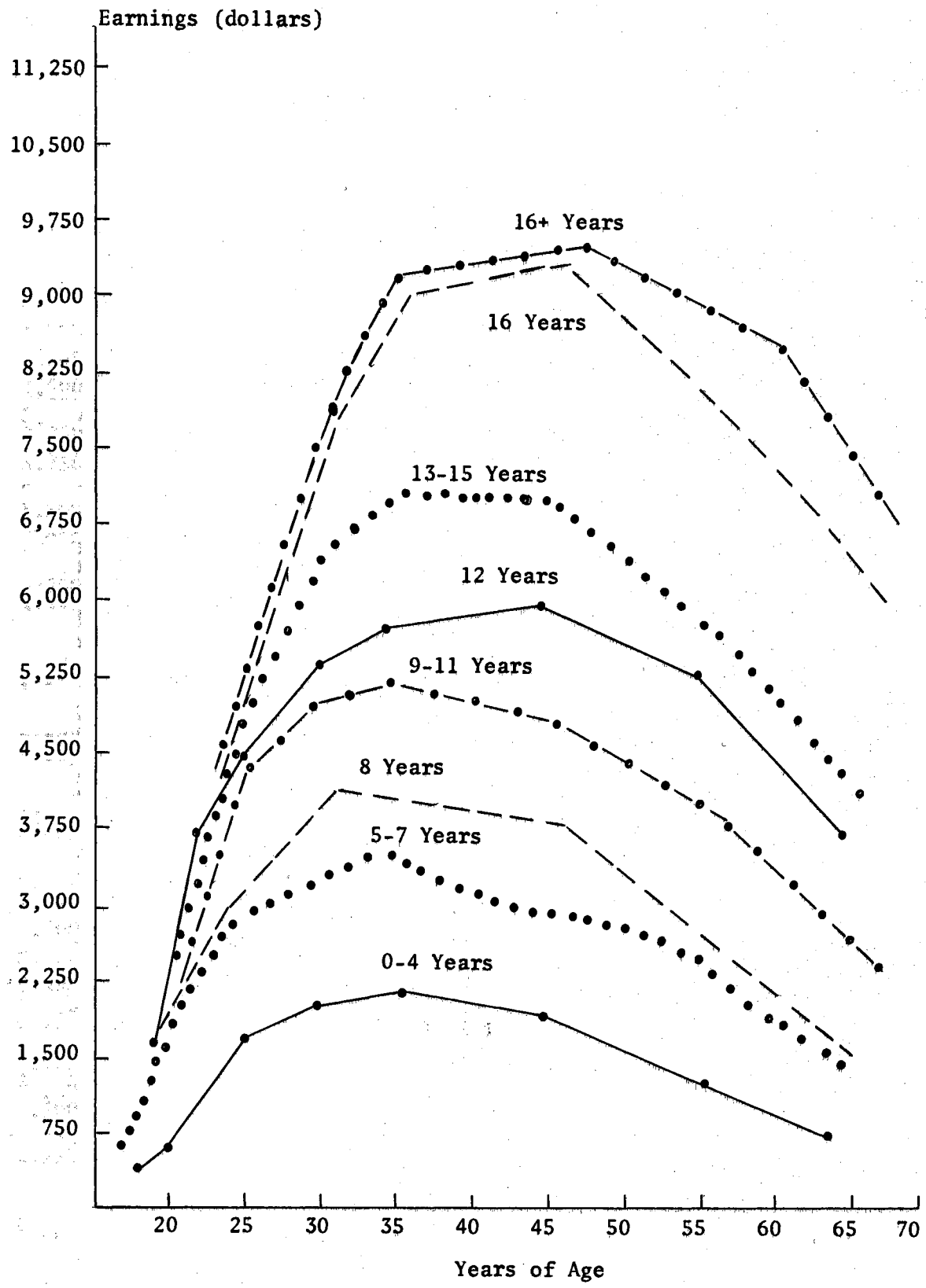


Figure 5. Age-Earnings Profile for White Males in the Rural Nonfarm United States, 1959, by Years of Schooling Attained

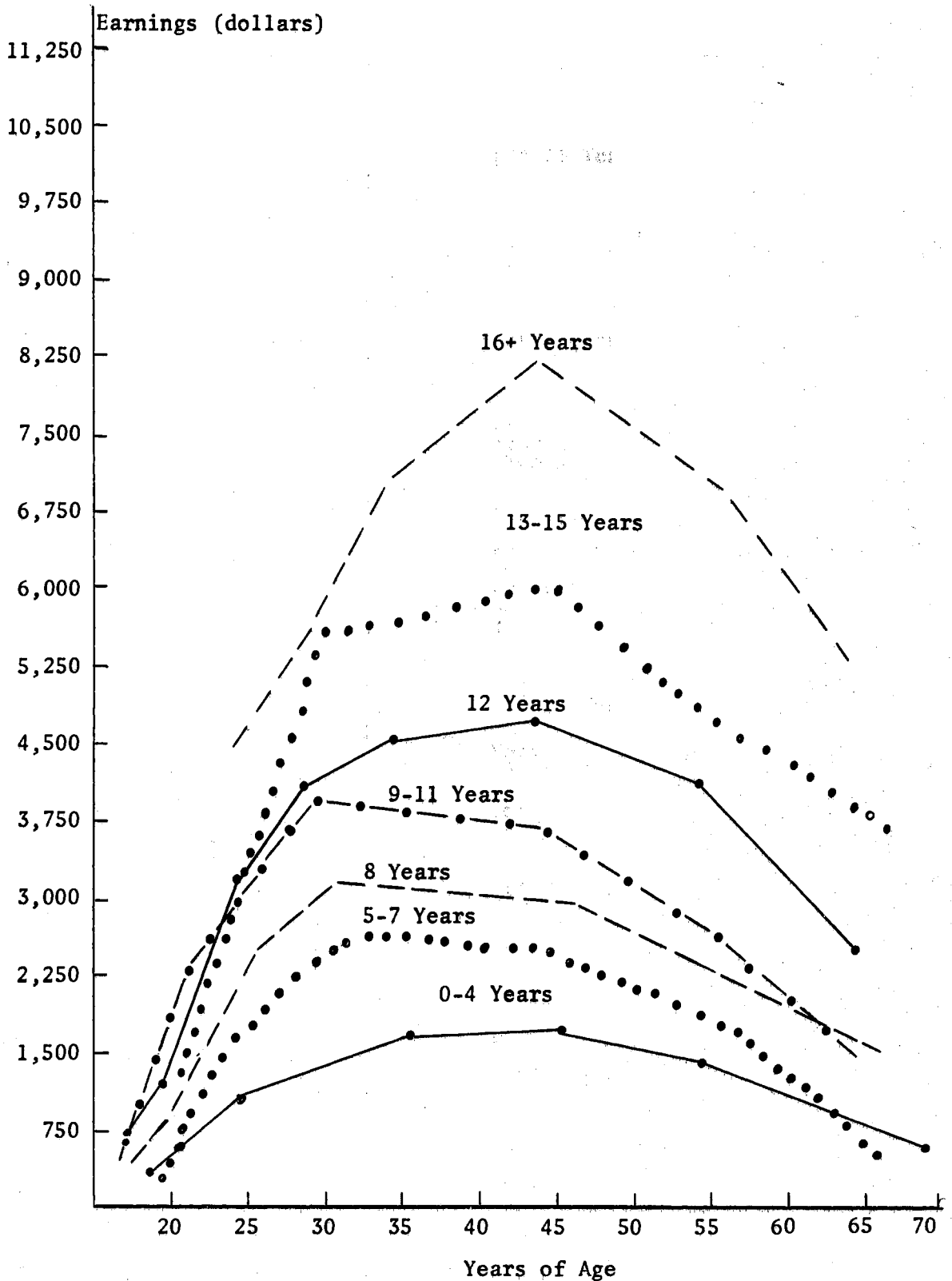


Figure 6. Age-Earnings Profiles for White Males in the Rural Farm United States, 1959, by Years of Schooling Attained

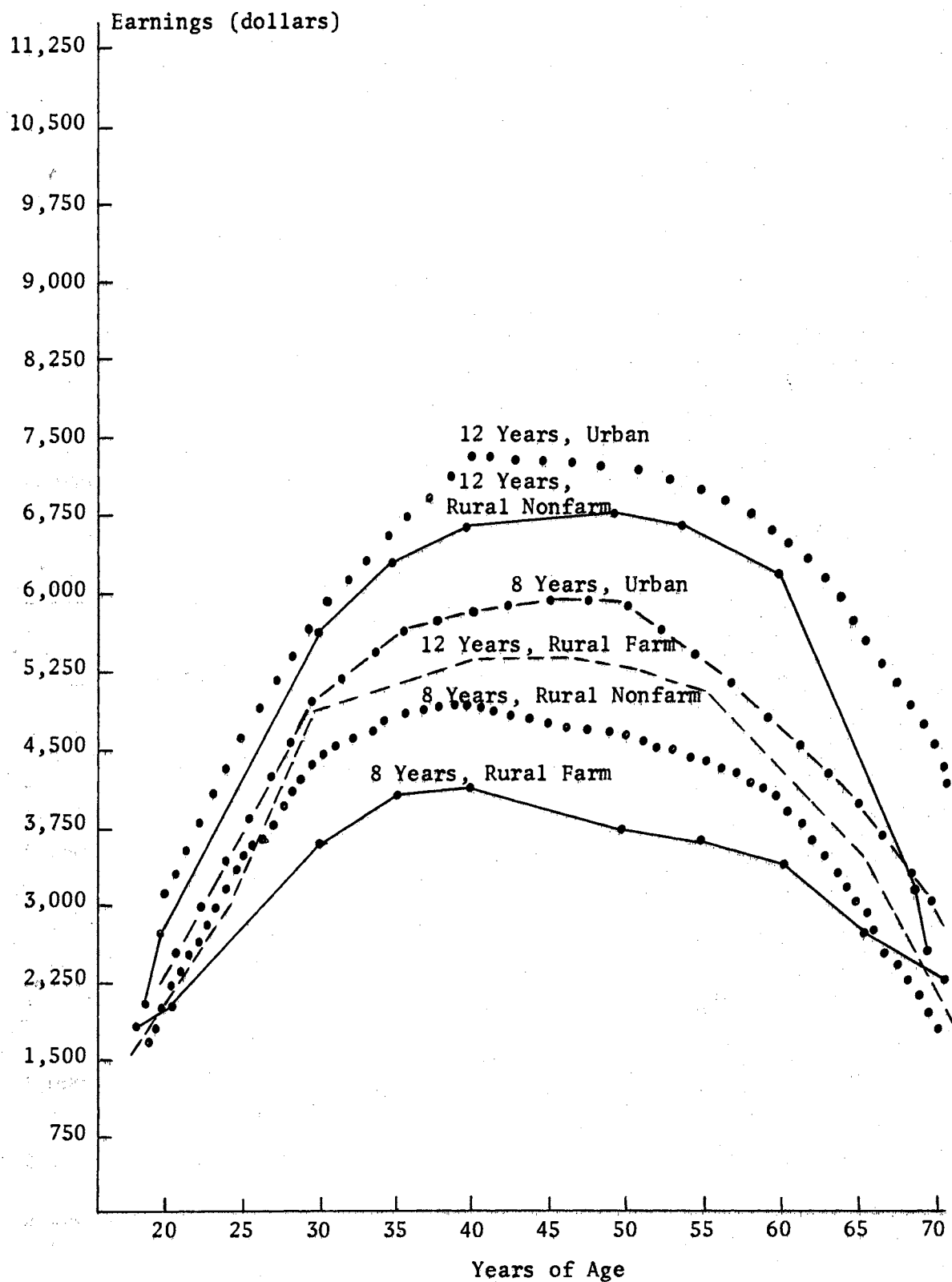


Figure 7. Age-Earnings Profiles for White Males in the United States, 1959, by Place of Residence, with 8 and 12 Years of Schooling

difference in the profiles for the same level of schooling, but a different place of residence, to be seen clearly.

Three places of residence classification are considered: urban, rural nonfarm and rural farm. With 12 years of schooling, urban people have the highest profile with a peak of \$6,700 at 40 years of age. Rural nonfarm persons are relatively close with peak earnings a little over \$6,000 at age 49. Rural farm persons have peak earnings of only \$4,700 at about 45 years of age. This is \$1,300 below the rural nonfarm residence classification and is actually below the age-earnings profile of urban residents with only 8 years of schooling, where peak earnings of \$5,200 are at 50 years of age. The earnings of rural nonfarm residents with 8 years of schooling peak at age 40 with a value of \$4,250. Rural farm residents with 8 years of schooling have the lowest profile of any in Figure 7. The highest earnings for this group are \$3,400, which occur at age 38.

A significant difference between the 8 years of schooling graph and the 12 years of schooling graph is the shift in the rural nonfarm profile relative to the two other profiles which bound it above and below. With the lesser amount of education, the rural nonfarm profile appears to be about midway between the urban and rural farm profiles. For 12 years of schooling completed, the rural nonfarm profile has moved relatively close to the urban profile above it and away from the rural farm profile below it. This suggests that an extra four years of education does not benefit the person who stays in a rural farm place of residence to the same degree that it benefits the rural nonfarm resident.

It is also possible to show the corresponding profiles for the Southern region. Figure 8 shows these profiles. Fewer observations underlie these age-earnings profiles which are thus less regular in

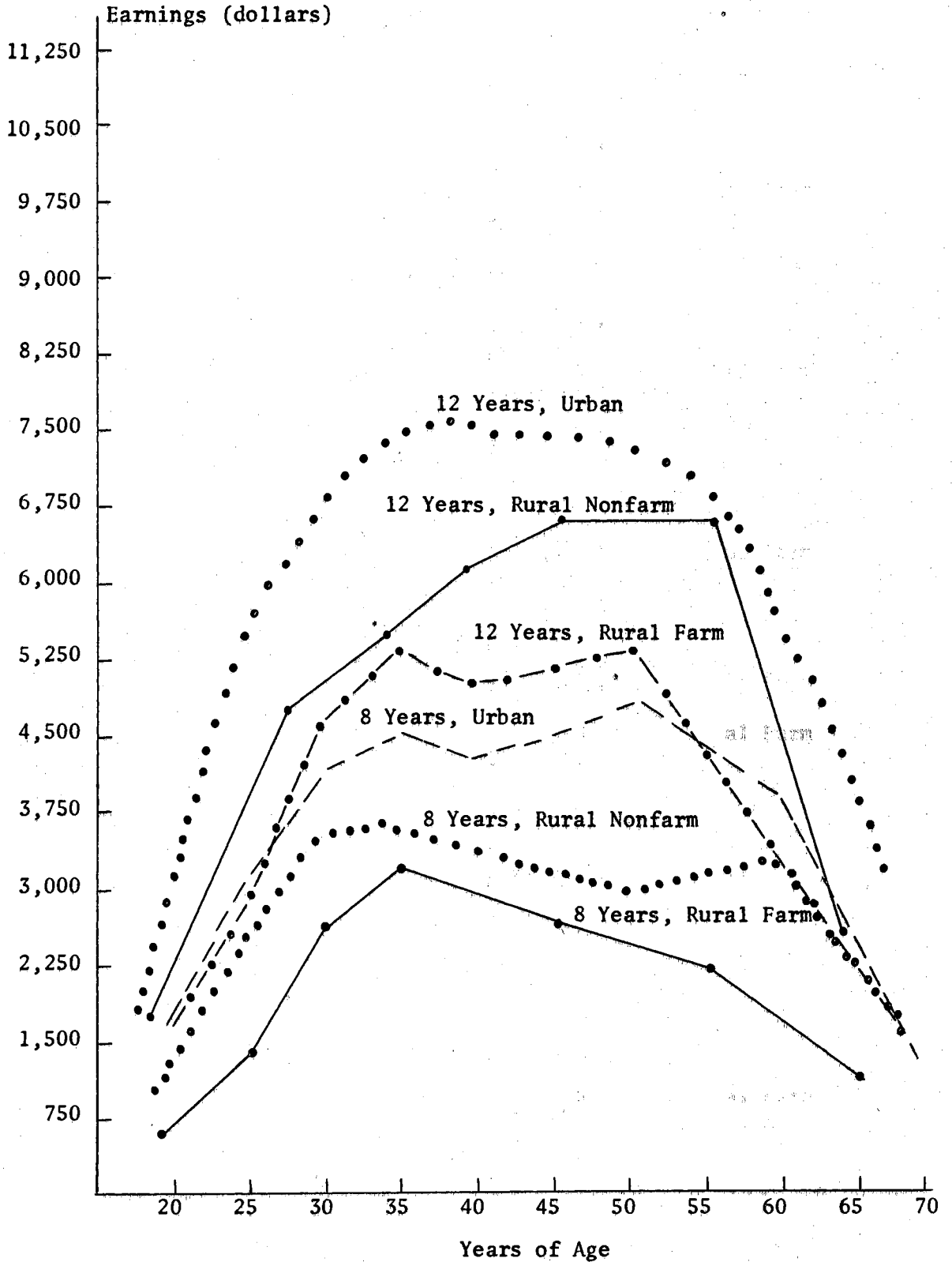


Figure 8. Age-Earnings Profiles for White Males in the South, 1959, by Place of Residence, with 8 and 12 Years of Schooling

appearance than profiles presented earlier. However, approximately the same rankings hold as for Figure 7. With 12 years of schooling, urban groups have a higher profile than those groups living in a rural place of residence, and have peak earnings of \$6,400 at age 40 (this is \$300 under the corresponding figure for the United States). Rural nonfarm individuals on the average have a profile below the urban one, but above the rural farm group for all but five years around age 35. With 8 years of schooling, urban residents again have the highest profile with peak earnings of \$4,600 at age 49. Both of the rural residence classifications are lower than the urban one and relatively close to each other. The rural nonfarm sector has a peak of \$3,500 at age 35 and the rural farm sector has a peak of \$3,200 at the same age.

Age-Earnings Profiles of Nonwhite Males

In contrast to the age-earnings profiles for white males by place of residence, the age earnings profiles for nonwhites based on the 0.1 percent sample are not as regular in appearance due primarily to the smaller number of observations on which the profiles are based. In the next section, age-income profiles based on a larger sample are presented. First, however, some comments can be made about age-earnings profiles for 12 and 8 years of schooling by place of residence (a 10-year moving average was used to generate these profiles). For 12 years of schooling, the profile for urban nonwhites is higher than those for rural nonfarm and for rural farm nonwhites. Urban nonwhites have peak earnings of \$4,300 at age 49. For 8 years of schooling, the same ranking is apparent. The peak income for urban nonwhites is \$3,600 at age 59.

The difference between whites and nonwhites in the number of observations underlying the profiles is worth noting. First, considering

the 8 years of schooling category for whites, there were 1,017 white rural farm residents. Of these, 173 reported no earnings, a majority of whom were over 65 years of age. There were 2,147 rural nonfarm residents (474 reported no earnings) and 5,139 urban residents (1,012 reported no earnings). The number of observations for 12 years of schooling completed for whites were (the number of people reporting no earnings is given in parentheses): rural farm, 855 (91); rural nonfarm, 2,351 (150); urban, 7,900 (508). The number of observations indicate that the urban profiles would be expected to be more reliable than the rural nonfarm profiles which in turn would be expected to be more reliable than the rural farm profiles.

For those nonwhites with 8 years of education completed, the profile is relatively smooth although slightly bimodal, having one peak at 40 years of age and another at 58 years of age. However, the relative smoothness of the urban profiles is not matched by the profiles of the rural residency groups. The number of underlying observations is significantly smaller. They are as follows for 8 years of schooling (the number of persons reporting no earnings is given in parentheses): rural farm, 34 (3); rural nonfarm, 93 (21); urban, 512 (77). Twenty-nine of the 34 nonwhites with rural farm residence are in the Southern region.

The situation for 12 years of schooling completed is similar. For nonwhite rural residents the sample frequencies for 12 years of schooling are: rural farm, 28 (3); rural nonfarm, 62 (16). In the case of urban residents, there are more nonwhite males with 12 years of schooling completed than there are with 8 years of schooling -- 650 against 512. There were 51 in the former group who reported no earnings.

Age-Income Profiles of Nonwhite Males

Age-income profiles may also be used to provide additional information for nonwhites. They are based on the 5 percent sample of the Census of Population and are therefore more consistent than the age-earnings profiles. The income profiles are for those individuals with income in 1959. Income is expressed in terms of a median rather than an average.

The age-income profiles for nonwhites are for two place of residence classifications: rural farm, which is directly comparable to the same classification used with the 0.1 percent sample; and central cities, which is a sub-part of the urban classification. Income is greater than earnings by the amount of income in addition to wage and salary income and net business incomes. On this basis, the age-income profiles would be expected to be above corresponding age-earnings profiles. The population sampled is also different between the two types of profiles. Earnings were calculated on the basis of all individuals with the appropriate group characteristics, some of whom reported no earnings. Average earnings took into account the individuals with no earnings and are thus adjusted for unemployment. Average income was calculated for males with income. The population would not differ as much as might be expected however, because most individuals, except perhaps at the young ages, would have some income even if they were wholly or partially unemployed during the year. Another difference between the earnings and income figure used here is that the former does not consider males enrolled in school while the latter does consider them if they report positive income.

Figure 9 allows a direct comparison between the relative position of urban and rural nonwhites for 8 years of schooling and 12 years of

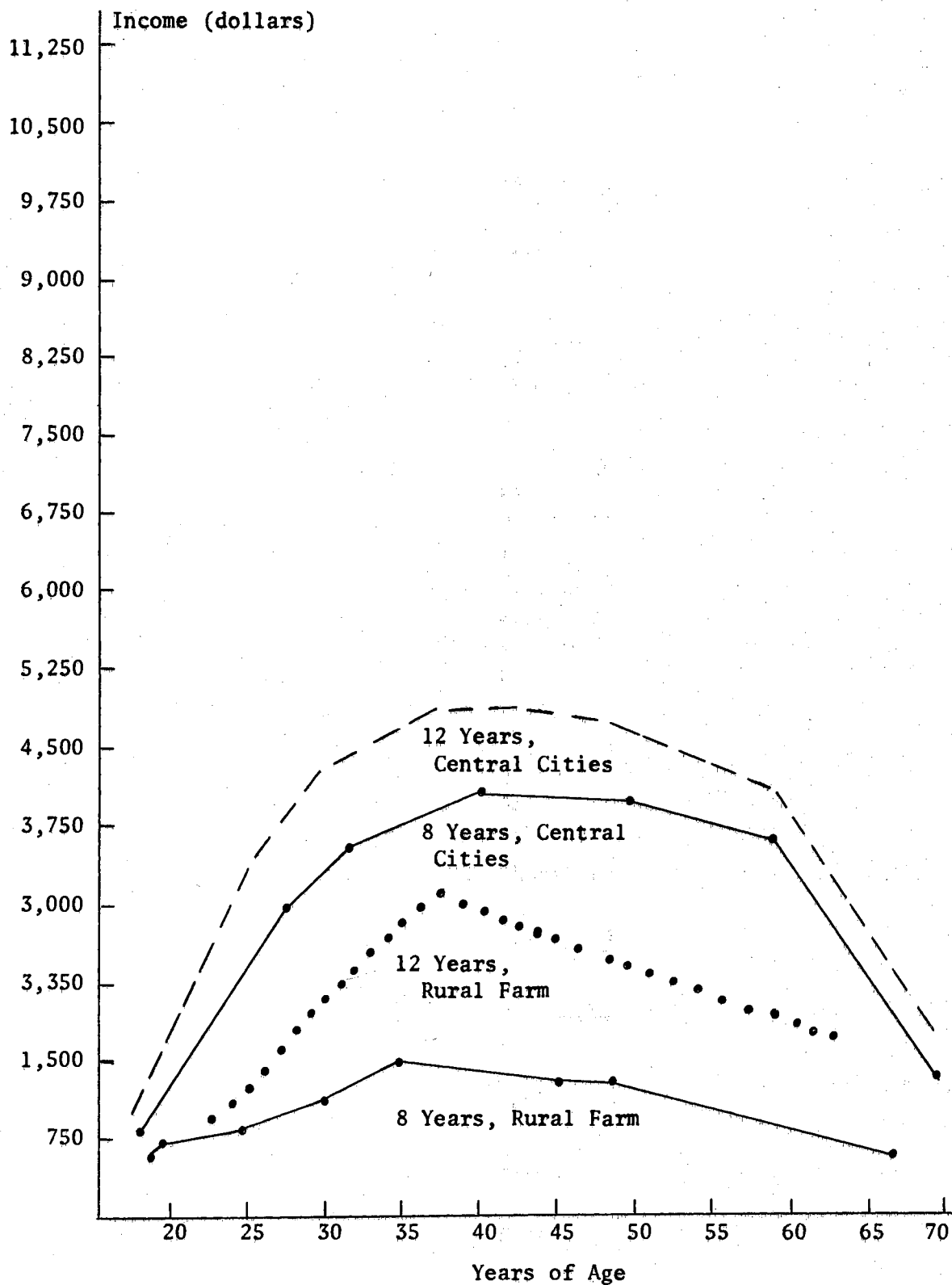


Figure 9. Age-Income Profiles for Nonwhite Males in the United States, 1959, for Central Cities in Urbanized Areas and Rural Farm Places of Residence, with 8 and 12 Years of Schooling

schooling. For central cities, the age-income profile for 12 years of schooling has a peak of \$4,300 at age 39. The 8 years of schooling profile for central city nonwhites has a peak income of \$3,600 at a somewhat later age. Eight years of schooling for central city nonwhite males yields a higher income than 12 years does for rural farm nonwhites. The peak income for rural farm nonwhites with 12 years of schooling is \$2,700 at age 40. The peak income for rural farm nonwhites with 8 years of schooling is \$1,450 at age 35.

There are several reasons for this wide disparity in incomes between central city nonwhites and rural farm nonwhites, such as different wage scales, different unemployment rates, and different quality of education. Also, adjustment for the difference in cost of living would narrow the income gap between the incomes of the two residence groups.

Summary

In general, age-earnings or age-income profiles will be higher for greater amounts of schooling completed. When comparisons are made with the level of schooling held constant, urban profiles are higher than rural nonfarm profiles which, in turn, are higher than rural farm profiles. Between races, the white profile is higher than the nonwhite profile for the same level of schooling and place of residence.

CHAPTER VI

EMPIRICAL ESTIMATES OF THE RETURN TO SCHOOLING

Age-earnings differentials and the corresponding schooling cost estimates are the basis for calculating rates of return to schooling. The theoretical aspects of the rate of return were presented in Chapter II. The assumptions underlying the calculated estimates were presented in Chapter IV.

Three other measures of the costs and returns of schooling are useful as supplementary information to aid in the analysis of rate of return estimates:

(1) Private and social incremental schooling costs discounted to the beginning year of extra schooling indicate the discounted value of the total costs that the individual or society will pay for the extra schooling being considered. For example, for a white male in the United States who has 8 years of schooling and is considering staying in school for four more years, discounted private costs are \$3,522.

(2) Age-earnings differentials discounted to the beginning year of extra schooling indicate the discounted value of the extra earnings that the individual would expect to receive by obtaining the extra schooling. For a white male in the United States this amounts to \$18,411 for 12 years of schooling over 8 years. Usually this figure will be positive but there are both statistical and theoretical explanations for some part of the age-earnings differential to be negative. A differential

is constructed by subtracting the values of the age-earnings profile for the lower education level from the corresponding values of the age-earnings profile for the higher education level. When the higher profile is below the lower one, part of the differential will be negative. Theoretically, negative differentials might occur towards age 74. A possible explanation is that an individual with a higher level of schooling has more "other income" from, for example, pension and life insurance plans. Therefore, he might retire earlier than those with less education and, therefore, less "other income." As a result the more highly educated individual might have less earnings (though more income) than the less educated individual.

(3) The benefit-cost ratio is the ratio of net returns to costs, where both are discounted to the same year. Both the private and the social ratios are calculated. Where the benefit-cost ratio is estimated to be less than one, the discounted value of the earnings resulting from extra education is less than the discounted value of the costs of the extra education, given the rate of discount used.

Rates of return to schooling estimates are presented in the following tables. One or more of the three other measures of costs and returns to schooling are presented where appropriate.

White Males, White Females, and Nonwhite Males in the United States

Private Returns

In the tables showing the complete set of rates of return, the estimates along the main diagonal (i.e., the estimates at the extreme right of each row) can be described as marginal rates in the sense that they deal with adjoining schooling levels. The remainder of the

estimates are average rates since they compare non-adjointing pairs of schooling levels.

Estimates of private returns to schooling for white males are shown in Tables XI through XIV. The estimated rates of return have a tendency to decrease down each column in Table XI. For example, for white males the rate of return to 8 years of schooling over no schooling is 155.1. It declines to 58.4 for 12 years over no schooling and declines even further for 16 years over no schooling to 33.4. The sum of age-earnings differentials increase with a larger quantity of schooling. But at the same time the number of years in which costs have to be met increases; also higher per year costs are incurred. The net result is the tendency for a declining rate of return to schooling down each column.¹

The private rates of return for 5-7 years of schooling over 1-4 and 0 years of schooling are infinitely high. This is in part explained by the assumption made that private costs are nonexistent below age 14. It seems reasonable to assume that both foregone earnings (adjusted for unemployment) and the associated other private schooling costs will in fact be negligible, if not zero, below this age.

If it is assumed that individuals have an opportunity cost of six percent for their savings or can borrow money at that rate, then the estimates of private rates of return for white males in the United States show that schooling is a worthwhile investment. All rates of return for elementary and secondary schooling are high. College schooling has somewhat lower rates.

¹In the tables showing complete sets of rate of return estimates, theory would indicate that if the marginal rate increases over the preceding marginal rate, then the corresponding average rate will be increased, and vice versa. Where this pattern is not present it is probably due to variation in the data.

TABLE XI
PRIVATE RATES OF RETURN TO EDUCATION, WHITE MALES,
UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Percent)						
1-4	^a b						
5-7	^a b	^a b					
8	155.1	117.1	48.6				
9-11	80.9	56.3	32.2	25.4			
12	58.4	41.4	26.9	22.3	19.3		
13-15	40.8	28.6	19.4	16.1	13.0	10.0	
16	33.4	24.6	18.1	15.8	13.8	12.4	15.1

^aThe basic data source was the One-in-One Thousand Sample of the 1960 Census of Population. The basic unit is a person not in school or in the armed forces. Earnings (self-employment income plus wage and salary income) were used to compute returns. Private rates of return match earnings differences against the earnings foregone by continuing on in school plus direct cost incurred by the individual (tuition, supplies, books).

^bRate is infinitely large because costs are assumed to be zero below age 14.

For the remainder of the private rate estimates, only the rate of return table is presented here; the associated tables are located in Appendix C. Table XV presents private rate of return estimates for white females in the United States that indicate that both elementary and secondary schooling are profitable. Up to 9-11 years of schooling, the estimates are generally below the corresponding ones for white males. Completion of college does not have as high a rate of return for white females as for white males. But all the private rate of return estimates for white females are above six percent.

TABLE XII
 INCREMENTAL PRIVATE SCHOOLING COSTS DISCOUNTED TO THE
 BEGINNING YEAR OF EXTRA SCHOOLING, WHITE MALES,
 UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Dollars)						
1-4	0 ^b						
5-7	0 ^b	0 ^b					
8	156	192	238				
9-11	347	627	1,364	1,478			
12	889	1,825	2,991	3,522	2,816		
13-15	1,669	3,399	5,402	6,488	6,866	5,176	
16	2,637	5,115	8,478	10,434	12,093	12,882	7,808

^aPrivate costs are earnings foregone by continuing on in school plus direct costs incurred by the individual (tuition, supplies, books). Beginning year of extra school is the year in which the decision maker decides whether or not to continue in school.

^bCosts are assumed to be zero below age 14. Data is described in more detail in private rate of return table footnote.

TABLE XIII
 EARNINGS DIFFERENTIALS DISCOUNTED TO THE BEGINNING YEAR OF
 EXTRA SCHOOLING, WHITE MALES, UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Dollars)						
1-4	6,466						
5-7	14,309	9,340					
8	17,680	14,571	6,238				
9-11	24,068	21,177	14,715	9,737			
12	28,769	27,329	22,242	18,411	10,265		
13-15	32,451	32,360	28,771	26,002	19,515	11,016	
16	39,910	41,806	41,054	40,294	36,365	31,783	22,484

^aThe differences are identical for private and social calculations. Data are described in more detail in the private rate of return table footnote. Beginning year of extra schooling is year in which the decision maker decides whether or not to continue on in school.

TABLE XIV

PRIVATE BENEFIT-COST RATIOS OF EDUCATION, WHITE MALES,
UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
1-4	∞^b						
5-7	∞^b	∞^b					
8	113.05	75.72	26.17				
9-11	69.29	33.79	10.79	6.59			
12	32.36	14.97	7.44	5.23	3.65		
13-15	19.45	9.52	5.33	4.01	2.84	2.13	
16	15.13	8.17	4.84	3.86	3.01	2.47	2.88

^aData are described in more detail in the private rate of return table footnote.

^bRatio is infinitely large because costs are assumed to be zero below age 14.

TABLE XV

PRIVATE RATES OF RETURN TO EDUCATION, WHITE FEMALES,
UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Percent)						
1-4	∞^b						
5-7	∞^b	∞^b					
8	42.3	10.0	12.3				
9-11	35.6	15.4	18.4	27.9			
12	40.6	25.7	27.3	39.6	53.0		
13-15	29.5	19.3	20.8	24.7	23.4	11.3	
16	24.6	16.0	17.2	18.7	16.5	9.8	8.4

^aData and assumptions used are described in the private rates of return table footnote for white males in the United States.

^bRate is infinitely large because costs are assumed to be zero below age 14.

Comparing Table XI for white males with Table XV for white females, it might be asked why the rates for white females are not consistently lower than those for white males. The respective tables of the discounted sums of the age-earnings differentials show that the sums for males are always significantly larger than corresponding sums for females. But at the same time the discounted sums of incremental private schooling costs are also always larger for males than for females. The net result when costs and returns are combined in the calculation of rate of return estimates is that the estimates for males and females do not have any consistent relationship to each other.

Estimates of the private rates of return to schooling for nonwhite males are presented in Table XVI. Estimates of private rates of return for nonwhite males indicate that both elementary and secondary schooling have a rate of return significantly greater than six percent.

TABLE XVI
PRIVATE RATES OF RETURN TO EDUCATION, NONWHITE MALES,
UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Percent)						
1-4	∞^b						
5-7	∞^b	∞^b					
8	78.8	46.4	9.3				
9-11	53.1	38.1	14.2	30.6			
12	40.8	32.6	18.0	27.3	24.9		
13-15	23.7	20.4	12.1	14.2	10.3	1.4	
16	18.5	17.0	11.4	12.4	10.0	4.2	9.5

^aData and assumptions used are described in the private rate of return table footnote for white males in the United States.

^bRate is infinitely large because costs are assumed to be zero below age 14.

College schooling is not economically profitable on the average for nonwhite males, based on a six percent opportunity cost of capital. The estimated rate of return for college graduates is 4.2 percent; and is only 1.4 percent for college dropouts.

Nonwhite males have private rates of return which are less than the corresponding rates for whites except for 9-11 years over 8 years, 12 years over 8 years and 12 years over 9-11 years. The probable explanation of this is sampling variation, but it is possible that the labor market for nonwhites is different from that for whites. That is, completion of 9-11 and 12 years of schooling is particularly favorable to nonwhites measured by the additional earnings that they receive compared with what they would receive with only 8 years of schooling.

All discounted sums of age-earnings differentials are lower for nonwhites than for whites. Also, all sums of incremental private schooling costs except two (8 years over 0 years, and 9-11 years over 0 years) are markedly less for nonwhites. For these two exceptions the costs do not differ markedly between races. Here again, a probable explanation is sampling variation.

Social Returns

Social returns estimates are calculated from the same age-earnings differentials as used for private returns, and from social schooling costs. Social schooling costs consist of private schooling costs plus schooling resource costs.² Estimates of social rates of return are always lower, of course, than the estimates of private rates. Social returns for white males are shown in Tables XVII - XIX. Both elementary

²Schooling resource costs are defined as school current expenditures plus a charge for capital on a per student basis.

TABLE XVII

SOCIAL RATES OF RETURN TO EDUCATION, WHITE MALES,
UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Percent)						
1-4	13.2						
5-7	18.9	22.4					
8	18.7	22.1	21.4				
9-11	19.0	20.8	19.3	17.8			
12	18.5	19.5	17.8	16.4	15.0		
13-15	15.9	15.5	13.2	11.7	9.7	7.4	
16	15.1	14.5	12.8	11.6	10.5	9.4	11.5

^aSocial rates of return match earnings differences against the earnings foregone by staying in school, plus direct costs incurred by the individual, plus costs of providing the education incurred by society (the latter consists of current expenditures plus a charge for capital on a per student basis).

TABLE XVIII

INCREMENTAL SOCIAL SCHOOLING COSTS DISCOUNTED TO THE
BEGINNING YEAR OF EXTRA SCHOOLING, WHITE
MALES, UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Dollars)						
1-4	1,947						
5-7	1,947	1,659					
8	2,615	1,861	964				
9-11	3,400	2,999	2,932	2,424			
12	4,470	4,829	5,308	5,310	3,762		
13-15	6,786	8,234	9,899	10,724	10,563	8,267	
16	9,121	11,577	14,769	16,849	18,240	18,742	10,900

^aSocial costs are earnings foregone by continuing on in school, plus direct costs incurred by the individual (tuition, supplies, books), plus costs of providing the education incurred by society (the latter consisting of current expenditures plus a charge for capital on a per student basis).

TABLE XIX
 SOCIAL BENEFIT-COST RATIOS OF EDUCATION,
 WHITE MALES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
1-4	3.32						
5-7	7.35	8.82					
8	6.76	7.83	6.47				
9-11	7.08	7.06	5.02	4.02			
12	6.44	5.66	4.19	3.47	2.76		
13-15	4.78	3.93	2.91	2.42	1.85	1.33	
16	4.38	3.61	2.78	2.39	1.99	1.70	2.06

^aData are described in more detail in the social rate of return table footnote for white males in the United States.

and secondary schooling have high rates of return for white males; the lowest of these rates is 13.2 for 1-4 years over 0 years of schooling.

The rate of return estimates to college schooling for white males are relatively low. For college graduates it is 9.4 percent; for college dropouts it is 7.4 percent. Investment in college schooling has not provided as large a rate of return as has investment in elementary or secondary schooling. However, it is interesting to note that all social benefit-cost ratios for white males are greater than one; hence, the rate of return is over six percent. The lowest ratio is 1.33 for college dropouts (see Table XIX).

Private schooling costs are a relatively small percentage of social schooling costs (both expressed as the discounted sum of annual costs) for elementary school graduates but increase to approximately 60 percent for high school and college graduates. For white males, elementary

school graduates have private schooling costs of \$156 and social schooling costs of \$2,615. Private and social schooling costs for high school graduates are \$3,522 and \$5,310 respectively. The typical white male college graduate has private schooling costs of \$12,882 and social schooling costs of \$18,742.

The same schooling resource costs are used for both males and females. Females have lower private schooling costs than males and hence need not have as high age-earnings differentials to attain a comparable rate of return. Social rate of return estimates for white females are shown in Table XX. Social rates of return for white females are less than 10 percent except for those rates involving completion of high school. Assuming an opportunity cost of six percent, the rate estimates for females suggest that additional investment could profitably be directed into secondary schooling for women, rather than into either elementary schooling or college.

For women, the benefit-cost ratio is less than 1.0 for all college schooling and also for some schooling comparisons involving 8 years of schooling and less than 8 years.

All of the estimates of the social rate of return to investment in schooling for nonwhite males (Table XXI) are lower than the corresponding estimates for white males except for the estimate for 12 years over 8 years of schooling. This exception was also noted with the private rate estimates.

Elementary and secondary schooling resource costs were adjusted for race. The same college schooling resource costs were used for both whites and nonwhites in the United States. No data were found which gave sufficient basis for using different college cost estimates for whites and nonwhites. If, in fact, U. S. nonwhites attend colleges where

TABLE XX

SOCIAL RATES OF RETURN TO EDUCATION, WHITE FEMALES,
UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Percent)						
1-4	b						
5-7	b	3.6					
8	6.4	4.3	5.7				
9-11	7.2	5.9	7.9	10.0			
12	8.6	8.0	11.0	14.6	22.4		
13-15	7.5	6.9	8.1	8.7	8.2	4.8	
16	7.6	6.2	6.7	6.9	6.3	4.6	4.4

^aData and assumptions used are described in the social rate of return table footnote for white males in the United States.

^bEstimate not calculated.

TABLE XXI

SOCIAL RATES OF RETURN TO EDUCATION, NONWHITE MALES,
UNITED STATES, 1959^a

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Percent)						
1-4	2.6						
5-7	12.5	22.0					
8	10.2	13.1	7.8				
9-11	11.1	13.8	9.8	16.0			
12	12.5	14.9	14.0	17.4	18.3		
13-15	9.0	9.9	7.6	7.6	6.0	0.3	
16	8.2	8.8	7.0	6.7	5.5	0.7	4.5

^aData and assumptions used are described in the social rate of return table footnote for white males in the United States.

the schooling resource cost is less than that for U. S. whites, then these social rates of return for nonwhites will be underestimated.

While the rate of return estimates to elementary and secondary schooling for nonwhites are less than those for whites, they are still generally above six percent and therefore appear worthwhile as an investment by society.

Those estimates of social rates of return for nonwhite males for schooling levels involving 13-15 and 16 years of schooling are all quite low; the highest of these is 9.9 percent for 13-15 years over 1-4 years of schooling. The rates for college graduates and college dropouts are very low, 0.7 percent and 0.3 percent respectively. The corresponding benefit-cost ratios are both less than 1.0.

White Males, United States, by Place of Residence

Four place of residence classifications were used: urban, rural, rural nonfarm, and rural farm. Comprehensive sets of estimates were made for the urban and rural residents and are available in Appendix C. In order to facilitate comparisons, the three schooling increments considered the most important are focused upon in this section. Private returns are considered first.

Private Returns

Table XXII illustrates these. For elementary school, high school, and college completion, the discounted benefits are greater for urban residents than for rural residents and greater for rural nonfarm residents than for rural farm residents. If costs were the same between residences for a given schooling level, then it would follow that the rates of return would be greater for urban than for rural, and greater

TABLE XXII

ESTIMATES OF PRIVATE RETURNS TO EDUCATION, WHITE MALES,
UNITED STATES, BY PLACE OF RESIDENCE, 1959

Schooling Comparison	Urban	Rural	Rural Nonfarm	Rural Farm
Elementary School (8/0-4 Years)				
Rate of Return (Percent)	155.9	76.7	179.3	87.9
Discounted Costs	\$238	\$348	\$115	\$327
Discounted Benefits	\$16,075	\$15,988	\$16,988	\$12,307
High School (12/8 Years)				
Rate of Return (Percent)	14.3	23.3	26.6	15.1
Discounted Costs	\$4,895	\$3,065	\$2,859	\$3,434
Discounted Benefits	\$15,644	\$17,993	\$19,440	\$12,387
College (16/12 Years)				
Rate of Return (Percent)	12.8	12.8	11.8	14.1
Discounted Costs	\$12,808	\$10,929	\$11,928	\$7,601
Discounted Benefits	\$32,928	\$27,255	\$27,190	\$22,566

for rural nonfarm than rural farm. However, it can be seen that this is not the case, although they are all of approximately the same magnitude for a given level of schooling. Discounted private costs for a college education range from \$7,600 to \$12,800. They range from \$2,900 to \$4,900 for a high school education, and \$115 to \$348 for an elementary school education.

Rate of return estimates for elementary school are all above 75 percent. High school has a higher rate of return to rural residents than urban residents. The rates of return to college are all above 11 percent with rural farm residents having the highest rate of 14.1 percent.

Social Returns

Table XXIII shows the corresponding social estimates. Discounted benefits are identical to those in Table XXII, but discounted costs are much higher because of the inclusion of schooling resource costs. Costs are higher for urban residents than for rural residents for all three levels of schooling.

TABLE XXIII

ESTIMATES OF SOCIAL RETURNS TO EDUCATION, WHITE MALES,
UNITED STATES, BY PLACE OF RESIDENCE, 1959

Schooling Comparison	Urban	Rural	Rural Nonfarm	Rural Farm
Elementary School (8/0-4 Years)				
Rate of Return (Percent)	21.2	23.7	26.0	21.7
Discounted Costs	\$2,471	\$1,798	\$1,570	\$1,782
Discounted Benefits	\$16,075	\$15,988	\$16,988	\$12,307
High School (12/8 Years)				
Rate of Return (Percent)	11.2	17.9	20.0	12.1
Discounted Costs	\$6,943	\$4,399	\$4,193	\$4,768
Discounted Benefits	\$15,644	\$17,993	\$19,440	\$12,387
College (16/12 Years)				
Rate of Return (Percent)	9.7	9.2	8.7	9.3
Discounted Costs	\$18,650	\$16,771	\$17,770	\$13,443
Discounted Benefits	\$32,928	\$27,255	\$27,190	\$22,566

The rates of return for elementary school are all above 20 percent and are slightly higher for rural residents. The difference in rates for high school also favors rural residents, particularly rural nonfarm residents. At the college level, all places of residence have a rate of return of approximately nine percent.

Tabular Summary

Tables XXIV and XXV present a summary of private rate of return estimates and social rate of return estimates respectively.

TABLE XXIV
ESTIMATES OF PRIVATE RATES OF RETURN TO EDUCATION,
UNITED STATES, 1959

	College Graduates (16 Years Over 12 Years of Schooling)	High School Graduates (12 Years Over 8 Years of Schooling)	Elementary School Graduates (8 Years Over No Schooling)
	(Percent)		
White Males, U. S.	12.4	22.3	155.1
White Females, U. S.	9.8	39.6	42.3
Nonwhite Males, U. S.	4.2	27.3	78.8
White Males, Urban U. S.	12.8	14.3	155.9 ^a
White Males, Rural U. S.	12.8	23.3	76.7 ^a
White Males, Rural Nonfarm U. S.	11.8	26.6	179.3 ^a
White Males, Rural Farm U. S.	14.1	15.1	87.9 ^a

^a8 years over 0-4 years of schooling.

TABLE XXV
ESTIMATES OF SOCIAL RATES OF RETURN TO EDUCATION,
UNITED STATES, 1959

	College Graduates (16 Years Over 12 Years of Schooling)	High School Graduates (12 Years Over 8 Years of Schooling) (Percent)	Elementary School Graduates (8 Years Over No Schooling)
White Males, U. S.	9.4	16.4	18.7
White Females, U. S.	4.6	14.6	6.4
Nonwhite Males, U. S.	0.7	17.4	10.2
White Males, Urban U. S.	9.7	11.2	21.2 ^a
White Males, Rural U. S.	9.2	17.9	23.7 ^a
White Males, Rural Nonfarm, U. S.	8.7	20.0	26.0 ^a
White Males, Rural Farm, U. S.	9.3	12.1	21.7 ^a

^a8 years over 0-4 years of schooling.

Adjustment of Rate of Return Estimates for
Secular Growth in Incomes, Mortality,
Taxes, and Ability

Some factors which are relevant to the estimation of rates of return to schooling are difficult to control and were not taken into account in the above estimates. Four important factors are the secular growth in incomes, mortality, ability and taxes. The purpose of this section is to explore the effect of these factors on rates of return. Rates of return to schooling for white males in the United States were recalculated for college, secondary, and elementary schooling corrected

for the effect of each factor separately and for all factors together. The secular growth in incomes is considered first.

Secular Growth in Incomes

The cross-sectional data used in the analyses show earnings for different age and education groups in 1959. Due to the secular growth in incomes resulting from productivity gains and inflation, a person with a given quantity of schooling will expect to have greater earnings at a specific future age than a person with the same schooling who is now at that age. For example, a person who is 20 years old will expect to make, when he is 30 years old, the 1959 earnings of a person with the same schooling who is 30 years old multiplied by a factor which takes into account the secular growth in earnings over the intervening 10 year period.

Becker assumed a two percent average annual growth rate in incomes. This rate is also used here so that the earnings t years later of a cohort finishing its schooling in a base year is estimated by multiplying the base year earnings of the cohort with the same schooling and t years older by $(1.02)^t$.³

Time series age-earnings differentials were constructed for college, high school, and elementary school completion by adjusting the appropriate pairs of age-earnings profiles and then subtracting the profile for the smaller number of years of schooling completed from the profile for the larger number of years of schooling completed.

Schooling resource costs have also increased over time. Between 1955 and 1967 United States current expenditures per pupil in ADA in

³Becker, p. 139.

public elementary and secondary schools increased by an average of 6.2 percent per year.⁴ It was assumed that 3.2 percent was due to an upgrading of facilities and 3 percent was due to inflation. Therefore schooling resource cost estimates were increased by 3 percent a year to take inflation into account.

Table XXVI shows the rate of return estimates adjusted for the secular growth in incomes and schooling resource costs. The estimates are increased in all cases. Private rates are increased by 19, 12, and 3 percent for college, high school, and elementary school completion respectively. Social rates are increased by 24, 15, and 12 percent respectively. Thus, by taking this factor into consideration, the investment in schooling for both private individuals and society appears more profitable.

Mortality

A similar procedure to that used by Hansen is employed to adjust for mortality. The net cost-income stream (referred to in this study as the age-earnings differential together with associated schooling costs) must be adjusted downwards to reflect the probabilities that at each age the costs or returns will be incurred or received respectively.⁵

The statistic appropriate to adjustment for mortality is the proportion of persons alive at the beginning of an age interval who will

⁴U. S. Department of Health, Education and Welfare, Office of Education, Digest of Educational Statistics, 1967 (Washington, 1967), Table 76, p. 62.

⁵Hansen, p. 132.

TABLE XXVI

RATE OF RETURN TO EDUCATION ESTIMATES FOR WHITE MALES IN THE UNITED STATES, 1959, ADJUSTED
FOR SECULAR GROWTH IN INCOMES, MORTALITY, TAXES, AND ABILITY

	16 Years Over 12 Years (College Over High School)	Percent Change from Unad- justed Rate	12 Years Over 8 Years (High School Over Elementary School)	Percent Change from Unad- justed Rate	8 Years Over 0 Years (Elementary School Over No School)	Percent Change from Unad- justed Rate
(Percent)						
Private Rate of Return Estimates						
Unadjusted	12.4		22.3		155.1	
Adjusted for:						
Secular Growth in Incomes	14.8	+19	25.0	+12	160.4	+3
Mortality	12.4	0	22.3	0	155.1	0
Total Taxes	12.4	0	22.3	0	154.7 ^a	0
Ability	9.9	-20	15.4	-31	-- ^b	-- ^a
All Adjustments	12.2	-1.6	17.8	-20.2	b	b
Social Rate of Return Estimates						
Unadjusted	9.4		16.4		18.7	
Adjusted for:						
Secular Growth in Incomes	11.7	+24	18.9	+15	20.9	+12
Mortality	9.4	0	16.4	0	18.7	0
Ability	7.5	-20	10.7	-35	-- ^a	-- ^a
All Adjustments	9.7	+3	14.6	-11	b	b

^aNo figures available to make an ability adjustment.

^bThis line is not applicable for 8 years over 0 years of schooling.

die during that interval. These probabilities are available on a yearly basis in the United States life tables.⁶

For white males in the United States, the probability of surviving at a particular age is high up to the later ages. Even for the 65 to 74 year age group, the average probability of surviving any given year is 0.95. The probability of surviving a given year is smaller for nonwhite males at all ages.

Adjustment for the incidence of mortality was made for 25 years of age up to 74 years of age. Table XXVI shows that rate of return to schooling estimates change little when mortality is taken into account in the manner described.

Taxes

Tax data for 1961 indicate that federal income taxes are progressive.⁷ For gross income under \$1,000, the tax is 3.2 percent of income. For income between \$6,000 and \$7,000 the tax is 10.4 percent. For income between \$9,000 and \$10,000 the tax is 12.1 percent.

When other federal taxes, in addition to the federal income tax, are taken into account, 1958 data indicate that total federal taxes were 7.4 percent of personal income for incomes of less than \$2,000; they were 12.5 percent for incomes of \$6,000 to \$7,999; and they were 12.6

⁶U. S. Department of Health, Education and Welfare, Public Health Service, United States Life Tables: 1959-61 (Washington, 1964), Table 5.

⁷U. S. Internal Revenue Service, Individual Income Tax Returns, 1961, Internal Revenue Service Publication No. 471 (Washington, 1964), p. 30.

percent for incomes of \$10,000 to \$14,999. Thus, other federal taxes are less progressive than income taxes.⁸

The addition of state and local taxes (both property taxes and other taxes) to federal taxes makes total taxes neutral with respect to income rather than being regressive (as the state and local taxes are by themselves) or progressive (as the federal income tax is by itself). For all income groups, ranging from less than \$2,000 and up to \$14,999, total taxes are approximately 20 percent of income.

This latter rate is used below to adjust rates of return for all taxes. These tax figures are for 1958, and the earnings figures are for 1959 so that taxes and earnings are for a very similar base period. If it is assumed that earnings are 95 percent of income, then a 20 percent tax on income is equivalent to a 21 percent tax on earnings. Since the total tax figure is approximately 21 percent of earnings for all earnings levels, rate of return calculations are made by taking .79 percent of unadjusted age-earnings differentials. Admittedly, the general use of a 21 percent tax rate ignores the effects of age differences, family size and other unique factors.

Because foregone earnings were adjusted for taxes in the same way as positive earnings, the effect of taxes on private rate of return estimates was zero.

Social rates of return are not adjusted for taxes since these taxes are retained and utilized by society and thus constitute part of the return to society provided by schooling.

⁸Burton Weisbrod, Spillover of Public Education Costs and Benefits (St. Louis, 1963), p. 94. Data also include the estimated burden of corporate income tax.

Ability

Available quantitative measures show a positive relationship between education and several measures of ability. Becker adapted one table from data gathered by Dael Wolfle which indicated that average I.Q. was 106.8 for high school graduates, 120.5 for college graduates and 106.2 for college dropouts.⁹ Two other measures of ability -- percentage with I.Q. over 120 and average rank in high school graduating class -- are in line with average I.Q.

I.Q. estimates for other levels of schooling are also presented by Becker. High school graduates had an average I.Q. of 112; high school dropouts had an I.Q. of 98.0; and those persons with 7-8 years of schooling had an average I.Q. of 84.9.

When these I.Q. figures are matched with appropriate earnings data they give a basis for adjusting returns to schooling estimates for ability.

Tweeten estimated an equation with income a function of schooling achieved and I.Q. Based on the previous I.Q. figures, it was assumed that the typical college graduate has an I.Q. of 120, the typical high school graduate has an I.Q. of 110 and the typical elementary school graduate has an I.Q. of 85. The equation may be used to estimate expected earnings of persons with the same level of schooling but different I.Q.'s.

The typical elementary school graduate has an I.Q. of 85. Estimated income is \$1,176. The typical high school graduate has an I.Q. of 110. Presumably if he had left school after 8 years instead of

⁹Becker, Table 4, p. 80. The I.Q. figures are for 1953. The data were taken from: Dael Wolfle, American Resources of Specialized Talent (New York, 1964).

of continuing his schooling he would have greater income than the persons with an I.Q. of 25 points lower. Estimated income for the persons with a 110 I.Q. are \$2,688. The difference in income amounts to \$1,512, one and a quarter times the lower I.Q. income. This very large increase must be used carefully. The data used to estimate the equation were based on five schooling levels (elementary school, some high school, high school diploma, college - no degree, and Bachelor's degree) with elementary school being the lowest in terms of years of schooling; also, the I.Q. of 85 is a low value. These data suggest that ability should be taken into account when estimating the rate of return to high school education.

The equation can be used to make the same kind of standardization between college graduates and high school graduates in order to estimate the rate of return to a college education. The average I.Q. for college graduates is 120; that for high school graduates is 110. Incomes for persons with a high school education are found to be higher for persons with an I.Q. of 120 than those high school graduates with an I.Q. of 110. The incomes are \$5,308 and \$5,509 respectively.

In contrast to the very large income effect of I.Q. calculated for elementary school graduates, the income effect of I.Q. for high school graduates is relatively small. In fact, income was only four percent larger for the group with the higher I.Q. of 120. This suggests that ability will have relatively small effect on the rate of return to college education.

These results for elementary school graduates and for high school graduates are consistent with Becker's findings concerning the effects of ability on rates of return. He states that, based on the limited quantitative data available,

the evidence suggests that this correlation (between ability and school level) explains only a small part of the apparently large return (to college education). ... however ... much of the larger apparent return to primary and secondary education does result from differential ability.¹⁰

Becker examined several studies which related earnings or income to some measure of ability. Based on a study of college graduates employed by the Bell Telephone Co. which provided data on rank in college and earnings, Becker estimated that if a typical high school graduate goes on to college he would have earned about seven percent less than typical college graduates actually receive.¹¹ In terms of the unadjusted age-earnings differential, this seven percent equals almost 20 percent of the apparent gain from college when measured by the rate of return.

Using data on I.Q. rather than class rank, another study indicated that the I.Q. adjustment and the rank adjustment would have about the same effect on the apparent gain to college. Since rank and I.Q. are highly correlated it would be incorrect to adjust for both additively.

Becker summarized his findings on the effect of class rank and I.Q. on unadjusted earnings from a college education by stating that "college education itself would be the major determinant of the apparently high return associated with education."¹²

Another study examined by Becker is of particular interest because it is applicable to both college and high school education and appears to be consistent with the other studies reviewed by Becker as well as the income estimates derived from Tweeten's regression equation. It is

¹⁰ Ibid., p. 80.

¹¹ This figure is based on earnings differences 15 years after beginning employment due to rank differences.

¹² Ibid., p. 85.

also applicable to the Census data used in this study. Morgan and David¹³ adjusted earnings differentials of white male heads of nonfarm households in the labor force for measures of religion, personality, father's education, labor market conditions, mobility, and supervisory responsibilities. In a sense, this group of adjustment variables measures motivation rather than ability, but it is likely that ability is partially accounted for through supervisory responsibility. The adjusted differential between high school and elementary school graduates is 64 percent of the unadjusted differentials at age 18-34 and 40 percent at ages 35-74. Between college and high school graduates the respective ratios were 60 percent and 88 percent.

Comparable percentages are not available to make an ability adjustment for completion of elementary school over no schooling. It has been indicated that the average I.Q. of those with 7-8 years of schooling is 85. The very high unadjusted rates of return for 8 years of schooling do suggest that an ability factor might be important. Becker appears to think that it is. He states that "adjustments for differential ability, however, seem to reduce the apparent rate more to high school graduates."¹⁴

The differentials of 64 and 40 percent between high school graduates and elementary school graduates and 60 and 88 percent between college graduates and high school graduates calculated by Morgan and David were applied to the rate of return to schooling estimates calculated in this study. Table XXVI shows that the unadjusted private rate

¹³James Morgan and Martin David, "Education and Income," Quarterly Journal of Economics, LXXVII (1963), pp. 423-437.

¹⁴Becker, p. 126.

of return estimates for college schooling is decreased by 20 percent, the estimate for secondary schooling is decreased by 31 percent.

The effect on the social rate of return estimates is approximately the same. The estimates for college schooling and secondary schooling are decreased by 20 percent and 35 percent respectively.

All Adjustments Combined

Private rate of return estimates were calculated taking into account all four adjustment factors simultaneously. The resulting rate for college schooling is 12.2, only 1.6 percent less than the unadjusted rate. For 12 years over 8 years the adjusted rate is 17.8 percent, 20.2 percent less than the unadjusted rate. The ability factor has a greater effect in this instance which more than compensates for the secular growth in incomes which, taken by itself, causes the rate of return to increase. Data were not available to adjust the elementary school completion category for an ability differential.

Social rate of return estimates were adjusted simultaneously for secular growth in incomes, mortality, and ability. The relationship between these adjusted rates and the unadjusted rates are similar to that for private rates. For 16 years of schooling over 12 years the adjusted rate is three percent greater than the unadjusted rate. It is 11 percent less than the unadjusted rate for 12 years over 8 years of schooling, again reflecting the depressing effect of the ability adjustment on the estimates.

The adjusted social rate of return for 8 years of schooling over no schooling was adjusted for two factors only, secular growth in incomes and mortality. It is 12 percent higher than the unadjusted rate.

It is likely that a correction for ability would bring the adjusted rate at least down to the unadjusted rate.

To summarize the effects of all the adjustments together, the private and social rates of return for college are only slightly affected, but the adjusted private and social rates for high school are both significantly lower.

Summary

Age-earnings profiles, together with the schooling resource costs estimated in Chapter IV, were used to estimate the returns to investment in schooling for different race-sex groups and place of residence groups. A review of the major results of the analysis is presented in Chapter VIII, the summary and conclusions chapter.

CHAPTER VII

THE RETURNS TO INVESTMENT IN SCHOOLING IN A LOW INCOME AREA

The previous chapter was concerned with the returns to elementary, secondary, and college schooling for groups classified by race, sex, and place of residence in the U. S. The age-earnings profiles for rural residents in the United States are lower than those for urban residents. Also the age-earnings profiles for the Southern region are lower than those for the United States. However, there is also variation of age-earnings profiles among rural residents of the Southern region. This chapter is concerned with the incomes and schooling of residents of 29 low income counties in the Southern region. These counties are characterized by low incomes, rurality, old populations and high outmigration between 1950 and 1960. The 29 low income counties were located in seven Southern states: four in Alabama, four in Kentucky, four in Louisiana, six in Mississippi, three in North Carolina, four in Tennessee, and four in Texas. Initially, data for 1,890 households, who were selected in a self-weighting sample, were obtained. There were 1,012 households that had complete data for the regression analysis used to estimate earnings increments for additional years of schooling. All of the households sampled lived in open country residence and therefore may be classified as rural households.

The sample is homogeneous on the basis of socio-economic characteristics of the counties (income and rurality, for example) rather than

on the basis of geographic location. Table XXVII indicates where the basic 1,890 observations came from on the basis of economic area, state, and county. The report by the President's Advisory Commission on Rural Poverty lists five major areas of rural poverty within the South. They are Appalachia, the Coastal Plains, the Ozarks, the Black Belt of the Old South, and Mexican-American concentrations along the southern border. The sample includes data from all these areas except the Ozarks and the southern border area.

Characteristics of the Low Income Counties

The 29 counties are analyzed with respect to annual earnings, age, years of schooling, economic areas, attitude, and occupation. This section presents the results of four studies which investigate other aspects of the S-44 project counties or of counties with similar characteristics on which research was carried out in association with the S-44 project.

Taylor and Glasgow analyzed occupational data from the S-44 sample based on 1,074 employed male household heads, 768 (72 percent) of whom were white and 306 (38 percent) nonwhite.¹ Table XXVIII below shows the percentage of household heads in each of nine different occupations. The study also defines high prestige and low prestige occupational groups. High prestige occupations are farm operator or manager, manager-proprietor, professional, and sales-clerical workers. The remaining six occupations are placed in the low-prestige group. Except for farm operators, there are relatively few men in the high prestige occupations.

¹Lee Taylor and Charles W. Glasgow, Occupations and Low-Income Rural People, Southern Cooperative Series Bulletin 90 (1963).

TABLE XXVII

DISTRIBUTION OF S-44 SAMPLED HOUSEHOLDS BY COUNTY, ECONOMIC AREA AND STATE^a

Economic Area	State	County	Number of Households	Economic Area	State	County	Number of Households	
Appalachian Mountains	Ky.	Harlan	61	Southeastern Hilly	Miss.	Clay	81	
	Ky.	Perry	60		Miss.	Holmes	111	
	Ky.	Whitley	78		Miss.	Lawrence	80	
	Ky.	Wolfe	67		Miss.	Neshoba	80	
		N. C.	Ashe	121	Total		352	
		Tenn.	Hancock	71				
		Tenn.	Houston	76	Southern Piedmont and Coastal Plains	Ala.	Clark	100
		Tenn.	Humphreys	59		Ala.	Monroe	58
	Tenn.	Union	63	Ala.		Montgomery	46	
				Ala.		Tallapoosa	70	
Total			656		La.	Livingston	16	
Mississippi Delta	La.	Franklin	40		N. C.	Anson	100	
	La.	Natchitoches	45		N. C.	Robeson	117	
	Miss.	Coahoma	32	Total			507	
	Miss.	Tunica	30					
Total			147					
Sandy Coastal Plains	La.	Union	43					
	Texas	Burleson	47					
	Texas	Cass	36					
	Texas	Newton	69					
	Texas	Upshur	33					
Total			228					

^aThe number of households by states were as follows (with the number of counties in parentheses): Alabama, 274 (4); Kentucky, 266 (4); Louisiana, 144 (4); Mississippi, 414 (6); North Carolina, 338 (3); Tennessee, 269 (4); and Texas, 185 (4).

TABLE XXVIII
DISTRIBUTION OF S-44 SAMPLED HOUSEHOLD HEADS
BY MAJOR OCCUPATION

Major Occupation	Percent of Household Heads (Percent)
Farm Operator or Manager	33
Farm Laborer or Foreman	10
Manager, Proprietor, Professional, Technical	<3
Sales or Clerical	<3
Craftsman or Foreman	15
Domestic or Service Worker	<3
Operative	18
Laborer	10
Military Service	<3

Part of the explanation for this is the fact that two-thirds of the respondents had eight years or less of schooling.

A 1966 study by Moon and McCann used the same S-44 data to investigate the subregional variability of adjustment factors of the families in the sample.² The sample was taken from five economic areas which (along with one other area, the Ozark-Ouachita Mountains for which no data are available) have been designated as low income problem areas by the U. S. Department of Agriculture. Total family income was considered

²Seung Gyu Moon and Glenn C. McCann, Subregional Variability of Adjustment Factors of Rural Families in the South, Southern Cooperative Series Bulletin III (1966).

to be a measure of the family's adjustment level. It was found that the income situation differed significantly among subregions. Other factors besides income were considered such as education and degree of anomia. Anomia is a psychological state in an individual commonly characterized by demoralization, alienation, and pessimism.

It was concluded that the Sandy Coastal Plains area appears to be the most favorable in terms of the levels and potentials of adjustment. Some of the reasons for this are the following: a higher proportion of heads and homemakers who are better educated, relatively young, less anomic and physically less handicapped. Also a greater proportion are classified as nonfarm families.

The most handicapped subregion within the South appears to be the Mississippi Delta followed in rank by the Southeastern Hilly area. One general explanation for the seriousness of adjustment problems in the two areas is the high proportion of nonwhite families. It is pointed out that although color is not significantly related to certain variables such as social participation and joint decision making, it is significantly related to such variables as level of living, income and education.³

A contributing study⁴ to the S-44 project presents a description of Fayette County, Alabama which is classified in the serious low income category. Although it is not one of the S-44 counties, its low income situation is relevant. The study was based on 171 rural farm and

³Ibid., p. 43.

⁴Harold Nix, Opportunities for and Limitations of Social and Economic Adjustments in an Alabama Rural County, Auburn University Agricultural Experiment Station Bulletin 338 (Auburn, 1962).

nonfarm households and provides statistics on occupation, income, education and attitudes.

Thirty-two percent of the household heads reported their main occupation as farming; however, only 14 percent of these families received all of their income from farming. Only 18 percent of the household heads received a majority of their income from farming or from farm work. About 40 percent of the families reported some income from non-work sources.

Twenty-nine percent of the sample families had less than \$1,000 in net cash income for the year 1959. For all the families in the sample, the median family income was \$1,676 and the average family income was \$2,379. This suggests that a frequency distribution, if fitted, would be skewed to the right. A reason for this is the presence of extreme values at the higher income levels. This study also provided an estimate of the number of homemakers who had jobs. In 1959 in Fayette County, 10 percent of those homemakers who were less than 65 years old and not disabled reported employment.

A similar study was made in Van Buren County, Arkansas.⁵ The average number of years of school completed by children of the sampled families was 11.4 years. The median schooling completed by the rural farm population 25 years old and older in the same county was 7.8 years, indicating that the quantity of schooling achieved has increased between generations.

⁵William S. Folkman, Attitudes and Values in a Rural Development Area: Van Buren County, Arkansas, University of Arkansas Agricultural Experiment Station Bulletin 650 (Fayetteville, 1962).

S-44 Income Data

As with the 0.1 percent Bureau of the Census sample used to obtain data for returns calculations made in Chapter VI, the 1959 income data available from the S-44 project were recorded on a class basis rather than as point estimates.

Five different income measures are available. They are total family income, net farm income, nonfarm income of the household head, homemaker's income, and income from all other sources.⁶ Total family income is the sum of the four other income categories.

For purposes of estimating the value of schooling to the household heads in the sample, the most appropriate income measure is annual earnings of the household head. This measures a person's actual current earning power. It is the same income measure that was used in Chapter V where the data are taken from the Census of Population. Thus, it is possible to make a comparison between Chapter V earnings and the low income area earnings presented in this chapter. It also follows that, if the same assumptions and same procedure are used to calculate estimates of the rate of return to schooling for the low income data as was used to calculate the estimates based on census data, then it is possible to make meaningful comparisons between the two sets of estimates.

With the S-44 low income data analyzed in this chapter, the earnings of the household head were obtained for each one of the heads in the study by adding together net farm income and nonfarm income.

⁶Net farm income was estimated as 40 percent of gross farm income from the sale of agricultural products plus government payments. Income from other sources consists of the total of welfare payments, retirement and survivors income, workers benefits, veterans benefits, investment income, and miscellaneous income.

Annual Earnings and Associated Class Frequencies
by Age and Years of Schooling

The analysis of this chapter considers several different groupings of the sample of 1,012 household heads. They are as follows: all 1,012 household heads, 744 white household heads, 268 nonwhite household heads, 522 white household heads who are not farm operators or managers, 222 white household heads who are farm operators or managers. The following tables show earnings by age and years of schooling for each of the five groups listed above for the 29 low income counties.⁷

The first table (Table XXIX) for all 1,012 employed household heads shows the distribution of the sample by education and by age. There are 38 heads with more than 12 years of schooling, 272 with 9-12 years of schooling, and 702 with 8 years or less of schooling. The largest education class is that for 5-7 years of schooling with 258 heads. When considering the age classes, the two classes with the highest frequencies are 30-39 years (203 heads) and 55-64 years (219 heads). As would be expected, based on the results of other studies and the results presented in Chapter V, earnings generally increase for any particular age level as the amount of education increases. Also for any particular education level, earnings increase to a peak as age increases and then decrease.

The tables for white household heads (Table XXX) and nonwhite household heads (Table XXXI) indicate that, for the sample, earnings of

⁷Earnings do not necessarily represent the total purchasing power of the household head and his dependents. The homemaker might contribute earnings to the family; they may also receive income from transfer payments, retirement income, life insurance, etc. Using total family income the data available indicate the families in this sample require at least 9-11 years of schooling to rise above poverty (defined approximately as an annual total family income of \$3,000).

TABLE XXIX

AVERAGE ANNUAL EARNINGS AND ASSOCIATED CLASS FREQUENCIES FOR 1,012 EMPLOYED MALE HOUSEHOLD HEADS BY AGE AND EDUCATION LEVEL^a

Age (Years)	Level of Education (Years)									Age Group Frequencies
	0	1-3	4	5-7	8	9-11	12	13-15	16+	
<20	--	--	--	1,187 (2)	--	125 (1)	3,000 (1)	--	--	4
20-29	--	775 (5)	1,062 (10)	1,406 (16)	1,744 (23)	2,541 (27)	3,110 (26)	3,000 (1)	3,000 (1)	109
30-39	1,312 (2)	1,118 (19)	1,447 (12)	2,080 (42)	2,150 (39)	3,658 (37)	4,104 (37)	4,500 (5)	4,025 (10)	203
40-44	2,041 (3)	1,223 (14)	1,616 (15)	2,098 (42)	2,802 (24)	3,397 (28)	4,489 (12)	5,125 (1)	--	139
45-49	375 (6)	2,090 (11)	1,865 (13)	2,106 (41)	2,333 (27)	2,125 (15)	3,250 (8)	2,781 (4)	4,968 (4)	129
50-54	1,950 (5)	1,493 (18)	1,693 (11)	1,898 (32)	2,369 (24)	1,766 (31)	2,612 (10)	1,500 (3)	4,000 (2)	136
55-64	943 (11)	1,137 (31)	1,250 (22)	1,708 (66)	2,072 (52)	2,143 (27)	2,550 (5)	2,458 (3)	3,687 (2)	219
65-74	291 (6)	958 (12)	1,453 (8)	1,164 (16)	1,645 (12)	833 (3)	625 (2)	2,187 (2)	--	61
>75	375 (1)	1,000 (4)	1,062 (2)	500 (1)	3,062 (2)	250 (1)	625 (1)	--	--	12
Education Group Frequencies	34	114	93	258	203	170	102	19	19	1,012

^aFor each cell of the table, the top number is average annual earnings measured in dollars; the bottom number is the cell frequency.

TABLE XXX

AVERAGE ANNUAL EARNINGS AND ASSOCIATED CLASS FREQUENCIES FOR 744 EMPLOYED WHITE
MALE HOUSEHOLD HEADS BY AGE AND EDUCATION LEVEL^a

Age (Years)	Level of Education (Years)									Age Group Frequencies
	0	1-3	4	5-7	8	9-11	12	13-15	16+	
<20	--	--	--	--	--	125 (1)	3,000 (1)	--	--	2
20-29	--	187 (2)	1,125 (3)	1,500 (11)	1,809 (21)	2,381 (19)	3,386 (21)	3,000 (1)	3,000 (1)	79
30-39	1,312 (2)	847 (9)	1,550 (10)	2,522 (28)	2,275 (34)	3,553 (33)	4,201 (36)	4,500 (5)	4,390 (8)	165
40-44	--	1,347 (9)	1,850 (10)	2,880 (21)	3,092 (19)	3,771 (23)	4,443 (11)	5,125 (1)	--	94
45-49	0 (1)	3,250 (4)	2,111 (9)	2,355 (25)	2,410 (21)	2,488 (11)	3,250 (8)	2,781 (4)	4,968 (4)	87
50-54	1,950 (5)	2,275 (10)	1,535 (7)	2,342 (23)	2,916 (18)	1,723 (28)	2,612 (10)	1,750 (1)	4,000 (2)	104
55-64	700 (5)	1,486 (18)	1,515 (16)	1,697 (48)	2,196 (44)	2,265 (24)	2,550 (5)	2,458 (3)	3,687 (2)	165
65-74	437 (2)	1,100 (5)	2,050 (5)	1,223 (14)	1,925 (10)	1,062 (2)	875 (1)	4,000 (1)	--	40
>75	375 (1)	1,333 (3)	1,062 (2)	--	3,625 (1)	--	625 (1)	--	--	8
Education Group Frequencies	16	60	62	170	168	141	94	16	17	744

^aFor each cell of the table, the top number is average annual earnings measured in dollars; the bottom number is the cell frequency.

TABLE XXXI

AVERAGE ANNUAL EARNINGS AND ASSOCIATED CLASS FREQUENCIES FOR 268 EMPLOYED NONWHITE
MALE HOUSEHOLD HEADS BY AGE AND EDUCATION LEVEL^a

Age (Years)	Level of Education (Years)									Age Group Frequencies
	0	1-3	4	5-7	8	9-11	12	13-15	16+	
<20	--	--	--	1,187 (2)	--	--	--	--	--	2
20-29	--	1,166 (3)	1,035 (7)	1,200 (5)	1,062 (2)	2,921 (8)	1,950 (5)	--	--	30
30-39	--	1,362 (10)	937 (2)	1,196 (14)	1,300 (5)	4,531 (4)	625 (1)	--	2,562 (2)	38
40-44	2,041 (3)	1,000 (5)	1,150 (5)	1,315 (21)	1,700 (5)	1,675 (5)	5,000 (1)	--	--	45
45-49	450 (5)	1,428 (7)	1,312 (4)	1,718 (16)	2,062 (6)	1,125 (4)	--	--	--	42
50-54	--	515 (8)	1,968 (4)	763 (9)	729 (6)	2,166 (3)	--	1,375 (2)	--	32
55-64	1,145 (6)	653 (13)	541 (6)	1,736 (18)	1,390 (8)	1,166 (3)	--	--	--	54
65-74	218 (4)	857 (7)	458 (3)	750 (2)	250 (2)	375 (1)	375 (1)	375 (1)	--	21
>75	--	0 (1)	--	500 (1)	2,500 (1)	250 (1)	--	--	--	4
Education Group Frequencies	18	54	31	88	35	29	8	3	2	268

^aFor each cell of the table, the top number is average annual earnings measured in dollars; the bottom number is the cell frequency.

white heads are generally greater than those of nonwhite heads of the same age and schooling level. In the case of nonwhites, only five out of 268 heads have more than 12 years of schooling.

Table XXXII shows frequencies by age and education level for whites and nonwhites separately and together. Two broad schooling classifications were used: less than 8 years of schooling, and 8 years or more of schooling. For nonwhites, 70.5 percent had less than 8 years of schooling. In contrast, only 41.4 percent of the whites possessed less than 8 years of schooling.

TABLE XXXII

FREQUENCIES BY RACE, EDUCATION LEVEL, AND AGE FOR
1,012 EMPLOYED MALE HOUSEHOLD HEADS

Age	NONWHITE			WHITE			ALL		
	Years of Education			Years of Education			Years of Education		
	Less Than 8	8 or More	All Education Levels	Less Than 8	8 or More	All Education Levels	Less Than 8	8 or More	All Education Levels
<20	0	2	2	0	2	2	2	2	4
20-29	15	15	30	16	63	79	31	78	109
30-39	26	12	38	49	116	165	75	128	203
40-44	34	11	45	40	54	94	74	65	139
45-49	32	10	42	39	48	87	71	58	129
50-54	21	11	32	45	59	104	66	70	136
55-64	43	11	54	87	78	165	130	89	219
65-74	16	5	21	26	14	40	42	19	61
>75	2	2	4	6	2	8	8	4	12
Total	189	79	268	308	436	744	499	513	1,012
Percent by Years of Schooling	70.5	29.5	100.0	41.4	58.6	100.0	49.3	50.7	100.0

It was decided to limit the comparison of farmers and nonfarmers to the 744 white household heads. Of the 744, 522 were classified as nonfarmers (Table XXXIII) and 222 (Table XXXIV) were classified as farm operators or managers. Except for the 13-15 and 16 years of schooling levels, earnings of white nonfarmers are generally higher than the earnings of white farmers with the same age and schooling levels. Twenty-six out of 522 white nonfarmers had 13 years or more of schooling; seven out of 222 white farmers fell in the same category.

Earnings Adjusted for Age, Schooling, Economic Area, Race, Occupation and Attitude with Regression Analysis

The actual age-earnings profiles for all those sampled and for whites and nonwhites separately have been presented in the previous section in this chapter. To calculate the returns to additional schooling, it is necessary to focus on the earnings differentials between earnings for pairs of schooling levels.

The procedure in Chapter VI to calculate returns for a particular race, sex, and place of residence group was to obtain the difference between the age-earnings profiles for two levels of schooling. An alternative procedure used in this chapter is to employ regression analysis. Earnings are the dependent variable and the following are incorporated as independent variables: economic area, race, age, schooling level attained, occupation and attitude. All the explanatory variables are incorporated as dummy (zero-one) variables except for age which is incorporated as a continuous variable with a linear and a squared term. There are five areas, two races, nine age groups, nine education groups, two occupation categories, and two attitude characteristics.

TABLE XXXIII

AVERAGE ANNUAL EARNINGS AND ASSOCIATED CLASS FREQUENCIES FOR 522 EMPLOYED WHITE NONFARMER
MALE HOUSEHOLD HEADS BY AGE AND EDUCATION LEVEL^a

Age (Years)	Level of Education (Years)									Age Group Frequencies
	0	1-3	4	5-7	8	9-11	12	13-15	16+	
<20	--	--	--	--	--	--	3,000 (1)	--	--	1
20-29	--	187 (2)	1,125 (3)	1,656 (8)	1,992 (17)	2,493 (18)	3,444 (18)	3,000 (1)	3,000 (1)	68
30-39	1,750 (1)	1,583 (3)	2,333 (6)	2,677 (24)	2,638 (27)	3,539 (32)	4,591 (30)	5,000 (4)	4,416 (6)	133
40-44	--	1,500 (6)	2,375 (6)	3,111 (18)	3,285 (14)	4,125 (17)	4,850 (10)	5,125 (1)	--	72
45-49	0 (1)	3,250 (4)	2,187 (6)	2,808 (17)	3,017 (14)	4,150 (5)	3,660 (7)	2,187 (2)	4,968 (4)	60
50-54	2,916 (3)	2,421 (8)	1,083 (6)	3,053 (14)	3,403 (13)	2,078 (19)	3,196 (7)	--	4,000 (2)	72
55-64	875 (2)	2,112 (10)	2,357 (7)	2,100 (26)	2,759 (27)	2,500 (16)	2,875 (4)	2,458 (3)	3,687 (2)	97
65-74	--	1,281 (4)	2,531 (4)	1,062 (4)	1,250 (1)	1,250 (1)	--	--	--	14
>75	375 (1)	1,937 (2)	--	--	3,625 (1)	--	625 (1)	--	--	5
Education Group Frequencies	8	39	38	111	114	108	78	11	15	522

^aFor each cell in the table, the top number is average annual earnings measured in dollars; the bottom number is the cell frequency.

TABLE XXXIV

AVERAGE ANNUAL EARNINGS AND ASSOCIATED CLASS FREQUENCIES FOR 222 EMPLOYED WHITE FARMER
MALE HOUSEHOLD HEADS BY AGE AND EDUCATION LEVEL^a

Age (Years)	Level of Education (Years)									Age Group Frequencies
	0	1-3	4	5-7	8	9-11	12	13-15	16+	
<20	--	--	--	--	--	125 (1)	--	--	--	1
20-29	--	--	--	1,083 (3)	1,031 (4)	375 (1)	3,041 (3)	--	--	11
30-39	875 (1)	479 (6)	375 (4)	1,593 (4)	875 (7)	4,000 (1)	2,250 (6)	2,500 (1)	4,312 (2)	32
40-44	--	1,041 (3)	1,062 (4)	1,500 (3)	2,550 (5)	2,770 (6)	375 (1)	--	--	22
45-49	--	--	1,958 (3)	1,390 (8)	1,196 (7)	1,104 (6)	375 (1)	3,375 (2)	--	27
50-54	500 (2)	1,687 (2)	4,250 (1)	1,236 (9)	1,650 (5)	972 (9)	1,250 (3)	1,750 (1)	--	32
55-64	583 (3)	703 (8)	861 (9)	1,221 (22)	1,301 (17)	1,796 (8)	1,250 (1)	--	--	68
65-74	437 (2)	375 (1)	125 (1)	1,287 (10)	2,000 (9)	875 (1)	875 (1)	4,000 (1)	--	26
>75	--	125 (1)	1,062 (2)	--	--	--	--	--	--	3
Education Group Frequencies	8	21	24	59	54	33	16	5	2	222

^aFor each cell in the table, the top number is average annual earnings measured in dollars; the bottom number is the cell frequency.

The format of the full regression model which is used here is as follows:

$$\begin{aligned}
\text{Head's Earnings} = & \text{Constant Term} + b_i \sum_{i=2}^5 \text{Area} + c \cdot \text{Race} \\
& + d_j \sum_{j=1}^9 \text{Education} + e \cdot \text{Occupation} + f \cdot \text{Attitude} \\
& + g \cdot \text{Age} + h \cdot \text{Age}^2 + e \\
& e = \text{Error term}
\end{aligned}$$

The constant term in this full regression model represents an average person with the following attributes: residence in Appalachia, nonwhite, 5-7 years of schooling, nonfarm occupation (i.e., some other occupation other than farm operator or manager), and a "bad" attitude.

Several different regressions were run by dividing the sample data on the basis of race and occupation. Table XXXV shows the group frequencies for all 1,012 observations for each of the variables considered. The regression for 744 white household heads will be considered in some detail; the remaining regressions will be described more briefly.

The relevant column in Table XXXVI for the 744 white household heads is the second one headed "white". In this type of zero-one regression analysis the beta coefficients represent actual dollar increments to the annual earnings of the employed household heads (all male) in the sample. The constant term is representative of a certain set of socio-economic characteristics of the household heads. These were chosen to be mostly unfavorable and the estimate is -\$218. This must be interpreted with care since the age variable is included as a continuous variable (to conserve degrees of freedom) rather than as a set of zero-one variables used for each of the other explanatory variables. Thus, a person who has all the characteristics associated with the constant term and is in the age range of 30-39 years will have an

TABLE XXXV

DISTRIBUTION OF OBSERVATIONS FOR 1,012 LOW INCOME EMPLOYED HOUSEHOLD
HEADS FOR AREA, RACE, AGE, EDUCATION, OCCUPATION
AND ATTITUDE VARIABLES

Variable	Group Frequencies	Percent of Total Frequency (Percent)
Economic Area		
Appalachian Mountains (1)	372	36.8
Mississippi Delta (2)	44	4.3
Sandy Coastal Plains (4)	84	8.3
Southeastern Hilly (5)	210	20.8
Southern Piedmont and Coastal Plains (6)	302	29.8
Race		
White	744	73.5
Nonwhite	268	26.5
Age		
Under 20	4	.4
20-29	109	10.8
30-39	203	20.1
40-44	139	13.7
45-49	129	12.7
50-54	136	13.4
55-64	219	21.6
65-74	61	6.0
75+	12	1.2
Education		
None	34	3.4
1-3	114	11.3
4	93	9.2
5-7	258	25.5
8	203	20.1
9-11	170	16.8
12	102	10.1
13-15	19	1.9
16+	19	1.9
Occupation		
Farmer	337	33.3
Nonfarmer	675	66.7
Attitude		
Good	404	39.9
Bad	608	60.1

TABLE XXXVI

REGRESSION COEFFICIENTS AND LEVELS OF SIGNIFICANCE FOR THE REGRESSION

Variable	All (1,012)	White (744)	White Nonfarmers (522)	White Farmers (222)	Nonwhite	
					(268)	(263) ^a
Constant term	-637	-218	-1,436	191	479	523
Area		^b				
Mississippi Delta (2)	239	208	385	233	-102	-99
Sandy Coastal Plains (4)	29	-75	201	408	78	330
Southeastern Hilly (5)	147	216	100	422	-255	-291
Southern Piedmont and Coastal Plains (6)	469**	499**	363*	908**	123	128
Race (white)	702**	--	--	--	--	--
Schooling						
None	-427	-639	-557	-739	-283	-297
1-3	-453**	-410	-300	-346	-508**	-516
4	-228	-290	-389	-91	-140	-155
5-7	0	0	0	0	0	0
8	328*	275	291	291	416	416
9-11	471**	320	392**	231	901**	887**
12	1,149**	1,131**	1,317	379	392	327
13-15	962**	1,035**	851	1,446	198	--
16	1,633**	1,662**	1,542**	2,465**	706	--
Occupation (farmer)	-1,240**	-1,291**	--	--	-1,131**	-1,121**
Attitude (good)	454**	470**	474**	467**	397**	347*
Age: Age Linear	100**	118**	183**	23	57	57
Age Squared	-1.10**	-1.30**	-2.08**	-0.22	-0.61	-0.61
R ²	0.36	0.31	0.21	0.22	0.34	0.34
Significance of Regression	*	*	*	*	*	*
F	33.5118	20.7682	9.1412	3.9405	8.0323	9.2843
Degrees of freedom	17 & 994	16 & 727	15 & 506	15 & 206	16 & 251	14 & 248

^aExcluding 13-15 and 16 years of schooling.

^bBracket indicates level of significance for variable set.

^c*Significant at the five percent level. **Significant at the one percent level.

estimated annual income of \$2,301 ($-\$218 + \$2,519$). In the case of the age variable, the beta coefficients are \$118 (linear age term) and $-\$1.30$ (squared age term). Unlike the rest of the explanatory variable beta coefficients, these are not directly interpreted as increments to annual earnings. Instead, the two terms must be combined to get the estimated increments to annual earnings. One such increment has already been given (\$2,519 for the 30-39 age group). It can be seen from the table that in the case of the 744 whites, the older the man is the greater is the increment to earnings up to the peak increment of \$2,647 associated with the 45-49 age group. After that, group earnings increments due to age decline in a uniform manner. This relationship between annual earnings and age has been well documented by the census data used in the previous chapter.

After age, the next variable to be considered is occupation. The household heads were classified on the basis of whether their occupation was farm operator or manager, or any other occupation. The beta coefficient shows that farm operators and managers have \$1,291 less on the average in annual earnings than those persons involved in other occupations. Considering the low level of both earnings and incomes in the sample areas, this points to some of the problems faced by the planners of agricultural policy at the national level.

The attitude variable is likewise interesting from the point of view of a consideration of the various plans that have been put forward recently to help families move out of a low income group to a higher income group. The household head's attitude is represented by one dummy variable in the regression equation, and since it can take on only one of two values, these have been labeled "good" attitude and "bad" attitude. The attitude variable is based on a series of eight statements

with which the respondent is requested to agree or disagree. The statements all relate to different ways of looking at life and provide a measure of anomia (social alienation) according to whether the respondent agreed with three or less responses (good attitude) or four or more responses (bad attitude). While not as sophisticated as a need-achievement scale used by Morgan and David¹⁰, it is considered to be a useful variable to incorporate into the regression. It was expected that the good attitude would be reflected in a positive monetary return, which is the case with all regressions. The beta coefficient of the attitude variable suggests that a good attitude contributes \$470 to annual earnings.

The area variable is not considered of direct importance to the estimation of rates of return to schooling because the sample cannot be easily split by area. However, it should be noted that the area included in the constant term is Appalachia. For the white males being considered, the Sandy Coastal Plains sample area is relatively worse off (-\$75), the Mississippi Delta and Southeastern Hilly areas are better off to about the same extent (\$208 and \$216, respectively), and the Southern Piedmont and Coastal Plains area is the best off relative to the Appalachian area (\$499 better off).

Regression analysis provides an indication of the contribution to annual earnings of all the explanatory variables mentioned above together with the schooling variable. Schooling is the most important explanatory variable from the point of view of the calculation of the return to schooling. The zero dollar increment to the 5-7 years of schooling indicates that this schooling level is the one incorporated

¹⁰ Morgan and David, p. 421.

into the constant term. Lesser amounts of schooling achievement result in less returns to schooling relative to that base. These are indicated by the three negative earnings increments. More schooling than 5-7 years results in positive earnings increments relative to the base. Except for the 13-15 years of schooling level, the earnings increments attributable to schooling increase as theory would indicate. The more schooling, *ceteris paribus*, the more annual earnings.

The statistical analysis consists of using an F-test to test the contribution of each variable to the full model and a t-test to examine the contribution of each component of a particular variable.

All the sets of variables (e.g., all schooling variables taken together) are statistically significant at the one percent level, using the F-test to determine if the addition of each variable or set of variables, when considered as a new addition to the remainder of the model, causes the model to be changed in any significant way.

There are three explanatory variables which have more than one beta coefficient associated with them. They are age, area, and schooling. With age, both the linear and squared terms are significant at the one percent level. The only area component which is significant is the Southern Piedmont and Coastal Plains area. The 12 years, 13-15 and 16 years of schooling components are significant at the one percent level; the remaining schooling components are not significant.

Two regression equations were used for nonwhites. In one, all 268 persons are included, while in the other the five nonwhites in the sample with more than 12 years of schooling were excluded. The latter equation was judged to be the most useful. The table showing the coefficients indicates that area is significant at the five percent level, schooling and occupation are significant at the one percent level, and

attitude and the age squared term are significant at the five percent level.

The 744 white heads in the sample were divided into farmers and nonfarmers. There were 222 white farmers (defined as farm operators or managers) and 522 nonfarmers (the remaining heads, all of whom had some other occupation).

The regression equation for the 522 white nonfarmers is considered first. Area is not significant, but schooling, attitude and age are all significant at the one percent level.

The regression for the 222 white farmers shows that area and attitude are significant at the one percent level; schooling is significant at the five percent level. Age was not significant for this group. As with the census data, smaller sample size leads to less regularity in the coefficients.

The regression equations can be used to make several comparisons; however, the primary purpose is to obtain estimates of the benefits from extra amounts of schooling so that these benefits may be combined with the appropriate costs of schooling to determine the rate of return to schooling.

Schooling Costs

The costs associated with attending school are necessary for the calculation of rates of return to schooling. Foregone earnings plus additional private schooling costs are necessary to calculate private rates. In addition to these costs, schooling resource costs must be added to calculate social rates of return. The assumptions necessary for the calculation of schooling costs are generally the same as those

used for the census data¹¹; where they are modified the reason is to take into account the particular properties of the data for low income rural household heads on which this chapter is based.

Private Schooling Costs

The low income data do not provide adequate age-earnings streams for the different levels of education below age 20. Therefore, the census data for white males in the rural South were adjusted so that they are applicable to the low income sample for younger ages.

Rates of return were calculated for three sample groups: the 744 white household heads (occupation was not considered), the 522 white nonfarmers and the 222 white farmers. Hence three adjustments were made on age-earnings below age 20, one for each of these three groups.

The adjustment procedure was to calculate the ratio of sample earnings to census earnings for each level of schooling that was required to estimate the rates of return. This ratio was then applied to the census data for below 20 years of age to get the age-earnings streams which are necessary for the methodology being used (for both earnings after leaving school and also private schooling costs prior to the time that the individual leaves school).

The foregone earnings for the three groups are shown in the following two tables (Table XXXVII and Table XXXVIII). Nine education categories were considered for the 744 whites; however, for the farmers and nonfarmers it was decided to concentrate on the returns to primary

¹¹To briefly recap the main assumption, earnings of those persons out of school were used as the foregone earnings of those persons of the same age in school. It was assumed that whatever additional private costs were faced by the individual staying on in school were approximately matched by earnings which he obtained by part-time work during the school year and by part-time or full-time work during vacations.

TABLE XXXVII

EARNINGS FOREGONE FOR LOW INCOME WHITE MALES IN THE SOUTH^a

Age Class	Years of Schooling Completed								
	0 ^b	1-3 ^b	4 ^b	5-7	8	9-11	12	13-15	16
	(Dollars)								
14-15	284	337	364	430					
16-17	379	449	485	573	663	655			
18-19	507	600	648	766	896	986	1,543		
20-21	889	1,050	1,134	1,341	1,275	1,453	2,113	1,750	
22-24	1,249	1,478	1,596	1,887	2,133	2,030	3,013	2,924	3,550

^aThese earnings are based on the census data for white males in the rural South. The procedure used is described in the text.

^bThe earnings in these columns are estimated from the earnings for 5-7 years of schooling. This is considered the most satisfactory procedure.

schooling (8 years of schooling completed), and secondary schooling (12 years over no schooling and 12 years over 8 years). Because of this, foregone earnings were only calculated for no schooling and 8 and 12 years of schooling.

The above two tables showing foregone earnings for low income individuals indicate that, in general, earnings increase as age increases and as the level of schooling increases. The second of the above two tables shows that foregone earnings are greater for the average nonfarmer compared with the average farmer. Another way of stating this, in terms of human capital analysis, is that the private opportunity cost of additional schooling is smaller for the average low income farmer in the sample compared with the average low income nonfarmer.

TABLE XXXVIII
EARNINGS FOREGONE FOR LOW INCOME WHITE FARMERS
AND NONFARMERS IN THE SOUTH^a

Age Class	Nonfarmers			Farmers		
	Years of Schooling Completed			Years of Schooling Completed		
	0	8	12	0	8	12
	(Dollars)			(Dollars)		
14-15	378			96		
16-17	504	767		128	449	
18-19	694	1,057		173	606	
20-21	989	1,505	2,465	246	863	1,080
22-24	1,654	2,517	3,515	412	1,444	1,540

^aThese earnings are based on the census data for white males in the rural South. They are estimated using the same procedure that is used in the previous table.

Social Schooling Costs

Social schooling costs are the sum of private schooling costs and schooling resource costs. The latter were based on the estimates made in Chapter IV for the Southern region. However, they had to be adjusted so that they could be used for the low income sample. The first step was to obtain the difference between per capita income in the low income area and that in the South. The low income area income was estimated to be \$1,197 (this is a weighted average based on county incomes for those counties from which the sample was drawn weighted by county population). The corresponding per capita income figure for the South was \$1,752. The difference in per capita income was \$555. In order to be of use in

adjusting schooling resource costs, this income difference must be translated into a current expenditure's difference. This was done by using the equation in Table I of the article by Hines, Tweeten, and Redfern.¹² This equation translates the per capita income difference into a \$40 difference between the South's combined current expenditure per pupil and that of the low income sample area. When this adjustment was applied to the appropriate expenditures from Chapter IV, the result was current expenditures totaling \$193 per elementary school pupil for the low income area, and \$252 per secondary school pupil.

When the capital charge¹³ is added in, the total expenditure estimates were \$246 and \$323 per elementary student and secondary school student respectively.

College schooling resource costs for individuals in the low income area sample were assumed to be the same as the college schooling resource costs for the rural South, since a college student from the low income area would probably go outside the area to college. In the case of primary and secondary schooling, the individual does attend the school district in which he lives. The estimated college schooling resource cost is \$1,823 per student annually.

Returns to Schooling

The costs of schooling have been presented above. The regression equations provide estimates of the earnings differentials attributable to extra schooling. The assumptions concerning age of entry into the

¹²Fred Hines, Luther Tweeten, and Martin Redfern, "Social and Private Rates of Return to Investment in Schooling, By Race-Sex Groups and Regions," Journal of Human Resources V (1970).

¹³The capital charge is set at 10 percent for these estimates.

labor force and number of years in the labor force are identical to the ones used in Chapter VI (these assumptions are described in detail in Chapter IV).

There is a difference between the census data and low income data in the handling of earnings differentials. In Chapter II, Figure 1 shows hypothetical age-earnings profiles and Figure 2 below it shows one corresponding age-earnings differential. In this hypothetical case, the differential is assumed to increase as age increases up to a certain point and then decrease. This hypothetical situation is borne out by most of the actual age-earnings differentials in Chapter V.

In this chapter, however, age-earnings differentials derived from the regression equation are constant at all ages. This results from the additive regression model, which assumes that all variables are independent of each other and that there is no interaction between variables (which means that there is no interaction between level of schooling and age).¹⁴ The constant age-earnings differentials calculated are averages; therefore, it is likely that any bias which results from not calculating a differential which varies over age is small.

Estimates of Private and Social Rates of
Return to Schooling for Low Income
Sample White Household Heads

All Household Heads

This section shows rates of return to schooling based on the costs and earnings discussed above. The first table (Table XXXIX) presents the estimates of private and social rates of return to schooling for the

¹⁴Interaction terms could have been included in the regression equation. This procedure would have increased problems of multicollinearity and would have reduced degrees of freedom.

TABLE XXXIX

ESTIMATES OF PRIVATE AND SOCIAL RATES OF RETURN TO
SCHOOLING FOR THE 744 LOW INCOME WHITE
HOUSEHOLD HEADS^a

Years of Schooling	Years of Schooling							
	0	1-3	4	5-7	8	9-11	12	13-15
	(Percent)							
1-3	40.0							
	() ^b							
4	24.7	22.2						
	() ^b	() ^b						
5-7	23.8	27.8	47.6					
	() ^b	() ^b	() ^b					
8	19.7	21.0	25.2	18.6				
	(105.4)	(74.2)	(59.7)	(28.0)				
9-11	14.4	13.8	14.1	9.0	1.3			
	(41.8)	(30.8)	(25.5)	(13.3)	(2.6)			
12	15.8	16.1	17.0	15.2	15.6	27.3		
	(35.1)	(29.3)	(26.6)	(20.5)	(20.8)	(35.0)		
13-15	10.3	9.5	9.2	7.3	5.9	7.1		^c
	(22.1)	(18.1)	(16.2)	(12.0)	(10.7)	(12.4)	() ^c	
16	9.2	8.5	8.2	6.9	6.2	6.7	1.7	6.1
	(18.6)	(15.7)	(14.4)	(11.4)	(10.5)	(11.7)	(4.4)	(10.1)

^aThe top number is the social rate estimate, the bottom number is the private rate estimate.

^bInfinitely large rate of return.

^cNot estimable because earnings differential is negative.

744 white household heads for nine levels of schooling. The private rates will always be higher than the social rates.

The estimated private rates suggest the following general observations: primary education is a sound investment throughout the range of primary school levels shown in the table; secondary education is not as favorable, but still high enough to be classified as a sound investment; college education is the least favorable and for an individual with

a high opportunity rate of return might not be a sound private investment.

Similar general observations can be made about the social rate estimates. Primary schooling is the most favorable when considered as a potential investment by society, and college schooling is least favorable. The social rates of return for the latter are low enough to indicate that from an economic standpoint society might not want to invest in the resources to provide college schooling for men who will return to occupations of respondents in the low income counties being considered. However, if there are relatively large numbers of young men from these counties who went to college and then found employment elsewhere where the net benefits were greater, then these out-migrants as a group would have a higher rate of return. If society wished to consider both out-migrants and residents, then its decision as to the usefulness of college education for persons originating from the low income counties might be different.

Farm and Nonfarm Household Heads

As would be expected in a low income rural area sample of the size used, there are few farmers and nonfarmers who have completed college. Therefore, the estimates discussed are those for high school graduates and elementary school graduates. They are presented in Table XL. For elementary school the estimates of private and social rates for the two occupation groups are similar in magnitude, with those for farmers being slightly higher. Nonfarmers have social and private rates which suggest that high school is a good investment for them. On the other hand, farmers have a very low rate of return on their investment in a high school education. Perhaps limited capital and land resources available

TABLE XL

RETURNS TO SCHOOLING ESTIMATES FOR ALL LOW INCOME
PERSONS, FOR LOW INCOME NONFARMERS, AND
FOR LOW INCOME FARMERS

	Total		Nonfarmers		Farmers	
	Social	Private	Social	Private	Social	Private
High School (12/8)						
Rate of Return (Percent)	15.6	20.8	16.5	21.2	1.27	3.34
Benefit/Cost Ratio	2.86	4.05	3.06	4.15	0.38	0.62
Discounted Costs (Dollars)	3,797	2,676	4,250	3,131	2,931	1,812
Discounted Earnings Differential (Dollars)	10,842	10,842	12,995	12,995	1,115	1,115
Elementary (8/0)						
Rate of Return (Percent)	19.7	105.4	18.3	80.1	22.3	242.5
Benefit/Cost Ratio	4.88	25.20	4.26	17.57	6.31	84.02
Discounted Costs (Dollars)	1,895	367	2,016	489	1,652	124
Discounted Earnings Differential (Dollars)	9,250	9,250	8,582	8,582	10,424	10,424
12/0						
Rate of Return (Percent)	15.8	35.1	15.5	30.6	13.8	48.7
Benefit/Cost Ratio	3.96	10.64	3.72	8.37	3.32	19.81
Discounted Costs (Dollars)	3,552	1,322	4,009	1,779	2,678	448
Discounted Earnings Differential (Dollars)	14,066	14,066	14,892	14,892	8,885	8,885

to farmers restricts opportunities to utilize improved management ability or opportunities for part-time nonfarm work that would ordinarily be expected to come from a high school education.

Summary

This chapter provides empirical estimates of the returns to schooling for low income rural people in the South. It thus contributes to information relevant to policy makers concerned with the problem of providing all citizens with equal access to economic and social advancement without discrimination as to place of residence. The six multiple regression models that were run provide evidence of the influence of different variables on annual earnings of the household head. They also provide age-earnings differentials for the calculation of appropriate private and social rates of return. Rates of return to all the residents of low income communities were generally favorable for completion of elementary school. High school appeared to be economically rewarding to nonfarmers, but was of marginal economic value to farmers.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

Summary

Many observers have identified education as a potential means of alleviating some of the more serious human problems involving urban and rural poverty, city ghettos, and unemployment patterns which are such that the poorly educated person is in the position of being last hired and first fired. Education, regarded as an economic good, has both private good and public good characteristics. Looked at from another point of view, education is an investment which yields a flow of benefits to the individual and society over a period in the future. These characteristics make the calculation of both private and social returns both meaningful and important. There is a definite need for estimates which will allow decision makers to make the best use of available funds, either public or private. This need provides the basis for the objective of the study which is to estimate both private and social returns to schooling.

Several studies completed prior to this, estimated the value of schooling for one or more groups of persons. In general, two types of empirical measures of value were used. The first measures earnings and/or costs directly (they may or may not be discounted, depending on the purpose for which they are to be used); the second uses the same earnings and costs to calculate either the internal rate of return or

the benefit-cost ratio. Practically without exception, the more schooling the individual has the more lifetime earnings he has, the greater is his annual salary throughout practically all the years that he spends in the work force, and the greater is his labor force participation. This is most pronounced for white males but also holds for nonwhite males although in a less consistent way. When white males are compared with nonwhite males at each education level, the former are better off than the latter in each of the three categories. The general situation for females is less clear because of women's role in child bearing. This same factor also has an effect on the female white versus nonwhite comparisons.

A major new contribution of this study is the calculation of social rates of return for schooling based on 1959 data. The data and the method of analysis are presented in two major parts: the first part deals with a sample of the United States population, while the second is concerned with a sample of people living in open country residences in several low income counties from different areas of the Southern part of the United States:

(1) The data for the United States comes from the one-in-one-thousand sample of the 1960 Census of Population. The data were grouped on the basis of several characteristics, including race, sex, and place of residence. For a particular group, age-earnings profiles were calculated for different levels of schooling attainment. These profiles can also be used to calculate lifetime earnings, either discounted or undiscounted. The heart of the empirical analysis focused on estimating rates of return to investment in schooling. The rate is calculated from earnings together with costs. Considering only costs to the individual,

private rates of return were estimated. When schooling resource costs were added to private schooling costs, an estimate of the social rates of return to schooling resulted.

(2) The second part of the study utilized data from the Southern regional S-44 project. In this part, the age-earnings differentials were estimated using a multiple regression model incorporating zero-one variables for those attributes that could not be included as continuous variables.

Examining private rates of return (from Census data) for white males, white females and nonwhite males in the United States for college completion, high school completion and elementary school completion, it is apparent that rates are lower for the higher levels of schooling. Based on usual economic criteria for evaluating investments, the average individual in each of the three race-sex groups would find schooling worthwhile except for nonwhite males who completed college (4.2 percent). When United States white males are compared on the basis of urban or rural residence, the rate is the same for college graduates, higher for rural male high school graduates, but lower for rural male elementary school graduates. It is also useful to compare rural nonfarm residents with rural farm residents. Graduates from high school and from elementary school with a rural nonfarm residence have a higher rate than graduates from farm residences. However, in the case of college graduates, those from farm residences have a higher rate (14.1 percent compared with 11.8 percent).

In all instances the social rate estimate will be lower than the corresponding private rate estimate. Comparing United States white males, white females and nonwhite males, the rate of return is too low

to justify investment by society with limited capital in college graduates who are white females or nonwhite males.

The social rate of return to rural white male high school graduates is higher than for corresponding urban persons; for the same group comparison, rural elementary school graduates have a slightly higher rate. Within the rural residence category for white males, farm college graduates have a higher rate of return, but the rates of return for nonfarm high school and elementary school graduates are higher.

The last part of Chapter VI examined the effects on the unadjusted rate of several factors (secular growth in incomes, mortality, total taxes, and ability). To summarize the effects, when all adjustments are considered, the private and social rates of return for elementary schooling and college are only slightly affected, but the adjusted private and social rates for high school are both significantly lower.

The results from the analysis of the sample of low income household heads indicate that being nonwhite, or a farm manager or operator, or having a "bad" attitude can substantially lower the annual earnings of the household head. The rates of return calculated for the white household heads followed the pattern observed for the Census data. They are highest for elementary school graduates and lowest for college graduates. In the case of the latter the estimated private and social rates are very small. Rates for farmers and nonfarmers were only calculated for high school and elementary school graduates. Both private and social rates are economically favorable for elementary school graduates for both occupations. For high school graduates, the nonfarmers have favorable private and social rates of return; the farmers, however, had very small rates of return.

Conclusions

Implications

This study has a two-fold emphasis in that both private and social returns to schooling are estimated. Private returns estimates provide the individual with some knowledge as to what an extra amount of schooling will mean to him both in terms of the extra costs that he can expect to incur and the extra earnings that he can expect to realize from continuing on in school. Either explicitly or implicitly, many individuals facing this type of decision probably do attempt to measure these dollar amounts.

The social rates of return estimates have increasing relevance to government policy makers and decision makers as more and more emphasis is placed on allocating public funds to uses where they will have the highest social return. The internal rate of return provides a quantitative criterion which allows an evaluation of alternative investments. If the government policy makers are considering additional public funds for general education, the social rates of return calculated here will provide them with a quantitative measure of the differences in rate of return that they might expect according to the level of schooling for which they make the investment and according to groups divided on the basis of race, sex, place of residence, and income.

The general implication might be made that if society has decided to invest funds in general education (as opposed to other kinds of education such as on-the-job training or vocational-technical education) then the funds would have a higher rate of return being used to fund primary education. High school education would be next in priority in terms of the size of the rate of return. This general implication

applies to primary and secondary education for all race-sex groups considered and for all place of residence groups except for the low income farmers who had extremely low estimates of private and social rates of return to high school completion. One possible explanation of this exception is that these farmers are subject to a resource or capital constraint which is far more critical a factor with regard to annual earnings than whether or not the farmer has four years of high school education.

In terms of the estimates of rates of return to college schooling, the private rates are high enough to encourage most groups to consider college, especially if they include intangible benefits -- such as the consumption good aspects of college -- without adding to the cost; however, this is not true for United States nonwhite males or for the low income white males as a group. For society, college schooling would have the lowest priority *ceteris paribus*.

Although this section of the conclusions has been presented in terms of a rate-of-return criterion, the additional information presented might be used to supplement this. For example, the age-earnings profiles of an urban resident are greater than those for a rural resident. Likewise it was pointed out that in the case of the low income sample, families required at least 9-11 years of schooling to rise above an approximately defined poverty level of \$3,000 per year of total family income. If the objective is to provide at least a threshold minimum income level, the above types of data can be of use in setting public education goals.

Limitations

One of the limitations of this study is that not all the benefits or all the costs have been considered. The reason for this is that these are of an intangible nature and therefore extremely difficult to give a dollar value.

The use of 1960 cross-sectional data also needs to be explained. The estimates will be inaccurate to the extent that the cost and earnings relationships have changed since that year. It is a common problem, since a workable dynamic model is still somewhat of a rarity and static models must be relied upon (note, however, that an adjustment was made for growth in earnings over time in Chapter VI).

Obviously, with society having a constraint on investment funds, general education is one of many alternative uses of these funds. There are other types of education that could be funded by society and there are also other public goods and services. One of the problems is that it is difficult to use the estimates made here and the estimates made by some other researcher for, say, the rate of return to a specific national health service plan. In order to make a more valid choice in such a case, additional analysis would be needed. Analysis would involve, first, examination of the assumptions made and data used. Second, estimation of the effect of changing the assumptions and/or data for one investment, so that it would be more directly comparable with the other investment, would be necessary.

The estimates in this study are relevant for decisions to use limited funds efficiently. But equity considerations in many instances may be more important than efficiency. Nonwhite males tend to earn lower returns than white males on investment in schooling. But society

may deem that additional schooling funds should go to nonwhite males, based on equity considerations, to provide a socially acceptable income,

The limitation of the estimates because of data limitations has been explicitly recognized throughout, and therefore will not be discussed further here.

Need for Further Study

Further study would be useful with regard to low income areas in order to provide decision makers with greater knowledge in order to initiate programs to alleviate poverty.

The 1970 Census of Population will provide valuable information about any changes in the productivity of schooling that have taken place over time. It is possible that with investment by society at time period t , there will be a drop in the rate of return at time period $(t + 1)$.

Since there are many different means that might be used to achieve certain ends that society holds with respect to human capital, there could be a continuing need for further study of the efficiency, equity, and investment characteristics of these alternatives.

In conjunction with the above paragraph, it would appear that more work would be beneficial in the area of developing measures for evaluating the effect of alternative uses of funds in a very wide range of uses (e.g. transportation systems, public housing, employment services, provision of moving expenses to workers who have become redundant at a certain location, and the different levels of general education).

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APPENDIX A

APPENDIX A

THE DERIVATION OF SEPARATE ELEMENTARY AND
SECONDARY SCHOOL EXPENDITURES

Current expenditures per student in ADA are available on a state basis for elementary and secondary schools combined. But elementary and secondary school expenditures are required separately for the calculation of rates of return to schooling. The available data that may be used to obtain these separate costs are (1) aggregate current expenditures for public elementary and secondary day schools combined (C), (2) public elementary day school students enrolled (E), and (3) public secondary day school students enrolled, (S). Enrollment figures were used because average daily attendance figures were not available for elementary and secondary schools separately.

In addition, a cost relationship is required to relate elementary and secondary school costs. The Cost of Education Index published annually in School Management indicates that in terms of educational resources used, one secondary school student is the equivalent of 1.3 elementary school students.

The part of aggregate expenditures allocated to elementary schools can then be expressed as:

$$C \cdot \frac{E}{E+S(1.3)}$$

The part allocated to secondary schools may be expressed in like manner as:

$$C \cdot \frac{S(1.3)}{E+S(1.3)}$$

When added together the result is aggregate expenditures, (C).

Elementary school expenditures per elementary student in ADA are given by:

$$A_E = \frac{C}{E} \cdot \frac{E}{E+S(1.3)} = \frac{C}{E+S(1.3)}$$

Secondary school expenditures per secondary school student in ADA are given by:

$$A_S = \frac{C}{S} \cdot \frac{S(1.3)}{E+S(1.3)} = \frac{C}{E+S(1.3)} \quad (1.3)$$

Therefore, once the value for elementary school has been obtained, the secondary school value can be obtained by multiplying the elementary value by the factor of 1.3.

Average current expenditures for elementary and secondary school students combined are given by:

$$A = \frac{C}{E+S}$$

The accompanying table shows how the expressions above were used to find two factors, A_E/A and A_S/A , which could be applied to combined expenditure figures to obtain elementary and secondary school costs separately. The factors are 0.93 and 1.21.

APPENDIX A, TABLE I

DERIVATION OF THE RELATIONSHIP BETWEEN CURRENT EXPENDITURES
PER STUDENT FOR ELEMENTARY AND SECONDARY SCHOOLS
SEPARATELY, AND COMBINED CURRENT EXPENDITURES
PER STUDENT, UNITED STATES, 1959-60

Total Current Expenditures for Public Elementary and Secondary Day Schools (C) (\$1,000)	12,184,447
Enrollment for Boys and Girls in Full-Time Public Elementary Day Schools (E) (1,000)	27,602
Enrollment for Boys and Girls in Full-Time Public Secondary Day Schools (S) (1,000)	8,485
Total Enrollment (E+S) (1,000)	36,087
Current Expenditures per Enrolled Elementary School Student	\$315.40
$(A_E = \frac{C}{E+S(1.3)})$	
Current Expenditures per Enrolled Secondary School Student	\$409.98
$(A_E = \frac{C}{E+S(1.3)} (1.3))$	
Current Expenditures per Enrolled Student	\$337.64
$(A = \frac{C}{E+S})$	
Ratio $\frac{A_E}{A}$.934
Ratio $\frac{A_S}{A}$	1.214

Source: U. S. Dept. of Health, Education, and Welfare, Office of Education, Statistics of State School Systems, 1959-60 (Washington, 1964). Current Expenditures from Table 30, p. 57. Enrollment from Table 17, p. 40.

APPENDIX B

APPENDIX B

CALCULATION OF A CHARGE FOR CAPITAL FOR THE USE OF
SCHOOL LANDS, BUILDINGS, AND EQUIPMENT

Calculation of the charge for capital was based on a three percent rate, based on data obtained by Rude and used by T. W. Schultz in his 1960 article, "Capital Formation by Education". Schultz was concerned with stocks and flows of human capital and attempted to evaluate the productivity of conventional capital in the process of embodying capital into humans by education. Therefore he was concerned with the implicit interest on capital as well as depreciation and obsolescence. The implicit interest was estimated to be 5.1 percent.

In this study, the charge for capital makes up part of the cost which has to be paid to generate an extra amount of human capital therefore only the cost of depreciation and obsolescence of school capital was considered.

Depreciation and obsolescence was set at three percent based on calculations by Robert Rude made in 1954.¹ Rude calculated that the distribution of physical assets for public elementary and secondary schools was as follows: land, 20 percent; buildings, 72 percent; equipment, 8 percent. Depreciation and obsolescence on land was assumed to be zero. It was set at 3 percent for buildings and 10 percent for equipment. The weighted rate of depreciation and obsolescence to be

¹Robert Rude, "Assets of Private Nonprofit Institutions in the United States, 1890-1948," Table II-2a cited by T. W. Schultz, "Capital Formation by Education," footnote to Table 3, p. 578.

applied to all school physical property is 2.96 percent which was rounded to 3 percent.

The table shows state current expenditures and value of property per student in ADA for the 1959-60 school year. Only 38 states (District of Columbia is included, Alaska and Hawaii are excluded) reported value of property figures, which ranged from a high of \$1,829 (New York) to a low of \$556 (Oklahoma).

The relationship between current expenditures and value of school property² was investigated by regressing value of school property against the former. The regression equation also allows value of property to be predicted for those states that did not report.

The resulting equation was the following:

$$\hat{Y} = -59.68 + 3.05X$$

\hat{Y} = predicted value of public school property per pupil in ADA
(in dollars)

X = current expenditures per pupil in ADA (in dollars)

The coefficient of determination (r^2) was 0.73 which is significant at the one percent level. This suggests a close positive relationship as might be expected, with the states having high current expenditures also having a high investment in school capital.

The charge for capital is calculated as three percent of the value of school property. It ranged from a high of \$55 per pupil to a low of \$17 per pupil. On a regional basis, column three of the table shows that the Southeast region is the only one with charges for capital on a

²The states were requested to report the original cost of school property plus the cost of all additions and alterations. However, if this cost was not available it could be reported on other bases such as replacement cost or insurance coverage.

state basis being in the low \$20 range. For the Northeast region, the charge for capital was generally in the \$30 range, except for Maine which recorded \$19.

Charge for capital as a percentage of current expenditures range from 6.3 to 10.9 percent among the states. There does not appear to be much difference among regions. Since the charge for capital is a relatively small sum in relation to current expenditures, it was decided to use the factor of 10 percent to calculate the charge for capital directly from current expenditures. This is higher than the unweighted average. However, the value of property figures were obtained on an original cost basis if such were available. An alternative way of reporting property value was value in terms of replacement cost. Replacement cost value is higher than original cost value due to inflation. Although it was not possible to determine the methods used for reporting by the individual states, if a majority of the states reported on an original cost basis it would cause the charge for capital to be a smaller percentage of current expenditures than if a replacement cost basis was used.

APPENDIX B, TABLE I

CURRENT EXPENDITURES, PROPERTY VALUE, AND CHARGE FOR CAPITAL
PER STUDENT IN ADA, 1959-60, BY STATES

	Current Exp. per Pupil in ADA	Property Value per Pupil in ADA	3 Percent of Property Value	3 Percent as Percent of Current Expenditures
	(Dollars)	(Dollars)	(Dollars)	(Percent)
<u>North Atlantic</u>				
1. Connecticut	436	1,151	34.5	7.9
2. Delaware	456	1,331 ^a	39.9	8.8
3. Maine	283	635	19.1	6.7
4. Maryland	393	1,107	33.2	8.4
5. Massachusetts	409	1,034	31.0	7.6
6. New Hampshire	347	1,101	33.0	9.5
7. New Jersey	488	1,017	30.5	6.3
8. New York	562	1,829	54.9	9.8
9. Pennsylvania	409	1,145	34.4	8.4
10. Rhode Island	413	1,129	33.9	8.2
11. Vermont	344	987	29.6	8.6
12. Dist. of Columbia	431	1,143	34.3	8.0
<u>Great Lakes and Plains</u>				
13. Illinois	438	1,496	44.9	10.3
14. Indiana	369	1,342	40.3	10.9
15. Iowa	368	1,116	33.5	9.1
16. Kansas	348	1,002 ^a	30.1	8.6
17. Michigan	415	1,276	38.3	9.2
18. Minnesota	425	1,405	42.2	9.9
19. Missouri	344	1,022	30.7	8.9
20. Nebraska	337	968 ^a	29.0	8.6
21. North Dakota	367	1,079	32.4	8.8
22. Ohio	365	1,085	32.6	8.9
23. South Dakota	347	999 ^a	30.0	8.6
24. Wisconsin	413	1,260 ^a	37.8	9.2
<u>Southeast</u>				
25. Alabama	241	795 ^a	23.9	9.9
26. Arkansas	225	594	17.8	7.9
27. Florida	318	737	22.1	6.9
28. Georgia	253	702	21.1	8.3
29. Kentucky	233	702	21.1	9.1
30. Louisiana	372	856	25.7	6.9
31. Mississippi	206	688 ^a	20.6	10.0
32. North Carolina	237	709	21.3	9.0
33. South Carolina	220	675	20.3	9.2
34. Tennessee	238	757	22.7	9.5
35. Virginia	274	936	28.1	10.2
36. West Virginia	258	651	19.5	7.6

APPENDIX B, TABLE I (Continued)

	Current Exp. per Pupil in ADA	Property Value per Pupil in ADA	3 Percent of Property Value	3 Percent as Percent of Current Expenditures
	(Dollars)	(Dollars)	(Dollars)	(Percent)
<u>West and Southwest</u>				
38. Arizona	404	1,172 ^a	35.2	8.7
39. California	424	1,233 ^a	37.0	8.7
40. Colorado	396	1,192	35.8	9.0
41. Idaho	290	877	26.3	9.1
42. Montana	411	1,448	43.4	10.6
43. Nevada	430	1,205	36.2	8.4
44. New Mexico	363	857	25.7	7.1
45. Oklahoma	311	556	16.7	5.4
46. Oregon	448	1,325	39.8	8.9
47. Texas	332	1,072 ^a	32.2	9.7
48. Utah	322	1,028	30.8	9.6
49. Washington	420	1,381	41.4	9.9
50. Wyoming	450	1,313 ^a	39.4	8.8

^aEstimated with the regression equation.

APPENDIX C

APPENDIX C, TABLE I

INCREMENTAL PRIVATE SCHOOLING COSTS DISCOUNTED TO BEGINNING YEAR
OF EXTRA SCHOOLING, WHITE FEMALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Dollars)						
1-4	0 ^a						
5-7	0 ^a	0 ^a					
8	111	131	330				
9-11	269	402	710	424			
12	587	901	1,198	921	842		
13-15	926	1,604	1,667	1,550	1,785	2,416	
16	1,144	2,234	2,154	2,188	2,686	4,295	2,788

^aCosts are assumed to be zero below age 14.

APPENDIX C, TABLE II

EARNINGS DIFFERENTIALS DISCOUNTED TO BEGINNING YEAR OF EXTRA
SCHOOLING, WHITE FEMALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Dollars)						
1-4	a						
5-7	a	254					
8	2,821	945	997				
9-11	4,238	2,717	3,165	2,432			
12	6,579	5,601	6,522	6,153	4,464		
13-15	7,987	7,600	8,502	8,485	7,320	4,566	
16	10,520	8,957	9,859	10,096	9,315	7,672	4,167

^aEstimate not calculated.

APPENDIX C, TABLE III

PRIVATE BENEFIT-COST RATIOS OF EDUCATION, WHITE FEMALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
1-4	∞^a						
5-7	∞^a	∞^a					
8	15.38	7.22	3.02				
9-11	15.77	6.76	4.46	5.74			
12	11.21	6.22	5.44	6.68	5.30		
13-15	86.21	4.74	5.10	5.47	4.10	1.89	
16	9.19	4.01	4.58	4.61	3.47	1.79	1.50

^aRatio is infinitely large because costs are assumed to be zero below age 14.

APPENDIX C, TABLE IV

INCREMENTAL PRIVATE SCHOOLING COSTS DISCOUNTED TO BEGINNING YEAR OF
EXTRA SCHOOLING, NONWHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
(Dollars)							
1-4	0 ^a						
5-7	0 ^a	0 ^a					
8	168	270	590				
9-11	367	591	1,290	766			
12	729	1,175	2,543	1,944	1,717		
13-15	1,329	2,142	4,447	3,518	3,985	3,314	
16	2,353	3,627	6,618	5,657	7,111	7,695	4,486

^aCosts are assumed to be zero below age 14.

APPENDIX C, TABLE V

EARNINGS DIFFERENTIALS DISCOUNTED TO BEGINNING YEAR OF EXTRA
SCHOOLING, NONWHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Dollars)						
1-4	343						
5-7	4,457	4,878					
8	5,890	6,678	2,411				
9-11	7,827	9,068	5,576	3,535			
12	11,924	14,100	12,127	10,666	8,406		
13-15	10,737	12,938	11,495	9,391	7,473	283	
16	12,652	15,485	14,930	13,011	12,194	5,892	6,502

APPENDIX C, TABLE VI

PRIVATE BENEFIT-COST RATIOS OF EDUCATION, NONWHITE MALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
1-4	∞^a						
5-7	∞^a	∞^a					
8	35.06	24.65	4.09				
9-11	21.33	15.33	4.32	4.61			
12	16.35	11.99	4.77	5.49	4.89		
13-15	8.07	6.04	2.58	2.67	1.87	0.09	
16	5.38	4.27	2.26	2.30	1.71	0.77	1.45

^aRatio is infinitely large because costs are assumed to be zero below age 14.

APPENDIX C, TABLE VII

INCREMENTAL SOCIAL SCHOOLING COSTS DISCOUNTED TO BEGINNING YEAR OF
EXTRA SCHOOLING, WHITE FEMALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
(Dollars)							
1-4	a						
5-7	a	1,059					
8	2,570	1,799	1,056				
9-11	3,321	2,777	2,278	1,370			
12	4,168	3,905	3,515	2,709	1,788		
13-15	6,043	6,438	6,164	5,786	5,482	5,508	
16	7,628	8,696	8,590	8,604	8,832	10,137	5,878

^aEstimate not calculated.

APPENDIX C, TABLE VIII

SOCIAL BENEFIT-COST RATIOS OF EDUCATION, WHITE FEMALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
1-4	a						
5-7	a	0.24					
8	1.10	0.53	0.94				
9-11	1.28	0.98	1.39	1.78			
12	1.58	1.43	1.86	2.27	2.50		
13-15	1.32	1.18	1.38	1.47	1.34	0.83	
16	1.38	1.03	1.15	1.17	1.05	0.76	0.71

^aEstimate not calculated.

APPENDIX C, TABLE IX

INCREMENTAL SOCIAL SCHOOLING COSTS DISCOUNTED TO BEGINNING YEAR OF
EXTRA SCHOOLING, NONWHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
	(Dollars)						
1-4	1,150						
5-7	1,632	887					
8	2,230	1,664	1,199				
9-11	2,926	2,582	2,604	1,558			
12	3,730	3,693	3,876	3,441	2,510		
13-15	5,862	6,489	8,567	7,464	7,529	6,406	
16	8,257	9,603	12,678	11,782	13,101	13,538	7,577

APPENDIX C, TABLE X

SOCIAL BENEFIT-COST RATIOS OF EDUCATION, NONWHITE
MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling						
	0	1-4	5-7	8	9-11	12	13-15
1-4	0.12						
5-7	2.73	5.50					
8	2.64	4.00	2.01				
9-11	2.68	3.51	2.14	2.27			
12	3.20	3.82	3.13	3.10	3.35		
13-15	1.77	1.99	1.34	1.26	0.99	0.04	
16	1.53	1.61	1.18	1.10	0.93	0.44	0.96

APPENDIX C, TABLE XI

PRIVATE RATES OF RETURN TO EDUCATION, URBAN WHITE MALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4 ^a	5-7	8	9-11	12	13-15
	(Percent)					
5-7	∞ ^b					
8	155.9	25.2				
9-11	59.9	18.9	14.4			
12	39.0	17.1	14.3	14.2		
13-15	27.8	14.9	12.9	12.2	10.9	
16	23.7	14.9	13.4	13.2	12.8	14.7

^aThe zero years and 1-4 years of schooling classes were combined for place of residence estimates.

^bRate is infinitely large because costs are assumed to be zero below age 14.

APPENDIX C, TABLE XII

INCREMENTAL PRIVATE SCHOOLING COSTS DISCOUNTED TO THE BEGINNING YEAR
OF EXTRA SCHOOLING, URBAN WHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Dollars)					
5-7	0 ^a					
8	238	1,120				
9-11	521	2,148	2,134			
12	1,703	4,625	4,895	3,232		
13-15	3,443	7,577	8,677	7,749	5,674	
16	5,398	11,286	13,331	13,524	12,808	8,520

^aCosts are assumed to be zero below age 14.

APPENDIX C, TABLE XIII

EARNINGS DIFFERENCES DISCOUNTED TO BEGINNING YEAR OF EXTRA
SCHOOLING, URBAN WHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Dollars)					
5-7	10,981					
8	16,075	7,252				
9-11	20,176	13,400	7,550			
12	25,118	20,324	15,644	9,225		
13-15	30,706	28,133	24,884	19,875	12,565	
16	40,048	41,168	40,017	37,424	32,928	23,384

APPENDIX C, TABLE XIV

PRIVATE BENEFIT-COST RATIOS OF EDUCATION, URBAN
WHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
5-7	∞^a					
8	67.50	6.47				
9-11	38.71	5.47	3.54			
12	14.75	4.39	3.20	2.85		
13-15	8.92	3.71	2.87	2.56	2.21	
16	7.42	3.65	3.00	2.77	2.57	2.74

^a Ratio is infinitely large because costs are assumed to be zero below age 14.

APPENDIX C, TABLE XV

PRIVATE RATES OF RETURN TO EDUCATION, RURAL WHITE MALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Percent)					
5-7	∞^a					
8	76.7	15.7				
9-11	54.7	21.6	29.5			
12	43.9	20.2	23.3	16.8		
13-15	33.6	17.1	17.6	13.3	11.3	
16	28.9	16.4	16.6	13.7	12.8	14.4

^aRate is infinitely large because costs are assumed to be zero below age 14.

APPENDIX C, TABLE XVI

INCREMENTAL PRIVATE SCHOOLING COSTS DISCOUNTED TO BEGINNING YEAR OF
EXTRA SCHOOLING, RURAL WHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Dollars)					
5-7	0 ^a					
8	348	1,021				
9-11	749	2,234	1,278			
12	1,349	3,668	3,065	2,471		
13-15	2,125	5,773	2,197	6,032	4,820	
16	3,142	8,446	8,844	10,655	10,929	6,866

^aCosts are assumed to be zero below age 14.

APPENDIX C, TABLE XVII

EARNINGS DIFFERENCES DISCOUNTED TO BEGINNING YEAR OF EXTRA
SCHOOLING, RURAL WHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Dollars)					
5-7	12,711					
8	15,988	4,725				
9-11	22,800	14,025	10,380			
12	27,518	20,858	17,993	9,033		
13-15	31,669	27,023	25,193	17,974	10,865	
16	38,427	36,944	36,704	31,748	27,255	18,418

APPENDIX C, TABLE XVIII

PRIVATE BENEFIT-COST RATIOS OF EDUCATION, RURAL WHITE MALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
5-7	∞^a					
8	46.65	4.63				
9-11	30.5	6.28	8.12			
12	20.40	5.63	5.87	3.66		
13-15	14.9	4.68	9.97	2.98	2.25	
16	12.23	4.37	4.15	2.98	2.49	2.68

^aRatio is infinitely large because costs are assumed to be zero below age 14.

APPENDIX C, TABLE XIX

SOCIAL RATES OF RETURN TO EDUCATION, URBAN WHITE MALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Percent)					
5-7	23.6					
8	21.2	16.7				
9-11	18.1	13.5	11.1			
12	16.5	12.7	11.2	11.4		
13-15	14.0	11.0	9.8	9.2	8.0	
16	13.4	11.1	10.3	10.1	9.7	11.4

APPENDIX C, TABLE XX

INCREMENTAL SOCIAL SCHOOLING COSTS DISCOUNTED TO THE BEGINNING YEAR
OF EXTRA SCHOOLING, URBAN WHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Dollars)					
5-7	1,573					
8	2,471	1,953				
9-11	3,518	4,245	3,218			
12	5,379	7,280	6,943	4,316		
13-15	8,845	12,411	13,173	11,583	8,765	
16	12,337	18,059	20,006	19,807	18,650	11,611

APPENDIX C, TABLE XXI

SOCIAL BENEFIT-COST RATIOS OF EDUCATION, URBAN WHITE MALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
5-7	6.98					
8	6.51	3.71				
9-11	5.74	3.16	2.35			
12	4.67	2.79	2.25	2.14		
13-15	3.47	2.27	1.89	1.72	1.43	
16	3.25	3.25	2.00	1.89	1.77	2.01

APPENDIX C, TABLE XXII

SOCIAL RATES OF RETURN TO EDUCATION, RURAL WHITE MALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Percent)					
5-7	29.8					
8	23.7	12.5				
9-11	23.2	16.7	21.8			
12	21.8	15.8	17.9	13.8		
13-15	17.8	12.7	12.8	9.9	7.9	
16	16.2	12.1	12.1	10.1	9.2	10.6

APPENDIX C, TABLE XXIII

INCREMENTAL SOCIAL SCHOOLING COSTS, DISCOUNTED TO BEGINNING YEAR
OF EXTRA SCHOOLING, RURAL WHITE MALES, UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
	(Dollars)					
5-7	1,026					
8	1,798	1,564				
9-11	2,702	3,404	1,984			
12	3,630	5,398	4,399	3,177		
13-15	6,247	9,682	9,259	9,488	7,911	
16	8,800	14,294	14,805	16,627	16,771	9,957

APPENDIX C, TABLE XXIV

SOCIAL BENEFIT-COST RATIOS OF EDUCATION, RURAL WHITE MALES,
UNITED STATES, 1959

Years of Schooling	Years of Schooling					
	0-4	5-7	8	9-11	12	13-15
5-7	12.39					
8	8.87	3.02				
9-11	8.44	4.12	5.23			
12	7.58	3.83	4.09	2.84		
13-15	5.07	2.79	2.72	1.89	1.37	
16	4.37	2.58	2.48	1.91	1.63	1.85

VITA

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Candidate for the Degree of

Doctor of Philosophy

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