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W. Lee Hansen

UNIVERSITY OF WISCONSIN - MADISON

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W. Lee Hansen is Professor of Economics and Educational Policy Studies, University of Wisconsin, and Research Associate, Institute for Research on Poverty. The research reported here was supported by funds granted to the Institute for Research on Poverty at the University of Wisconsin by the Office of Economic Opportunity, pursuant to the provisions of the Economic Opportunity Act of 1964.

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ABSTRACT

The paper reviews the numerous studies for different countries which report rates of return to investment in different levels and amounts of schooling. An effort is made to assess their comparability, to determine whether any empirical generalizations can be derived, to explore the general nature of the policy conclusions drawn, and to suggest some of the directions that future work on rate-of-return patterns should take. A special effort, though not a very successful one, is made to relate various educational distribution data to the observed rate of return patterns.

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INTRODUCTION

A dominant theme in the American work on the economics of education is the rate-of-return approach to decisions about human resource allocation. This stands in marked contrast to much of the European work and to one stream of American work which reflects a planning approach. Not only do these two approaches differ, but they also indicate in their purest forms rather divergent ways of viewing the labor market and the education-training market. The purpose of this paper is not to fan the flames of controversy by arguing the superiority of one approach over the other--more likely they complement each other, as has been suggested by Blaug (1967). Instead, this paper reviews the now numerous rate-of-return studies, to determine whether any empirical generalizations can be derived from them, to explore the general nature of the policy conclusions which have been drawn from them, and to suggest the directions that future work in this area should take. In doing so, a special effort has been made to examine the existing educational distribution data--educational attainment, school enrollment patterns, and the like--to help explain the observed rate-of-return patterns. This effort, while only moderately successful, did produce a clearer idea of what other types of education distribution

data are needed and what other analyses are essential to interpreting the varying patterns in the rates of return to educational investment in different countries. Hence, this paper represents an initial foray into an uncharted area and thus is far from being a definitive piece of work.

THE RATE-OF-RETURN APPROACH

The rate-of-return approach, developed largely by Becker (1960, 1964) and Schultz (1961, 1967), characterizes much of the initial work on the economics of human investment in the U.S. during the late 1950's and early 1960's. In essence, this approach recognizes that human investments in education involve cost outlays--to the individual and to society--which are expected to produce a stream of benefits, largely in the form of higher earnings over the working life of those who acquire schooling. The internal rate of return summarizes in a convenient way the relationship between the costs which are concentrated over a short span of years and the benefits which accrue over a much longer and more distant time horizon. The mechanics of the calculations and the definitions of costs and benefits ordinarily employed, as well as important qualifications to rate-of-return studies, need not be reviewed here (Becker, 1964; Hansen, August 1963).

The usefulness of the rate-of-return approach to questions about human resource allocation has been stressed by Schultz (1967), Johnson (1964), and Solow (1963) among the others.[1] All of them emphasize the need for a broad concept of capital, one that embraces the major stocks of productive resources--physical and human alike. They also maintain

that only by knowing the relative returns to these differing inputs can effective decisions be made about the whole gamut of activities and programs involving education and training.

While a major concern of the U.S. has been that of achieving greater economic efficiency, in the narrower sense, that is, making the best use of existing resource inputs, many nations are concerned with finding efficient ways to greatly and quickly augment the quantity and quality of their human resource inputs. The need for a better educated and trained labor force has long been apparent. But in the 1950's this need was dramatized by the studies of Fabricant (1959) and Kendrick (1961) who discovered the "residual"--the large increment to economic growth left unexplained by conventional labor and physical capital inputs--and by Denison (1962) whose pathbreaking work attributed a good part of the residual to education and the production of new knowledge. As a consequence of these efforts, there appears to be a growing convergence of interest in rate-of-return analyses and contribution-to-growth studies in the less developed countries (Gounden, 1965, 1967; Williamson, 1967, 1969). Contribution-to-growth studies indicate the role of education in accounting for past economic growth and are also suggestive of the effects on future economic growth. Rate-of-return studies complement growth studies through their focus on the various levels of schooling. Thus, they show more precisely the relationship between the benefits and costs of different types and levels of schooling, in the recent past and presumably in the near future as well.

As yet we know little about the relationship, if any, between the rates of return to the various levels of schooling and other characteristics of the economy and society--its level and rate of development, the level and distribution of educational attainment, the current flow of graduates from the educational system, and the like. Carnoy (1967) has speculated on some of these relationships, and Harbison and Myers (1964) have attempted some analyses along these lines, though without reference to rates of return to schooling.

A comparative examination of the available rate-of-return studies now seems appropriate in order to determine what broader generalizations, if any, can be drawn from them.[2] Part II describes the studies which are available, their temporal and geographic coverage, statistical base, and representativeness, and then reviews some of the major methodological problems encountered in comparing these studies. Part III compares the empirical results, and Part IV indicates what conclusions can be reached and what the priorities should be for future research on this topic.

II

SAMPLE OF STUDIES

During the past few years I have accumulated approximately twenty rate-of-return studies. While not systematic, the effort to collect these studies has been at least partly deliberate, with an eye to preparing a paper of this sort; undoubtedly, there are other studies which have not come to my attention. While a few of these studies are for the U.S. and for other developed countries, the bulk of them are for less-developed

countries actively seeking to speed their rate of economic growth. Included are the following countries: Kenya, Northern Rhodesia, Uganda, India (several studies), Philippines, Israel, Great Britain, Greece, Chile (several studies), Columbia (several studies), Mexico (several studies), United States (several studies), and Canada. Appendix Table A presents a full listing of these studies, indicating author, country, year, and scope of the study, as well as the data base. Most of the studies are for the late 1950's and early 1960's, although at least one extends back to the 1940's.

The extent to which these studies are comparable is not fully clear. For one thing, the coverage of political units varies considerably; though the analyses often are made at the national level, they are confined in some cases to particular geographic areas within a country. Moreover, they frequently apply to specific sectors of the economy rather than the economy as a whole, whatever the geographical coverage. The reported levels of schooling usually differ somewhat because the structure of each country's educational system varies. In addition, rates of return are not always available for certain levels of education, in particular, for literacy versus non-literacy among the non-formally educated, and for different types and amounts of post-secondary education. To further complicate matters the data base for the studies is rarely the same; some rely upon census-type data while others employ special survey data whose quality no doubt varies. Some studies are based upon income and others upon earnings. Finally, the methodology for deriving the costs and return streams differs in detail even though the same general approach is usually followed.

Assessing the effects of these many differences on the comparability of the rates of return is a major task, requiring a careful evaluation of each study and ultimately a recasting of them on a comparable basis. Since such an effort would, even if undertaken, still leave a good deal of uncertainty, we shall for the purposes of this paper assume that approximate comparability exists.

COMPARABILITY

A number of more substantive problems, aside from those just mentioned, arise in comparing the results of the various studies. These problems can be grouped into four major categories: (1) use of present value versus rate-of-return approach; (2) use of shortcut methods to estimate benefit streams; (3) use of unadjusted data versus data adjusted for other non-school-related characteristics associated with earnings differences; and (4) use of an economic growth factor in adjusting the cross-section age-earnings profiles. Each of these problems will be considered briefly. The three right-hand columns in Appendix Table B attempt to summarize for each study how these problems were handled.

Present Value versus Rate of Return

We shall use the rate-of-return criterion because most studies employ this rather than the present value net of cost. Moreover, the results are rarely reported in enough detail to permit the calculation of present figures. It is often possible, however, to infer the general magnitudes of the rates of return from present value figures, especially when the results are presented using several different discount rates.

A larger issue only touched upon here involves the underlying theoretical and empirical merits of the internal rate of return as compared to the present value. Alchian (1955), Hirschleifer (1958), and Bailey (1959), among others, have argued for the superiority of present value over rate of return, so as to avoid multiple rates of return caused by the sometimes irregular behavior of the age-education-earnings profiles. But in a recent note, Jean (1969) demonstrates that some of the examples typically used to cast doubt upon the rate-of-return approach represent rather special cases; he also shows which types of age-cost-return streams yield indeterminate solutions. In most rate-of-return studies, the age-cost-return streams are not of the type that produce multiple solutions. In any case, however, the available data force us to concentrate on the rate of return.

Use of Shortcut Methods

An early problem in calculating rates of return arose because of the absence of age-earnings[3] profiles by levels of schooling. Although this problem diminished as more data became available, some of the early studies are flawed because the short-cut methods of constructing age-earnings profiles led to over- or understatements of the rates of return.

One shortcut method assumes that average differences in earnings by level of schooling adequately reflect the actual pattern of differences by age level. By ignoring the fact that earnings differences tend to grow with age--after the investment period these differences become increasingly large with age--the effect is to increase the weight of benefits relative to costs and thereby to inflate the rate of return. The resulting

overstatement of the rate of return will vary depending upon the extent to which earnings differences do increase with age. For example, Baldwin's (1966) study of Northern Rhodesia uses this shortcut approach, although he builds in an offset to the overstatement that would otherwise occur. A somewhat similar approach is followed by Shoup (1959) for Venezuela where he assumes constant differentials or, in some cases, builds in rather arbitrary increases in earnings with age.

The other method involves constructing synthetic age-earnings profiles, based on a variety of assumptions but relying heavily upon some observed age-earnings patterns for another region or country. Although this method could produce an over- or understatement in the rates of return, the one case which has been examined--Harberger's (1965) study for India--produced an understatement (Hansen, August 1963). Using his same assumptions on U.S. data for 1949, I found that, for four years of college, the synthetic data produced rates of return that ranged from one to almost two percentage points below the actual rates of return, and, for four years of high school, the synthetic data produced rates of return between three and one-half and four and one-half percentage points below the actual rate of return. Thus, Harberger's rates of return could be understated by 8-17 percent for college and by 30-40 percent for high school. Offsetting this to some degree are the mortality effects which Harberger ignored but whose effects are less substantial. Kothari's (1966) study which follows Harberger's methodology undoubtedly contains similar biases.

While the magnitude of error is likely to be smaller using synthetic profiles rather than flat profiles, i.e., those based on average differences in earnings of people with different educational attainments, we are in

the somewhat more difficult position of not being certain whether the resulting rates of return are too high or too low. In any case, however, the greater plentitude of data has steadily reduced the need for constructing synthetic age-earnings profiles by level of schooling.

Other Adjustments

Initially, investigators had to work with whatever data were available. In the case of national or regional data, other important factors which might affect earnings differently by level of schooling could not be statistically controlled, such as family background, place of residence, etc. One way of obtaining what might be called "cleaner" estimates of the impact of schooling is to limit the sample to relatively homogeneous groups, though the cost is usually a great amount of information loss. The alternative is to use regression analysis to derive age-education earnings profiles which "hold constant" the effects of other often important independent variables. Carnoy (1964, 1967) experimented with several different sets of data; one was unadjusted, another was adjusted for father's occupation, industry, city of occupation, and attendance. The latter reduced the differentials in earnings attributable to schooling, since some of these other variables were correlated with schooling. Hanoch (1965, 1967), who carried out an even more elaborate adjustment using the abundant data from the 1960 U.S. Census 1/1,000 sample, found a similar reduction in the earnings differential attributable to schooling. Data limitations ordinarily prevent adjustments such as these, not to mention other desirable adjustments for differential ability and numerous other variables affecting incomes. Indeed, the adjustments for ability have usually been quite

arbitrary, assuming that anywhere from zero to half of the observed earnings differences are due to ability and school-related factors rather than to schooling as such (Denison, 1962; Gounden, 1965, 1967). Finally, and surprisingly, many investigators have made no allowance for expected mortality, differential unemployment rates, or labor-force participation patterns among groups with different amounts of schooling.

Economic Growth

While it is generally recognized that expected earnings will, because of economic growth, be greater than those indicated by cross-section, age-earnings profiles, relatively few studies have made such adjustments. It is difficult to know what the reason is, except that of convenience; however, Hollister (1970) recently suggested that cyclical fluctuations in economic activity alter age-earnings profiles differently for people with different levels of school attainment. A simple "rule-of-thumb" correction calls for adding the assumed rate of per-worker economic growth to the rate of return calculated from cross-section data. We shall have to be content with such crude corrections until the needed longitudinal data on education age-earnings profiles become available.

III

THE NATURE OF INTERNAL RATES OF RETURN

In attempting to squeeze some meaning out of internal rates of return, it is important to remember that they capture at a moment of time the outcome of a whole series of past events and also reflect in part future

events. We can think of these rates as reflecting the interaction between the supplies of and demands for different types of educated labor. The potential supply of labor was produced--and some is currently being produced--over several previous decades. The amounts produced as well as the facilities available to produce them reflect, in considerable part, the past "market" for educated manpower. Similarly, the configuration of potential demand for educated manpower has built into it past decisions about the educational intensity of production, reflecting the relative scarcity of available productive inputs, as well as those underlying factors that generate the final demand for output produced with educated manpower.

The supply and demand conditions also indicate in part future expectations. Even if present demand and supply appear to be in "balance," the prospects of sharp increases in either supply or demand in the near future are going to affect earnings levels and hence measured rates of return. Similarly, sharp expected increases in supply or demand can have effects on the costs of education and, hence, affect the rates of return independently of what might happen to future earnings levels.

Complicating all this is the fact that governmental policies may affect both the returns and the costs, and these policies may shift over time so that the prospects of disentangling the play of market forces from policy effects is difficult. In addition, other "imperfections" in the market will obviously have a bearing on the determinants of the rate of return through their effect on supply and demand.

The bare outlining of the factors which are "important" is of little help in interpreting rates of return. What it does suggest is the difficulty of the task. Until there is more research on the nature of

the educational labor market, including its dynamics, we are not in a strong position to say much about the underlying determinants of internal rates of return or of changes in them.

USES OF INTERNAL RATES OF RETURN

Customarily, and notwithstanding our lack of knowledge, internal rates of return have been used to assess the payoff to educational investment--to the individual as well as to society--relative to the payoff yielded by other forms of investment. The objective has been to say whether added investment in education should or should not be made. Much less attention has been given to the fact that rates of return usually differ by levels of schooling and that the patterns of the rates have a bearing on the answer to questions regarding the profitability of schooling investments. Hence, the purpose here is to focus on the patterns of the rates of return, while giving little if any explicit attention to relative profitability.

PATTERNS OF RATES OF RETURN

That any systematic patterns occur in the "incremental" rates of return across countries is not fully obvious from an inspection of the results of various countries; by "incremental" (sometimes referred to as "marginal") we refer to rates of return on each successive increment of schooling rather than on large blocks of schooling, e.g., from school entry through high school. It may be helpful, therefore, to set out several general types of patterns and then classify countries according to the type they

fit most closely. The following five types of patterns appear capable of capturing most of the variations observed:

Type	Characteristic Pattern by Level of Educational Attainment
I	Constant rates of return across all levels of educational attainment
II	Declining rates of return as level of educational attainment increases
III	Rising rates of return as level of educational attainment increases
IV	Declining and then rising rates of return
V	Rising and then declining rates of return

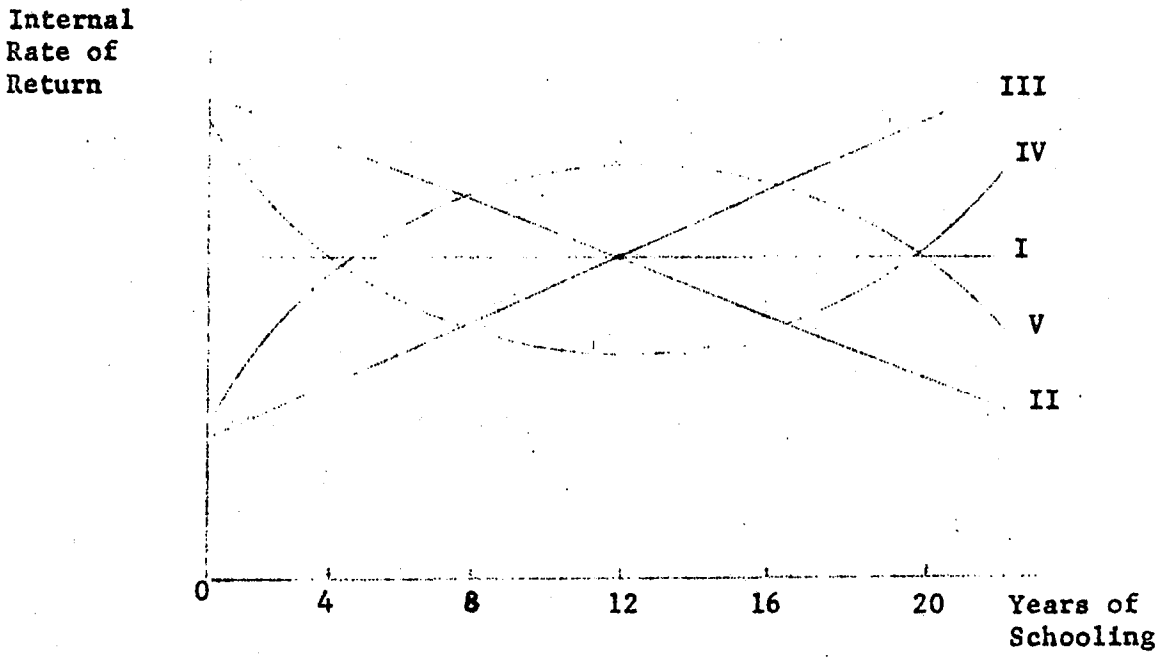
These patterns are shown in Figure 1.

While greatly oversimplified, these patterns are of interest for their policy implications. Of course, what one concludes about the rates will depend on whether they refer to private or social rates of return.[4] Let us for purposes of discussion focus on the social rates of return. The first pattern (I) suggests a policy of indifference as to which level should be expanded or alternatively argues for an across the board change; the second (II) indicates need for a greater concentration at the early years of schooling; the third (III) suggests a concentration at the later years; and the fourth (IV) a concentration at both the early and later years; and the fifth (V) a concentration at the intermediate years. Actually, the policy implications of patterns III, IV, and V are more subtle than just indicated. Given the education is a sequential process, requiring the completion of lower levels of schooling prior to the higher levels, maximization of the rate of return to educational investment must take account not only of the incremental rates of return but also the rates

Figure 1

Illustrative Patterns of Rates of Return

to Educational Investment



of return over larger increments of education. To achieve a high rate of return at say the completion of high school, a steady flow of students through the lower and intermediate grades is essential even though the rates of return at these levels may be much lower. Too often, however, education is viewed as a series of discrete steps, without recognition that the higher level of attainment requires completion of a whole series of steps. This argues for a focus on both incremental and average rates of return.

Utilization of the typology set forth above produces the classification shown in Table 1, which is abstracted in turn from the results presented in Appendix Table B. This classification is based on "social" rates of return, i.e., on total resources invested; where social rates were not available it became necessary to use the private rates. The importance of the level of disaggregation on the classification scheme should be noted, the finer the breakdown by level of schooling, the greater is the possibility for undulating patterns. In some cases the rates for related levels of schooling (e.g., the first two years and the second two years of college) were averaged in determining the patterns. To assist in the classification, subtypes IVa and Va were established to take account of double reversals in the rate of return patterns.

It is striking to note that most of the results are of Type II and Type V, with their respective patterns of declining rates of return, and of rising and then declining rates of return. A smaller number of studies fall into Type IV, with only one country represented by Types I or III. Given the narrow range of schooling over which estimates are available for Breat Britain (II)--only the upper levels--and Greece (III)--only the

Table 1

Classification of Studies on Rates of Return to Educational Investment

Type	Designation of Study
I	Constant rates of return
II	Declining rates of return
	Kenya, 1966 (Rogers)
	Bombay, 1956-67 (Kothari)
	India, 1960-61 (Gounden)
	India, 1960 (Selowsky)
	India Cities, 1964 (Reynolds)
	Great Britain, 1964 (Blaug)
	Santiago, Chile, 1962 (Bruton)
	Bogota, Columbia, 1963-66 (Selowsky)
	United States, 1949 (Hansen)
	United States, 1959 (Hanoch)
III	Rising rates of return
	Greece, 1960 (Liebenstein, in Bowles)
	Greece, 1964 (Liebenstein, in Bowles)
IV	Declining and then rising rates of return
	N. Rhodesia, 1960 (Baldwin)
	Israel, 1957-58 (Klinov-Malul)
	Venezuela, 1957 (Shoup)
	Canada, 1961 (Podoluk)
IVa.	Declining, rising, and then declining rates of return
	Uganda, 1965 (Smyth and Bennett)
V	Rising and then declining rates of return
	Hyderabad, India, 1957 (Harberger)
	Imus, Cavite, Philippines, 1966 (Williamson and DeVoretz)
	Chile, 1958-59 (Harberger and Selowsky)
	Chile, 1964 (Selowsky)
	Bogota, Columbia, 1965 (Schultz)
	Columbia, 1961 (Camacho, in Carnoy)
Va.	Rising, declining and then rising rates of return
	Mexico, 1963 (Carnoy)
	Mexico, 1964 (Selowsky)

lower levels--it is difficult to be certain about the appropriateness of the classifications of these countries. And the estimate for Venezuela (IV), one of the earliest, is probably subject to considerable error, given the assumptions made in calculating the rates of return. This leaves us with types II, IV, and V. It is interesting to note that the Indian, Chilean, and Columbian studies fall into Types II and V. In view of the assumptions utilized in Harberger's Hyderabad study (V), we might want to attach somewhat less weight to it. It is more difficult, however, to explain away the dual classification of the Chilean and Columbian studies.

EXPLANATIONS OF RATES OF RETURN PATTERNS

The limited number of studies, their lack of comparability, and the approximate nature of the results preclude a systematic effort to explain the variety of patterns found and the placement of any country in a particular category. Nevertheless, we can offer some preliminary speculations. To help organize these speculations, let us advance several reasons why we would generally expect the rate-of-return patterns to be as they are.[5]

Influence of Cost-Return Relationships

The general tapering off of returns at the higher levels of schooling and the usually higher rates of return at the early levels of schooling suggest that literacy and all that goes with the completion of a few years of schooling pays off rather well, but that diminishing returns soon begin to set in. Why should this be the case? One important consideration is the cost structure. The total costs of education--in terms of both income

foregone and the direct costs of schooling---rise rather steadily from elementary school on up through college. Thus, on the basis of the overly simplified assumption that the returns to education rise by equal absolute amounts per year of schooling while costs rise by equal percentage amounts, the rates of return will in general fall with more schooling. Of course, these underlying cost differences cannot provide a full explanation, since there is considerable variability in both the cost and return patterns.

Influence of Salary-Setting Mechanisms

The fact that rates of return do not always taper off any more than they do may lie on the return side, particularly in developing countries. Because many highly educated people are in the employ of governments which ordinarily have rather rigidly prescribed salary schedules, schedules which are set by the educated portion of the population, the benefit stream may be abnormally high. Hence, this would hide the full extent of any decline. Offsetting this no doubt is the fact that government employment ordinarily brings with it a sizeable array of fringe benefits, most of which are not captured in money wage data. Moreover, the prestige that goes along with government employment may add further to any understatement of the "true" rate of return for the better-educated. Which of these forces is strongest, we simply do not know.

Supply and Demand Forces

The comments made thus far suggest that some constant, underlying forces are at work, and that these cut rather uniformly across countries and time. An alternative view is that the rate-of-return patterns reflect

in part at least the impact of unique supply and demand forces, so that, if we had several sets of comparably calculated rates of return for different years, we would expect to find changing patterns. Put another way, the cross section results may reflect disequilibrium conditions and so can be explained by reference to other events affecting supply, demand, or both. For example, changes in the rate of a country's growth may give rise to differential increases in the need for people by skill and amount of schooling. If growth accelerates, then the stock of highly educated workers, for example, may be insufficient, with the result that wage levels will be bid up. This will trigger a response, often a belated one, as additional people seek to obtain the types of education most needed; the result is to eventually push earnings and the rate of return back down again. Or to take the opposite case, once a school system is geared up to a larger production level, and given inadequate information on the relative supply-demand situation, a larger number of people may enroll and eventually graduate than can be hired at prevailing salaries; the result will be either declining relative salaries, unemployment, or possibly both. In general, then, an increased demand for better educated workers would tend to raise rates of return at the upper levels, and vice versa. This assumes that growth produces a rather education-specific pattern of demand for labor; such an assumption about the pattern of demand seems quite explicit in much of the work on educational planning in developing countries. Presumably, the validity of this assumption could be examined with the help of education-occupation and/or education industry matrixes. An increased supply of educated people will, on the other hand, depress rates of return. What all this adds up to is the conclusion that rate-of-return patterns,

given the way rates are usually calculated, are not unambiguous in the kind of information they provide.

IV

ASSOCIATION WITH EDUCATIONAL DISTRIBUTION DATA

Given the emphasis on educational distributions, it is appropriate to take the limited results we have and see how they "fit" with the distribution data. The data on educational distributions are of two types. One type represents "stocks" and the other "flows." Distributions of educational attainment of the population or work force fall into the stock category, whereas distributions of school enrollments and enrollment rates more closely represent "flows." We shall examine both of these types of data.

Any effort to relate educational distribution data to rate-of-return patterns is complicated by what we think rate-of-return patterns reflect. One view is that rate-of-return patterns reflect the outcome of past decisions, whereas another is that they provide a signal of what is likely to happen. Hence, we must quite carefully specify any expected relationships. If we adopt the former view, that the distributions strongly affect rate-of-return patterns, we would expect to find an inverse relationship between relative quantities (of educated people, students, etc.) and relative rates of return. On the other hand, the notion that the distributions reflect a response to current and expected conditions, signaled by rate-of-return patterns, would lead us to anticipate a positive association between relative quantities and relative rates of returns. We may find,

therefore, that the rate-of-return patterns are consistent with one or the other of these two views of the role of rates of return.

Let us begin by looking at the distribution of educational attainment. We shall initially assume that rates of return reflect events of the recent past. This suggests that on average we can expect to find relative quantities and relative rates of return inversely related. More specifically, we would expect to find (1) heavier concentrations of people with post secondary educational attainment in countries of Types II and V, (2) heavier concentrations of people with elementary attainment in countries of Types III and V, and (3) heavier concentrations of people with secondary attainment in Type IV countries. The data in Table 2 are not consistent with (1) but they are generally consistent with (2) and (3). Thus, the distribution and rate-of-return data at least partially support the notion that rates of return reflect recent investment outcomes, as reflected by the distribution of relative quantities of educated manpower.

It should be clear that stock variables, such as data on the distribution of the educational attainment of the population or work force, are probably not entirely appropriate. Recent flows may at the margin have had a significant effect on earnings patterns and thus have altered rate-of-return patterns. Hence, flow variables are likely to be especially useful in casting light on rate-of-return patterns. If we take the distribution of students in school to represent the flow variable, and if we think of these flows as having a dominant effect on rate-of-return patterns, then we would expect to observe the same patterns (1), (2), and (3) discussed above. But Table 3 reveals clearly that the evidence does not support our expectations. Indeed, secondary education is most heavily concentrated in Type II countries,

Table 2

Percentage Distribution of Employment by

Level of Educational Attainment

		Primary (1)	Secondary (2)	Post Secondary (3)
I.				
II.	Kenya	--	--	--
	India	97	2	1
	Great Britain	52	40	7
	Columbia	--	--	--
	U.S.	53	27	19
III.	Greece	89	8	3
IV.	N. Rhodesia	--	--	--
	Israel	55	32	13
	Venezuela	--	--	--
	Canada	35	56	9
IVa.	Uganda	92	7	1
V.	India	97	2	1
	Philippines	80	14	6
	Chile	93	4	2
	Columbia	--	--	--
Va.	Mexico	93	5	2

Source: Organization for Economic Cooperation and Development (1966).

Table 3

Percentage Distribution of School Enrollment

by Level of Schooling

		Primary (1)	Secondary (2)	Post Secondary (3)
I.				
II.	Kenya	97	3	0
	India	62	36	2
	Great Britain	43	55	2
	Columbia	87	11	3
	U.S.	69	23	8
III.	Greece	77	21	2
IV.	N. Rhodesia	99	1	0
	Israel	85	12	3
	Venezuela	86	10	4
	Canada	77	20	3
IVa.	Uganda	78	21	1
V.	India			
	Philippines	78	13	8
	Chile	81	16	2
	Columbia	87	11	3
Va.	Mexico	97	6	2

Source: UNESCO, Current School Enrollment Statistics.

and elementary schooling shows a slightly heavier concentration in Type IV countries. On the other hand, there is no evidence of patterns the reverse of (1), (2), and (3) which would indicate people, through their enrollment patterns, are responding to rate-of-return patterns. We must therefore conclude that the flow data do not perform as we might have expected. Part of the difficulty may arise because the distribution of school enrollments is an imperfect measure of the flow of students out of the school system and into the labor force. Nor do such data tell much about either the possible queuing of people who desire either to enter the educational system or to proceed through ever-higher levels of the system. Nor do they tell about the effect of unemployment in whetting or dampening the desire on the part of young people to secure more education.

A further possibility is to look at enrollment rates rather than the distribution of enrollments, so as to better reflect the size of the flow relative to the stock of educated workers. The enrollment data are presented in Table 4. Our expectations would be identical with those earlier--high enrollment rates and low rates of return if we expect the flows to have affected the current pattern of rates of return. The evidence in support of expectation (1) is not apparent, nor is it apparent in support of expectations (2) and (3) either.

V

CONCLUSION

This analysis has brought out the fact that the patterns of rates of return to educational investment for the most part either fall with more schooling or first rise and then fall. But we have been able to show

Table 4

Enrollment Rates by Level of Schooling

		Primary (1)	Secondary (2)	Post Secondary (3)
I.				
II.	Kenya	53	4	0.0
	India	32	22	1.4
	Great Britain	61	105	4.9
	Columbia	46	17	1.8
	U.S.	81	80	33.9
III.	Greece	62	44	3.5
IV.	N. Rhodesia	---	---	---
	Israel	78	49	10.2
	Venezuela	71	30	5.1
	Canada	90	61	9.0
IVa.	Uganda	32	6	0.2
V.	India	32	22	1.4
	Philippines	56	25	9.7
	Chile	69	35	3.5
	Columbia	46	17	1.8
Va.	Mexico	57	11	3.1

Source: Columns 1-2 (UNESCO, 1966, Table 4), and Column 3 based on data from UN, Demographic Yearbook; UNESCO, 1966.

at best a weak association between these patterns and the educational structure, either as reflected in educational attainment data or in enrollment patterns. Several factors account for these rather disappointing findings. First, the models that we possess to explain the observed distributions of most variables are extremely primitive; although we can fit functions of one kind or another to such distributions, we are unable to say much about the forces which generate them. Second, in the absence of any substantial analytical scheme, one can only search for empirical regularities, as has been tried here. But because the sample of rate-of-return studies is still so small, this search has necessarily been a crude and exploratory one.

In future work on this topic, several steps must be taken. The first is to augment the supply of rate-of-return studies, preferably by assembling additional studies which have already been completed but are not included here. The second and more difficult is to produce more and better data on educational distributions so as to fill the existing information gaps. We need additional data on both stocks and flows. In particular, we require data that reflect what is going on at the key junctures in the educational system (continuation rates by level of schooling), and what is happening at the point where the educational system and the labor market join together (unemployment rates by level of school attainment for new and recent entrants into the labor force). Finally, we need unemployment rates by level of school attainment for those people already in the labor force. The third and still more difficult task is to develop a comprehensive set of hypotheses that seek to explain differences in rate-of-return patterns so that these hypotheses can be subjected to empirical

testing. This requires going beyond using only educational distribution data. In addition, variables reflecting demand conditions must be introduced, so as to capture the critical supply and demand factors which are at work. As a result of such work it should be possible for us to gain a better understanding of the determinants of rate-of-return patterns and their link to the underlying quantities of educated manpower. In the meantime, we are left with an intriguing set of observations that begs for an explanation.

FOOTNOTES

[1]The criticisms of the rate-of-return approach are numerous, and no attempt is made here to cover that well-explored territory; for a good review of the entire discussion see Pandit (1969).

[2]No effort is made to examine "shadow rates of return" generated through linear programming models (Psasharopoulos, 1970).

[3]We shall use the term "age-earnings" even though some of the data are for "age-income" profiles.

[4]Social rates of return are defined here as reflecting all monetary benefits and all costs--the direct and opportunity costs to students plus the other costs of education paid for by society.

[5]Another intriguing question arises which cannot be discussed here: Is it possible that questions regarding patterns and levels are intertwined, i.e., the relative pattern of the rates of return is related to the level of the rates of return to schooling or to the level of the rates offered by alternative investment opportunities?

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APPENDIX TABLE A

Summary of Studies on Rates of Returns to Educational Investment

Author, Date, and Reference	Year of Study, Location; and Type of Worker	Type of Data	Methods Used in Construction of Benefit Streams	Controls and Adjustments and Adjustments for Economic Growth
AFRICA				
Baldwin, [3]	1960, Northern Rhodesia	Urban males	Average wage levels without regard to age	
Rogers, 1968 [38]	1966, Kenya; civil servants and teachers	Government pay scales for civil servants and teachers	No information	Assumed a standard income by educational level
Smyth and Bennett, 1966 [47]	1965, Uganda	Public salary scales grossed upward to account for higher salary scales in private sector	Age-earning curves are linear exponential curves derived by inspection from the Government scales	Adjustment for alternative entry to wage or farm employment
ASIA				
Gounden, 1965 [16,17]	1960-61, India, Urban males and engineers	NCAER survey of 5000 urban males, CSIR study of 4000 engineers	Age-income streams taken directly from average annual income tabulated by age and education level	Arbitrary adjustment of 50% to account for non-educational determinants of income
Harberger, 1963 [22]	1957, Hyderabad, India; male earners	Sample of 5885 earners distributed by earnings and schooling	Assumed age earning profiles with the following form: (1) peak in earnings reached at a later age for successive educational levels (2) peak earnings were a higher fraction of average earnings for successive educational levels	Adjusted for labor force participation

APPENDIX TABLE A (cont)

Summary of Studies on Rates of Returns to Educational Investment

Author, Date, and Reference	Year of Study, Location; and Type of Worker	Type of Data	Methods Used in Construction of Benefit Streams	Controls and Adjustments and Adjustments for Economic Growth
Kothari, 1966 [31]	1956-57, Bombay City, India	3% random survey of tenaments in Greater Bombay, earnings by education level. (not by age)	Estimated an age-earning profile with similar assumptions as Harberger plus assumption that earnings decreased after age 55	Correction for survival rates of cohorts by educational level would reduce Rate of Return by about 2%.
Reynolds, 1968 [37]	1964, Bombay, Jamshedpur, Madras, and Rowkela; urban males	Sample of 1800 production workers in steel and metal-working firms.	Age-education-earnings data taken directly from survey results.	
Selowsky, 1967 [45]	1960-61, India; urban males and engineers	Gounden's data	Gounden's age-income profiles (including costs)	Attributed 100% of the wage differential to education rather than one-half as did Gounden
Williamson and DeVoretz, 1967 [53]	1966, Imus, Cavite (Philippines); male heads of households	A Population Institute survey. The sample size was 1063 and gives average annual income by age and level of schooling.	Regressions made of income on the age variable for each education level to yield an age-earnings profile.	Attributed 50% of differential to education. Used mortality adjustment.
EUROPE AND MIDDLE EAST				
Blaug, 1967 [7,8]	1964 and 1967, Great Britain a.) male workers b.) professional, managerial and skilled workers	2 surveys: a.) 1964, random sample of 6500 male heads of households b.) 1967, sample of 2800 workers in British Auto industry and 4 large electrical engineering firms	1st survey: earning differentials by present age are calculated 2nd survey: age-earnings profiles are obtained from the data.	Assumed that 0.6 of observed differential associated with extra education is due to education for 1st survey. No adjustment for ability, social class, etc. used for 2nd survey.

APPENDIX TABLE A (Cont)

Summary of Studies on Rates of Returns to Educational Investment

Author, Date, and Reference	Year of Study, Location; and Type of Worker	Type of Data	Methods Used in Construction of Benefit Streams	Controls and Adjustments and Adjustments for Economic Growth
Klinov-Malul, 1966 [30]	1957-58, Israel, a.) Jewish urban workers -- heads of households b.) professionals	a.) survey of 3000 families - wage and salary income by education b.) sample survey of 4 professionals (1000)	Calculation of the net effect of education for the population of each continent-residence combination; sometimes utilizing standardiaation and least squares methods.	Results standardized for Continent of Origin and length of residence. Alternate calculations of individual returns at a 3% annual growth in GNP
Leibenstein, 1967 [32]	1960,1964, Athens, Greece; male workers and female workers.	Sample size of 2,700, plus salary information on public workers and professional organizations.	Age-earnings profiles are constructed. Taken directly from data.	Assumes alternative annual growth rates of 0, 4, and 5 percent.
LATIN AMERICA				
Bruton, 1967 [9]	1962, Greater Santiago, Chile; male members of labor force	Data on education, age, and wage income (2500 observations -- a number of which were excluded)	Earnings are regressed on education to yield a wage-education relationship. Age-earnings profiles are developed	
Comacho, 1964 [11]	1961, Columbia urban males	No information	No information	
Harberger and Selowsky, 1966 [23]	1958-59, Chile, male and female	Sample size is not specified.	Age-earnings profiles are not constructed, rather they assume that the differential between the earnings of the education groups is relatively constant as a function of age.	

APPENDIX TABLE A (cont)

Summary of Studies on Rates of Returns to Educational Investment

Author, Date, and Reference	Year of Study, Location; and Type of Worker	Type of Data	Methods Used in Construction of Benefit Streams	Controls and Adjustments and Adjustments for Economic Growth
Schultz, 1968 [41]	1965, Bogota, Columbia	Sample Size: 684 men, 314 women. Both hourly and weekly earnings by age and education.	Regression estimates of age-log earnings profiles by level.	Adjustment for migration to Bogota.
Shoup, 1959 [46]	1950's, Venezuela	Sample data	Based on assumed shapes of age-earnings profiles.	
Selowsky, 1967 [44]	1964, Chile, urban males	No information	Age-earning profile in "Encuesta Nivel di Vida" centro de Planificacio'n Económica, Universidad di Chile, 1964.	
Selowsky, 1968 [45]	1963-66, Bogota, Columbia; urban males and females	Hourly wage data by schooling and age taken from unemployment samples. 10,715 observations.	Age-earnings profiles from data.	Five versions calculated, with adjustments for L.F. participation rates, unemployment, changes over time. Version 5 -- adjustment for growth in L.F. and gross domestic product.
NORTH AMERICA				
Carnoy, 1964 [12,13]	1963, Mexico City, Puebla, and Monterey, Mexico; male wage earners in 8 occupational classes.	3901 observations, data on wage and salary, schooling in years, age, father's occupation, discipline of study, and industry.	Earnings are regressed on schooling, age, occupations, father's occupation, etc.; sample is then divided into schooling levels which permitted analysis within each category. From these results life time earnings streams are constructed.	Controlled for father's occupation plus other variables (industry, city)

APPENDIX TABLE A (cont)

Summary of Studies on Rates of Returns to Educational Investment

Author, Date, and Reference	Year of Study, Location; and Type of Worker	Type of Data	Methods Used in Construction of Benefit Streams	Controls and Adjustments and Adjustments for Economic Growth
Hanoch, 1967 [21]	1959 U.S. males, white and nonwhite for North and South	1960 Census data	Used mean age-education-income data, adjusted for variables correlated with age.	
Hansen, 1963 [18]	1949, U.S. males	1950 Census data	Used mean age-education-income figures.	Adjusted for mortality.
Podoluk, 1965 [35]	1961, Canadian males	1961 Census data	Used average age-education-earnings data.	
Selowsky, 1967 [44]	1963-64, Mexico	Used Carnoy's sample and a sample from the Direccion de Muestreo.	Adjustment for expected labor force participation, unemployment, and survival rate.	Adjusted for expected annual growth rate of wages of level of schooling.

APPENDIX TABLE B

Summary of Rate of Return Estimates

City, Country, & Year	Level of Schooling	Rate of Return Private	Rate of Return Social	Special Notes
AFRICA				
Kenya, 1966 [38] (Rogers)	4th form plus	58		Assumption of no unemployment; earnings includes housing subsidy; persons begin entering the work force at age 18 and retire at age 55; private direct costs for higher levels in Kenya is zero; costs include foregone earnings and the individual and the states direct costs.
	9 mos. govt training/4th form			
	6th form/4th form	negative		
	4th form plus 2 yrs primary teacher training/4th form	10.6		
	4th form plus 3 years secondary t.t/4th form plus primary t.t.	39.0		
	4th form plus secondary t.t./6th form	42.0		
	university/4th form plus secondary t.t.	19.0		
	university/6th form	26.0		
	university/4th form plus primary t.t.	24.5		
Northern Rhodesia, 1960 [3] (Baldwin)	Standard I/O		13	Assumes constant earnings differences; Costs include foregone income and school costs; discounts over 45 years, in recognition of upward bias imparted by assumption of constant earnings differences
	Standard II/I		11	
	Standard III/II		4	
	Standard IV/III		15	
	Standard V/IV		16	
	Standard VI/V		22	
	Estimates from present value results			
Uganda, 1965 [47] (Smyth and Bennett)	primary(7)/(0)		66	Earning flows for primary educated manpower are only estimates; cost data includes foregone earnings, capital repayment on education plant, recurring operating costs, interest foregone (and the cost of educating those who do not pass their examinations).
	CSC(11)/P(7)		22	
	HSC(13)/CSC(11)		78	
	University(16)/HSC(13)		12	

APPENDIX TABLE B (cont)

Summary of Rate of Return Estimates

City, Country, & Year	Level of Schooling	Rate of Return Private	Rate of Return Social	Special Notes
ASIA				
Imus, Cavite; Philippines, 1966 [53] (Williamson and DeVoretz)	Elementary (7)/illiterates High School/Elementary College/High School	9 29 12	8 21 11	Cost data is from 1965 extrapolated to 1966; it includes direct expenditures and earnings foregone for the private estimates plus government expenditures for social costs.
Bombay City, India, 956-7 [31] (Kothari)	high school (12)/middle (8) college (17)/(12) engineering (17)/(12) arts & science (17)/(12)	- 14 25	20 13 22 10	It was necessary to estimate the age structure of the earners and to isolate the influence of business and commercial owners under the assumption that education only marginally influenced their earnings.
Hyderabad, India, 1957 [22] (Harberger)	secondary (12)/primary (8) college & Univ (18)/S(12) secondary + coll/P(8)		11.9 16.9 15.0	Sample was heavily weighted with younger people so sample was reweighted; data referred to people with some primary, etc. so it was necessary to estimated ave. income of completers; assumptions made were likely to produce over estimates for rates of return; cost data: earnings foregone and assumed direct costs (conservative).
India, 1960 [44] (Selowsky)	(5)/(2) (8)/(5) (11)/(8) (15)/(11) (17)/(15)	23.5 17.7 16.4 11.6 14.7	21.2 19.9 18.9 16.2 16.0	
India, 1960-61 [16,17] (Gounden)	Literates/illiterates Primary(5)/Literate Middle(8)/P(5) Matriculates(12)/M(8) Bach. Degree(15/M(12) Engineering(17)/M(12) Engin.(17)/Bach.(15)	-30 23.0 13.0 10.0 8.1 13.5 20.3	15.9 17.0 11.8 10.3 7.0 9.8 9.7	It was not always possible to isolate earnings figures from income figures; those with primary education and below enter the labor force at age 12 and retire at age 60; assumes full employment; cost data includes direct expenditures; depreciation of physical assets, imputed

APPENDIX TABLE B (cont)

Summary of Rate of Return Estimates

City, Country, & Year	Level of Schooling	Rate of Return Private	Social	Special Notes
				value of interests, and foregone earnings; gross investment in education forms 8.5% of adjusted NY and 44.1% of gross physical capital formation.
India Cities, 1964 [37] (Reynolds)	Primary(5)/literate	21.0	14.5	Cost data based on updating of Gounden data from 1961; based on earnings data to age 60.
	Middle(8)/primary(5)	12.0	9.1	
	Matriculate(12)/Middle(8)	11.4	7.0	
	Two years college(24)/ Matriculate(12)	4.4	1.8	
EUROPE				
Great Britain, [6,8]	Terminal Education Age			
1964 (Blaug)	(15-18)	13	12.5	First survey: no distinction between types of schooling or between full & part-time schooling; breakdown by age is too large to allow standardization.
	(15-21)	14	8	
1967	Level of Qualification			
	Royal Society of Arts, and City and Guild Institute of London			Second survey: more detailed information on type and level of education; social rates of return are calculated from before-tax earnings with cost data as the total resource costs including income foregone; the private rates of return are calculated from after the earnings and reflect only private costs.
	Preliminary certificates	5(5)	5.5 (5.5)	
	General Certificate--ordinary level, RSA adv. and CGL intermediate certification	8(/5)	8.5 (15)	
	General Certificate--Adv. level, ordinary national certificate and ordinary nat'l diploma	8(1.5)	7(0)	Figures not in parentheses refer to comparison with school leaving age. Figures in parentheses refer to comparison with previous level.
	Higher National Certificate, CGL full technical certif.	9.5(15)	7.5(12)	

APPENDIX TABLE B (cont)

Summary of Rate of Return Estimates

City, Country, & Year	Level of Schooling	Rate of Return Private	Rate of Return Social	Special Notes
	University degree, Higher National Diploma	8.5(7)	6(5)	
	University degree (honnors), diploma in technology	9.5(10)	8(8)	
Greece [32] 1960	12/6 (male)		4.5(9)	The survey collected data on each worker's age, years of education--both technical and general, monthly earnings, and occupation.
	15/6 "		6 (10)	
	15/12 "		8 (12.5)	
	12/6 (female)		3 (7)	
1964 (Liebenstein)	12/6 (male)		3 (7)	Figures in parentheses assume a 4% rate of economic growth.
	15/6 "		5 (9.5)	
	15/12 "		8 (12.5)	
	12/6 (female)		5 (9.5)	
Israel, 1957-58 [30] (Klinov-Malul)	(Present Values, IL thousands; 8% discount rate)	(private)	(social)	(soc.-adj) for 3% GNP growth rate
	Primary	11.3	9.4	
	Secondary		-0.8	+5.6
	(discount rate 10%	(-4.0)	(-4.0)	
	Higher Education		6.1	2.7
	Engineers	1.3	5.3	16.4
	Lawyers	-1.0	-0.2	3.1
	CPA's	42.9	25.9	82.7
	Physicians	-24.9	.6	-13.6
				Income tax is used as a partial measure of returns to society; the income of younger professional workers is rising relative to older workers. This change in the structure of income by age is somewhat peculiar to Israel (due to immigration) and is reflected even more strongly in the present value of incomes; cost data includes expenditures by society (salaries and wages, books and materials, depreciation in buildings) and the private expenditures of individuals (income foregone, tuition and fees, and books and materials)

APPENDIX TABLE B (cont)

Summary of Rate of Return Estimates

City, Country, & Year	Level of Schooling	Rate of Return Private	Rate of Return Social	Special Notes
LATIN AMERICA				
Chile, 1958-59 [23] (Harberger and Selowsky)	Primary (ave. 5.5 yrs)/none		24.0	Cost data is from $ and # Yver, "The Cost of Education in Chile." (Universidad Catolica de Chile, 1959). (mimeographed).
	"Special" Secondary (ave. 8.5 yrs)		29.0	
	Secondary (ave. 11.5 yrs)		16.9	
	University		12.2	
Chile, 1964 [44] (Selowsky)	2/0	7.7	7.7	Used cost data of Yver
	4/2	19.1	13.4	
	6/4	24.8	17.2	
	8/6	12.4	16.0	
	12/10	22.9	15.3	
Santiago, Chile, 1962 [9] (Bruton)	Primary(6)/none	18	(16.5)	Income data is a by product of a survey on unemployment conducted by the Instituto de Economia, Universidad de Chile; cost data is from Raul E. Yver's study and includes direct current outlays in teacher salaries, books and supplies plus rental value of school building, grounds and equipment plus foregone earnings.
	Secondary(12)/primary	18	(18)	
	Univ(17)/secondary	14	(14)	
	(figures in parentheses includes the costs of educating all persons attending school whether they finish or not)			
Bogota, Columbia [45] 1963-66. (Selowsky)	(all RofR are SOCIAL)	2	3	5	Costs include earnings foregone, payments to teachers and depreciation and interest of educational equipment Version: 2) adj. for L.F. participation rates; assume full empl. 3) adj. for unemployment wh/ is substantial in low wage groups. 5) assumption of growth over time in labor force and GDP
	Primary(3)/illiterates	32	26	28	
	Primary(5)/illiterates	33	28	30	
	Bachillerato(11)/B(8)	23	24	25	
	B(11)/B(10)	21	21	23	
	University(16)/B(11)	6	6	7	
	University(14)/B(11)	Neg.	Neg.	Neg.	
Bogota, Columbia, 1965 [41] (Schultz)	Primary(5)/none	18.2		15.3	
	Secondary(11)/P(5)	34.4		26.5	
	Vocational(8)/P(5)	51.6		35.4	
	University(16)/S(11)	4.5		2.9	

APPENDIX TABLE B (cont)

Summary of Rate of Return Estimates

City, Country, & Year	Level of Schooling	Rate of Return Private	Social	Special Notes
Colombia, 1961 [11] (Comacho)	Primary (5)	20		
	Technical Secondary (11)	19		
	General Secondary (11)	30		
	University	19		
Venezuela, 1957 [46] Shoup	Primary(6)/illiterates		82	Earnings foregone are not included in cost estimates of the primary rate wh/ would lower the rate to approx. 30%
	7-11		17	
	12-15		23	
NORTH AMERICA				
Canada, 1961 [35] (Podoluk)	Elementary	16.3		Assumes no unemployment
	Secondary	16.3		
	University	19.7		
Mexico, 1963 [12,13] (Carnoy) unadjusted	2-4	21.1	17.3	Private costs include direct expenditures on tuition, books, transportation, supplies, etc. plus earnings foregone; social costs originate in a study of public expenditure on formal schooling in Mexico--1940-1962; it includes implied rent and depreciation changes for buildings
	5-6	48.6	37.5	
	7-8	36.5	23.4	
	9-11	17.4	14.2	
	12-13	15.8	12.4	
	14-16	36.7	29.5	
father's income constant	2-4	15.2	12.8	
	5-6	44.9	34.5	
	7-8	31.0	20.6	
	9-11	15.2	12.3	
	12-13	14.6	11.4	
	14-16	39.5	31.5	
Mexico, 1964 [44] (Selowsky)	4/0 (marginal)	17.8	17.3	Adapted from Carnoy's results.
	6/5	37.3	24.3	
	7-8/6	24.0		(total--
	9-11/7-8	15.1	22.5	Carnoy's
	12-13/9-11	14.4		data)
	14-16/12-13	29.9	21.4	

APPENDIX TABLE B (cont)

Summary of Rate of Return Estimates

City, Country, & Year	Level of Schooling	Rate of Return Private	Social		Special Notes
United States, 1949	2/0		89		Assumes no unemployment. Costs include
[18]	6/2		14.5		all of usual components.
(Hansen)	8/6		29.2		
	10/8	12.7	9.5	11.4	
	12/10	18/6	13.7		
	14/12	6.2	5.4	10.2	
	16/14	18.7	15.6		
United States, 1959	4/0 (white	100.0	89.0		Assumes no unemployment; no adjustment
[20,21]	6/4 North)	21.8	6.0		for mortality.
(Hanoch)	8/6	16.3	10.0		
	10/8	16.0	12.0	(non-white	
	12/10	7.1	7.0	South)	
	14/12	12.2	7.0		
	16/14	7.0	5.0		