

PART V

EDUCATION AND INCOME DISTRIBUTION IN DEVELOPING COUNTRIES:
A REVIEW OF THE LITEFATURE

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I. INTRODUCTION

Education in developing countries is highly sought after. Part of its value is as a consumption good: education is valued in its own right and is seen as a basic human need. But education also has more materialistic value: it is a means to higher income, more stable employment, and better working conditions.

This paper is a survey of the available literature on education and income distribution in developing countries. Education may affect the distribution of income in a variety of ways: by raising the level of income; by changing, for better or worse, the dispersion of income; by opening up new opportunities for the children of the poor and thereby serving as a vehicle for social mobility and/or, by limiting participation to the children of the well-to-do, transmitting intergenerational inequality; by offering greater access to favored segments of the population (boys, city-dwellers, certain racial groups); by rewarding differently the education received by these groups; through public financing, by taxing some more heavily to subsidize the education of others; and by interacting with fertility, mortality, health, and other aspects of development.

The paper is divided into five sections. Section II-IV address the private benefits of education. Section II is concerned with the private benefits of education which accrue as better employment opportunities and higher labor incomes. Section III offers a critical review of the literature on differing benefits from education for different subgroups in the population, with particular attention to the econometric methods used. Section IV looks at who (by income class, parental background, region or tribe, sex, and other relevant distinctions) receives these private benefits from education and why some groups receive more education than others. Section V turns to social benefits and examines the relation between education and the incidence of poverty, the evidence on social rates of return to education and a critique of that evidence, and the association between the distribution of education and the inequality of income. Section VI considers the educational system as a fiscal program, combines data on the distribution of benefits with data on the distribution of costs, and examines the benefits each population group receives relative to the costs they pay. Conclusions appear at the end of each section.

This paper is one in a series of studies commissioned by the World Bank which evaluate various aspects of the role of education in economic development. Any review paper must be selective in the topics covered. In striking a balance between depth of coverage of some areas and breadth of coverage of all, some relevant areas have of necessity been shortchanged. Among the topics not treated in any substantial way here are: direct measures of education's role in augmenting the productivity of labor; distributional aspects of preschool education: the role of alternative forms of education

such as adult education and radio; interrelations between the distribution of income and the distribution of health and nutrition; the multidirectional linkages between education, fertility, and income distribution; the determinants of school achievement; and examination of the content of education. Several of these issues have been recently surveyed elsewhere and the small attention given to them in the present paper reflects the division of labor among researchers, not the inherent unimportance of these matters.

II. THE PRIVATE BENEFITS OF EDUCATION

Any examination of education and income distribution rests on the premise that education confers economic benefits on its recipients. This section examines the size of the private economic benefits of education. Two kinds of private benefits are treated in turn: employment benefits and income benefits. The question is then asked in Section III: do the benefits of education differ for different groups?

A. Private Employment Benefits

In the 1950s and the 1960s it was thought that education clearly improved the employment prospects of the people who received it. That perception changed in the late 1960s and early 1970s, partly as a result of the study by Blaug, Layard, and Woodhall (1969) detailing the dimensions of the problem of educated unemployment in India. Further evidence compiled by Turnham (1971) suggested that the relationship is not a simple monotonic one. Rather, what he reported was that the highest levels of open unemployment are found among people with intermediate education levels in Bogota, Colombia, Buenos Aires, Argentina; Caracas, Venezuela; urban India; urban Ceylon; urban Malaysia; and Syria. Evidence from other countries is mixed. Some subsequent studies (for example, for Colombia and Sudan) tend to support the pattern of highest unemployment in the intermediate educational categories, whereas others (for Kenya, Iran, Chile, the Dominican Republic, and Nicaragua) show the rate of unemployment falling with education. The relevant data are summarized in Table 1. Note that these data are not standardized by age.

The causes of unemployment and underemployment among the educated have been extensively debated. Among the arguments are: inappropriateness of the type of education received; the creation of false hopes by the educational system; low quality of education; inability of the economy and the labor market to create enough jobs that require the skills of the educated; and unemployment as part of a process of rational search by the educated for the best jobs. I personally am persuaded by the job search position, though not to the exclusion of other views; see Fields (1975a) for an elaboration on this theme.

Economists are now well aware of the limitations of unemployment measures in developing countries. 1/ Very simply, most people are employed according to the standard definition -- working at least one hour a week

1/ For a penetrating examination of measurement issues on employment and unemployment, see Bruton (forthcoming).

Table 1:

UNEMPLOYMENT RATES BY LEVEL OF EDUCATION,
SELECTED DEVELOPING COUNTRIES
(in percentages)

<u>Country</u>	<u>Illiterates</u>	<u>Educational level</u>		
		<u>Primary</u>	<u>Secondary</u>	<u>Higher</u>
Argentina	3.8	4.3	5.7	3.3
Ceylon	7.1	n.a.	11.8	2.3
Chile	12.1	4.6	1.3	0
Colombia	11.5	15.3	14.9	13.2
Dominican Republic	22.4	17.9	9.2	n.a.
India	1.2	2.7	7.0	2.8
Iran	10.0	8.1	13.0	2.6
Kenya	21.0	21.0	13.0	17.0
Malaysia	10.4	19.5	30.9	15.5
Nicaragua	23.8	14.0	12.2	n.a.
Sudan	2.0	2.5	5.5	5.0
Syria	4.3	n.a.	11.7	4.4
Venezuela	4.3	7.0	10.2	2.3

n.a.: Not available.

Note: Comparability between countries and educational levels is limited because of different definitions and sample populations.

Source: Psacharopoulos (1978, Table 15).

for pay, or fifteen or more hours a week not for pay in a family farm or business -- and very few are unemployed by the standard definition -- actively seeking a job but not working in the survey period. The reason why is clear: poor people cannot afford to be openly unemployed for very long. The International Labour Organisation mission to Colombia (ILO, 1970) redirected our attention from the fact of employment to the kind of employment, to which we now turn.

It is clear that education raises one's chances of working in a superior job. Data on the occupational distribution of the labor force broken down by educational attainment are usually found in national population censuses. Table 2 gives illustrative data for Peru. It is evident that the educated, on average, have better jobs. But we also find much diversity within occupations. In other words, a better education is neither necessary nor sufficient for entry into the better occupations, but more education does help.

B. Private Income Benefits

In every country where studies have been done, the evidence is that additional education raises income and reduces poverty, often by very substantial amounts. Micro-level breakdowns within developing countries show an inverse relation between education and poverty. National evidence for Brazil, Malaysia, Taiwan, Thailand, and India is presented in Table 3. Additional evidence for specific cities or regions is widely available elsewhere: for ten Latin American cities in the work of Musgrove (1978); for Lima, Peru, in Webb (1974); for Jakarta, Indonesia, in Papanek (1975); for Bogota and Cali, Colombia, in Mohan (1979); and in other studies too numerous to mention.

Looking at incomes more generally, rather than just at poverty, education appears as a key variable in earnings function studies throughout the world. Table 4 shows that the percentage gains in income associated with an additional year of education are estimated to range between 3.6 percent and 17.2 percent, with an average of 11.2.

The importance of education is also revealed in decomposition studies, which are surveyed in Fields (1979b). Education is the single most important determinant of income. That is, if you sought to determine an individual's income and could ask only one question, you would do best to ascertain how much education the individual in question had received.

One thing worth noting is that these are average figures. Some groups in these countries may benefit more than others from education. In particular, it is thought that the children of the well-to-do may benefit more from education than do the children of the poor. The evidence on this point is reviewed below in Section III.

Why education results in higher income is a matter of some debate. ^{1/} The dominant school of thought, and one which clearly contains a strong element of truth, is the human capital view, which holds that education creates additional productive skills and knowledge embodied in people. The higher income received by better-educated workers is seen as a payment to the superior productivity they have gained through education. But though the evidence from

^{1/} Blaugh (1973) terms this the "puzzling economic value of education."

Table 2:

EMPLOYED POPULATION BY OCCUPATIONAL GROUP AND
BY EDUCATIONAL LEVEL ATTAINED, PERU, 1972
(in percentages)

<u>Occupation</u>	<u>Without Schooling</u>	<u>Educational level attained</u>			<u>All educational levels</u>
		<u>Some or completed Primary</u>	<u>Secondary</u>	<u>Higher</u>	
Professional, technical, executive, and managerial	0.4	2.1	16.9	63.7	8.2
Clerical	0.3	1.9	20.0	14.5	6.0
Sales	4.5	8.8	13.3	6.2	8.7
Service	6.0	9.8	8.6	4.3	8.5
Agricultural	74.5	47.3	8.7	3.2	42.3
Other nonagricultural	11.8	27.2	28.2	5.0	23.2
Not specified	2.5	2.9	4.3	3.1	3.1
Total	100.0	100.0	100.0	100.0	100.0

Source: Oficina Nacional de Estadísticas y Censos, VII Censo Nacional de Población, 1972 (Lima, Perú, 1974).

Table 3:

INCIDENCE OF POVERTY AMONG HOUSEHOLDS AT DIFFERENT EDUCATIONAL LEVELS, SELECTED DEVELOPING COUNTRIES

<u>Country and Source</u>	<u>Education of head of household</u>	Poor Families (percent)	All Other (percent)
Brazil, 1960 (Source: Fishlow 1972)	None	64	35
	Primary	35	55
	Lower secondary	1	5
	Upper secondary	0	2
	University	0	2
<u>Education of head of household</u>		<u>Incidence of poverty (percent)</u>	
Malaysia, 1970 (Source: Anand 1977)	None	49.0	
	Some primary	39.1	
	Completed primary	32.8	
	Lower secondary	11.7	
	Some upper secondary	5.2	
	Certificate V or higher	2.1	
<u>Education of head of household</u>		<u>Poor groups (percent)</u>	
Taiwan, 1972 (Source: Kuo 1975)	Illiterate	81.0	12.3
	Primary	14.1	51.4
	Secondary	0	29.1
	College	4.9	7.2
<u>Education of head of household</u>		<u>Incidence of poverty (percent)</u>	
Thailand, 1968-69 (Source: Meesook 1975)	None	21.4	
	P1-MS2	26.1	
	MS3-MS4	1.1	
	MS5+	1.8	
<u>Education of head of household</u>		<u>Average disposable income per household (Rs.)</u>	
India, 1964-65 (Sources: Bardhan 1974 Da Costa 1971)	Illiterate	1,186	
	Primary	1,489	
	Above primary, below matriculation	2,358	
	Matriculation and intermediate	2,803	
	Prof./tech. certificate	2,630	
	College graduate, arts and sciences	5,432	
	Prof./Tech. degree	6,776	
	Postgraduate	12,015	

Table 4:

INCOME AND SCHOOLING IN SELECTED DEVELOPING COUNTRIES

<u>Percentage change in income associated with an additional year of schooling</u>	<u>Proportion of variance in income explained by included variables</u>	<u>Source</u>
17.2	.50	Velloso (1975)
16.1	.57	Fields (1976)
16.9	.32	Fields and Schultz (1977)
11.4	.32	Kugler <u>et al.</u> (1977)
12.5	.44	Demetriades and Psacharopoulos (1979)
5.7	.81 <u>a/</u>	Psacharopoulos and Williams (1973)
4.8	.42	Thais and Carnoy (1972)
5.3	.80 <u>a/</u>	Hoerr (1973)
15.0	.73	Carnoy (1967)
15.8	.44	Psacharopoulos (1977)
6.0	.55	Gannicott (1972)
3.6	.51	Blaug (1974)
16.8	.16	Stroup and Hargrove (1969)

2

Used grouped data, hence the high R .

The table shows the coefficient of earnings on years of schooling, in semi-logarithmic earnings functions. The coefficients are not strictly comparable because of the different independent variables used in each study.

te: Psacharopoulos (1978, Table 12).

literally hundreds of earnings function studies in dozens of countries is consistent with the human capital interpretation (Blaug 1978), that same evidence is also consistent with other explanations. Blaug (1973) calls these the "sociological" and "psychological" explanations, by which he means that education inculcates students with certain socially acceptable values (the "sociological" explanation), and that education acts as a screening device to select the best qualified workers for the job (the "psychological" explanation). Although each of these explanations is undoubtedly accurate to some degree, their relative explanatory value has not been determined and is even thought by some to be undeterminable.

One should note that the evidence reviewed above refers to the private benefits of education. Coefficients of education in earnings functions are sometimes interpreted as private rates of return, that is, a coefficient of X percent is taken to mean that "education raises the present value of expected lifetime income by X percent. This will only be correct if there are no precisely accurate (private) costs of education other than economies forgone while in school or if direct costs and unmeasured earnings while in school cancel each other out.

Data on the earnings received by individuals with different levels of educational attainment frequently are used to compute not private but social rates of return. This literature is reviewed in Section V.

C. Conclusions on the Private Benefits of Education

By now, it has been thoroughly documented that in some but not all developing countries better-educated workers have lower unemployment rates than do less-educated workers; that the better-educated tend to be employed more frequently in the superior occupations; and that they tend to earn higher incomes while working. Subsequent sections address whether the benefits differ for various population groups and identify who the beneficiaries are.

III. DIFFERENT BENEFITS OF EDUCATION FOR DIFFERENT GROUPS

Not everyone in developing countries benefits equally from education. At any given educational level, some individuals receive larger incomes and other benefits than do others. The empirical evidence is presented and examined critically below.

A. Empirical Evidence

Differences in returns to education are thought to arise in many dimensions: by sex, race or tribe, region, rural or urban location, stratum of the labor market in which the individual is employed, occupation, industry, socioeconomic background, and whether or not the individual is poor. Different incomes received by workers grouped according to any or all of these

dimensions would constitute "labor market segmentation" according to most definitions, none of which I find particularly satisfactory. 1/

The literature offers many studies of whether different groups in the labor force receive different rewards from education. The methodologies followed in these studies are of two general types, corresponding to two related but distinct questions. The first of these is: are some individuals paid more in the labor market than would be predicted from their education and skills, depending on their sex, race, or occupation? The second is: do the earnings functions (in general) and the estimated gains from more education (in particular) differ for various groups depending on their sex or race or occupation? Research into the first question looks for income differences in the earnings (or income-generating) functions themselves. In research into the second question the labor force is stratified into segments separate earnings-function regressions are run within each stratum, and the regression coefficients in each stratum are then compared.

1. Shift Variables in a Single-Equation Earnings Function

In the first approach, the supposed segmentation variable is included in a multiple regression as a shift variable in an earnings function. An example is the work of Bourguignon (1979). He uses the following variables:

Y = income,

EDUC = years of schooling,

EXP = labor market experience,

EXPSQ = labor market experience squared,

WORKTIME = hours per week,

M = dummy variable for modern sector employment.

1/ In a recent paper (Fields 1979a), I considered a number of alternative definitions of labor market segmentation. A commonly-used conceptualization is that stated by Selowsky (1979a, p. 22): "wage differences (for labor of equal skill or education) associated to particular occupation or sector of employment." Virtually the same definitions have been used in studies of developing countries by Mazumdar and Ahmed (1977), Souza and Tokman (1977), Altimir and Pinera (1977), and Bourguignon (1979), among others. I have problems with these definitions because they fail to consider why the worker is in one group rather than another. Others criticize these definitions for their failure to consider compensating (or equalizing) differences in unmeasured job attributes. As anyone familiar with utility theory knows, appeals to unmeasured variables explain everything, and hence nothing.

His regression evidence (p. 66, reg. 1. a) for males in Bogota is:

$$Y = 5.266 + .145 \text{ EDUC} + .074 \text{ EXP} - .001 \text{ EXPSQ} + .196 \text{ WORKTIME}$$

(.004) (.003) (.000) (.040)

$$+ .123 M, R^2 = .316, n = 3,713.$$

(.021)

All regression coefficients are statistically significant at the 1 percent level. Bourguignon interprets the significance of the modern-traditional sector employment variable as evidence of a degree of dualism in the Bogota labor market.

This kind of approach -- introducing shift variables into single-equation multiple regression models and observing whether people with the same measured education, experience, and other characteristics receive different incomes in the labor market depending upon their own characteristics or upon characteristics of their employment -- has been used in many studies of developing countries. Most shift variables have proven to be statistically significant. The results of some of the studies using this approach are presented in Table 5.

Two classes of variables have generally been found not to be significant in shifting the earnings function. One kind of variable pertains to the worker's socioeconomic background. We have studies by Kugler (1975) and Fields (1976) for Colombia, by Pang and Liu (1975) for Singapore, Carnoy (1967) for Mexico, Blaug (1974) for Thailand, and Mazumdar (1979) for Malaysia -- most of which show the unimportance of parents' income, occupation, or education in determining the incomes of their sons or daughters in the labor market (see Table 6). We should note, however, that it is only the direct effect of parental background that is shown to be insignificant. In nearly all studies that have allowed for indirect effects of parental background on the socioeconomic status of the children, a clear linkage is shown between the socioeconomic status of the parents, the educational attainment of their children, and the children's subsequent economic position. (See Section IV.) This evidence should be interpreted as a hopeful sign that, in many societies, the children of the poor -- if they do receive education -- will apparently not be discriminated against in the labor market when it comes time for them to seek jobs commensurate with the educational levels they have reached.

Another variable that usually is found to be insignificant in the studies of incomes and earnings in developing countries is the individual's migrant status. The relevant literature is reviewed in Yap (1977) and Todaro (1976); a more recent examination, perhaps the most thorough for a developing country, is the work of Ribe (1979) for Colombia. These studies report that migrants' earnings are virtually identical with those of natives at destination. Put differently, the evidence is that migrants quickly acquire economic comparability with lifelong residents. The implication for educational planning is that if a person is educated in one area and then moves elsewhere, that person is apt to find the labor market receptive to him and will therefore be able to put his education to effective use.

Table 5:

VARIABLES EXPLAINING DIFFERENCES IN EARNINGS,
SELECTED DEVELOPING COUNTRIES

<u>Source</u>	<u>Country</u>	<u>Shift variables</u>	<u>Higher coefficient for:</u>
Many studies too numerous to list		Sex	Males
Langoni (1975)	Brazil	Status, sector	Employers, manufacturing
Bourguignon (1979)	Colombia	Modern-traditional sector	Modern sector
Fields (1978a)	Colombia	Industry	Tobacco, rubber
Musgrove (1978)	Colombia	Occupation	Managerial
Musgrove (1978)	Ecuador	Occupation	Professional
Mazumdar and Ahmed (1977)	Malaysia	Firm size, sector	100+ employees, foreign sector
Musgrove (1978)	Peru	Occupation	Professional
Knight and Sabot (1977)	Tanzania	Occupation	Supervisory employees
Blaug (1974)	Thailand	Firm size, occupation	Large firms, executives
Stroup and Hargrove (1969)	Vietnam	Occupation	Professional and clerical
Thomas (1976)	Yugoslavia	Industry, occupation	Medium capital intensity, general management

Note: The table shows shift variables in single-equation earnings functions.

Table 6:

EFFECTS OF FAMILY BACKGROUND VARIABLES ON EARNINGS,
SELECTED DEVELOPING COUNTRIES

<u>Source</u>	<u>Country</u>	<u>Statistically significant variables</u>	<u>Nonsignificant variables</u>	<u>Reasons for overall unimportance a/</u>
Kugler (1975)	Colombia	Logarithm of father's income	Parents' occupation and education	Low explanatory power compared with other personal characteristics
Fields (1976)	Colombia	Mother's education	Father's occupation and education	As above
Mazumdar (1979)	Malaysia	None	Father's occupation and education	Statistically insignificant
Carnoy (1967)	Mexico	Father's occupation	--	b/
Pang and Liu (1975)	Singapore	Proxy for parents' income, mother's education	Father's occupation and education	c/
Blaug (1974)	Thailand	Parents' education, father's occupation (sales or executive)	Other father's occupations	Small coefficients and low explanatory power compared with other personal characteristics

a/ The reasons given for overall unimportance of the socioeconomic variables are those expressed by the authors themselves in their studies.

b/ Carnoy (1967) computed private rates of return to education. The magnitude of these rates is not associated in any direction with the occupation of the fathers.

c/ Pang Liu (1975) find that the proxy variable for parents' income accounts for more than 11 percent of the observed variance in earnings.

2. Earnings Functions on Stratified Subsamples

The second methodological approach to determining if "comparable" workers receive different rewards from the labor market is to run earnings functions on stratified subsamples of the labor force; sometimes, in place of multiple regression, these returns to education are estimated using simple cross-tabulations. These are several examples of such studies; their results are summarized in Table 7. Despite the seeming sophistication of many of these studies (in that they look for a variety of effects of education and other variables on the incomes of different population subgroups, and test for these effects using the Chow test or other sophisticated econometric methods), it nonetheless turns out that many of them are methodologically deficient. These methodological issues are discussed in the following subsection.

B. Methodological Issues

As a whole, the empirical studies have taken little care with the nature of the segmenting variables and the structure of the labor market that produces differences between groups. Most researchers have not concerned themselves with whether the groups are defined according to unalterable personal characteristics such as sex; choice variables such as place of residence; limited opportunity sets (for example, work in modern vs. traditional sector employment); or income itself. Yet, as I shall now show, how the segmenting groups are defined crucially affects the interpretation of both dummy variable and segmented earnings function regressions. 1/

1. A Simple Structural Model of Income Determination

In the pursuit of higher income, there are some exogenous factor that an individual has no power to change. Without question, these include sex, age, race, and family background; somewhat less certainly, but usually treated as unalterable, are an individual's education, migrant status, and religion. Other income-determining factors are endogenous to the income-determination process. These include occupation; industry of employment; characteristics of the occupation, industry or firm; and place of work. What these have in common is that workers presumably maximize over these variables by choosing subject to constraints, that occupation, industry, firm or workplace which pays best.

1/ For further details of these arguments, see Fields (1979a).

Table 7:

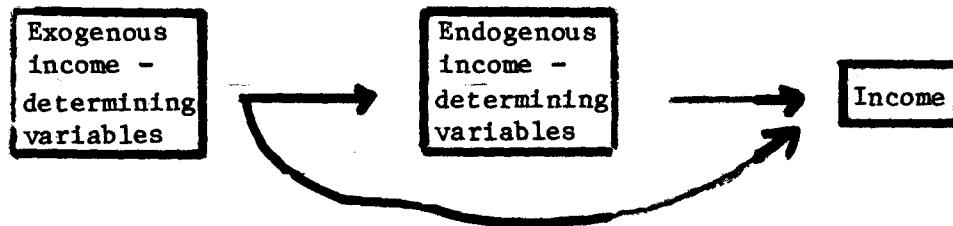
VARIABLES EXPLAINING DIFFERENCES IN EARNINGS
IN SELECTED DEVELOPING COUNTRIES

<u>Author</u>	<u>Country</u>	<u>"Segmentation" is reported according to:</u>	<u>Higher earnings for:</u>
Many studies too numerous to list		Sex	Males
Langoni (1975)	Brazil	Occupation, sector	Employers, tertiary sector workers
Jallade (1977)	Brazil	Socioeconomic group	Males, non-farm activity
Corbo (1974)	Chile	Industry-firm size	Chemical and pharmaceutical industry, 100 or more employees
Kugler (1977)	Colombia	Poor vs. non-poor	Nonpoor
Kugler <i>et al.</i> (1979)	Colombia	Modern vs. nonmodern, traditional vs. marginal sector	Modern, marginal
Musgrove (1978)	Colombia	City of residence	Bogota workers
Fields (1978a)	Colombia	Urban vs. rural, employer vs. employee	Urban workers, employers
Bourguignon (1979)	Colombia	Modern vs. traditional sector	Modern sector workers
Mohan (1979)	Colombia	Neighborhood within Bogota	Workers in higher income neighborhoods
Mazumdar (1978)	India (Bombay)	Three sectors: casual, small-scale, factory	Noncasual sector workers
Psacharopoulos and Williams (1973)	Iran	Three employee categories: permanent, contract, and new	Contract employees
Mazumdar (1979)	Malaysia	Public vs. private, white-collar vs. blue-collar, plant size, race (2 groups)	Public employees, white-collar, larger firm size, Malays
Webb (1974)	Peru	Self-employed vs. factory workers	Self-employed
Pang and Liu (1975)	Singapore	Primary vs. secondary sector	Primary sector workers
Knight and Sabot (1977)	Tanzania	Racial groups	Non-African Workers
Chiswick (1977)	Thailand	Employees vs. self-employed	Employees
Stroup and Hargrove (1969)	Vietnam	Farmers vs. non-farmers, occupation	Nonfarmers, sales and service workers
Thomas (1976)	Yugoslavia	Region	Slovenia

A simple structural model of the relationship between these sets of variables appears in the following figure:

Figure 1:

A SIMPLE STRUCTURAL MODEL OF INCOME DETERMINATION



In this model, the exogenous variables affect income both directly, by influencing one's income within occupational or industrial groupings, and indirectly by influencing which occupation or industry one is in.

We may now ask: having recognized this economic structure, what difference does it make to the econometric testing of the questions posed above? We consider first the use of shift variables in a single-equation earnings function and then earnings functions run on stratified subsamples.

2. Shift Variables in a Single-Equation Earnings Function

When one introduces shift variables into earnings functions, the issue is whether some individuals are paid more (or less) in the labor market than would be predicted from their education and skills alone, and whether these differences are associated with sex, race, or occupation. The econometric procedure used to address these issues is to introduce potential explanatory variables as additional regressors and estimate models of the form:

$$Y = \alpha + \beta EXOG + \gamma ENDOG + \epsilon,$$

where

Y = income (or its logarithm),

$EXOG$ = exogenous income-determining factor(s),

$ENDOG$ = endogenous income-determining factor(s),

α , β , γ = parameters, and

ϵ = error term.

How good is the estimated earnings function? Econometric theory offers a clear answer: all regression coefficients -- not only those of the endogenous factors such as occupation but also those of exogenous factors such as education -- are biased, because of the correlation between the endogenous variables and the error term. 1/

What is the direction of the bias? Suppose there were three income-determining factors: education (exogenous), sex (exogenous), and occupation (endogenous). The effect of ignoring the endogeneity of occupation is to attribute mistakenly to occupation a larger independent effect on income than is justified, for some part of the apparent effect is really derived from the intercorrelation among the explanatory variables and the error term. That is, if OLS (ordinary least squares) is used to estimate an earnings function like that given above, simultaneous equations bias causes one to overstate the independent contributions of occupation in explaining income and understate the independent contributions of education and sex. Nearly all investigators, myself included, have at one time or another failed to consider these biases in empirical work.

The usual remedy is to estimate a reduced form of the model illustrated in Figure 1. Reduced-form estimation is helpful up to a point. It is formally correct and yields unbiased estimates of the total effects of education, sex, and other exogenous income-determining factors on income. In particular, if we wish to know whether some individuals are paid more (or less) in the labor market than would be predicted from their education and skills, depending on their sex, race, or family background, reduced-form estimation is an appropriate method. 2/

These reduced-form estimates may be compared with those obtained when occupation and other endogenous income-determining factors are included in the usual way using OLS. Estimates derived in these two ways differ in empirical studies, but not by much. This means that the effects of education and other exogenous income-determining factors are measured reasonably well by established methods.

What about the effects of occupation and other endogenous income-determining factors? Reduced form estimation, by definition, does not even try to estimate the effects of these endogenous factors. It therefore offers no information on the extent to which different occupational or industrial groups in the population receive different benefits from education. Thus, the importance of the biases in the estimated effects of endogenous income-determining factors remains unknown.

In summary, those earnings functions estimated by OLS which include shift variables to allow for different rewards from education for workers who differ in sex, race or other exogenous factors are suitable provided the earnings function model is otherwise well specified. However, those which include shift variables to allow for different rewards from education

1/ I shall spare the reader the details of the argument; see Fields (1979a) for more on this.

2/ Provided, of course, that the income-determination model is otherwise well specified.

for workers in different occupations or industries suffer from simultaneous equations bias, which affects the estimates of all included variables. The size of the biases affecting the estimated effects of exogenous income-determining factors is unknown, but inferences from such estimates ought to be drawn with care. Because the available reviews in the literature fail to distinguish between relatively appropriate and relatively inappropriate studies, they cannot be relied on to resolve these issues.

We turn now to the question of separate earnings functions for different groups.

3. Earnings Functions on Stratified Subsamples

Earnings functions have been run separately for different groups in many developing countries (see Table 7). When is it valid to infer that some groups benefit more than others from education, or to conclude more generally that some groups' earnings functions differ significantly and meaningfully from those of others? The structural model of income determination shown in Figure 1 suggests that we can distinguish three kinds of groupings: according to exogenous income-determining variables, endogenous income-determining variables, or income itself. The validity of earnings function estimates for stratified subsamples depends on which kind of grouping is used. They are presented in turn.

Stratification by Exogenous Income-Determining Factors. When a sample of workers is stratified according to sex, race, or other exogenous characteristics, the question is: What function determines the income expected by a representative worker of sex or race? The principal conclusion about stratified earnings functions when workers are grouped by exogenous income-determining factors is that valid results are obtained when the labor force is segmented in this way. An undistorted estimate of the returns to education is obtained for members of each group.

Actually, a regression fitted to the whole sample may result in a biased estimate of the effect of an extra year of education on income for all strata. For example, if men and women each earn 10 percent higher incomes for each extra year of education, but men with any given level of education are paid more than women, then the effect of education on income estimated for a sample of both men and women might appear to be 20 percent or 5 percent when in fact everybody gets 10 percent. 1/ (See Figure 2.)

To sum up, when (i) different groups in the labor force receive different incomes, and (ii) these incomes are generated by different underlying earnings functions, and (iii) these groupings are based on an exogenous characteristic, then the sample should be stratified and separate earnings functions run for each segment, since not segmenting will typically produce a biased estimate of the effect of education on income.

1/ The magnitude and sign of such bias depends on how the different groups are distributed with respect to the explanatory variable (education in the example). The bias will be positive whenever the higher-paid group (males) also has, on average, a higher level of educational attainment, and negative otherwise, as shown in Cases A and B of Figure 2, respectively.

Stratification by Endogenous Income-Determining Factors. In several of the studies of developing countries cited in Table 7, earnings functions have been run and the structures compared for workers in various groupings by endogenous factors such as occupation, industry, firm size, and work place. How meaningful are within-group regressions like these? Before answering, we must establish carefully the objective of the exercise, since ambiguity abounds.

The purpose of stratifying a sample of workers according to occupation, industry, or other characteristics, is to establish what function determines the income expected by a worker with characteristics. This question in this particular form is too vague to be useful and has led to much confusion in the literature. Problems arise in two respects. For one thing, the question fails to specify when the worker is in group i. Is he/she in that group at the beginning of working life, at the time of the survey, or throughout? And second, once we recognize that workers are heterogeneous, we must ask: to which worker is the earnings function supposed to apply? To the representative worker in that group? To the representative worker in the population as a whole? Or to somebody else? More specificity is needed.

I suggest the following as an interesting question, perhaps the most interesting one, pertaining to intergroup differences in earnings functions: what function determines the income expected by a representative worker entering the labor force in group i? The standard method of answering this question is to divide the sample according to current occupation or industry and to run separate earnings functions within each such representative group.

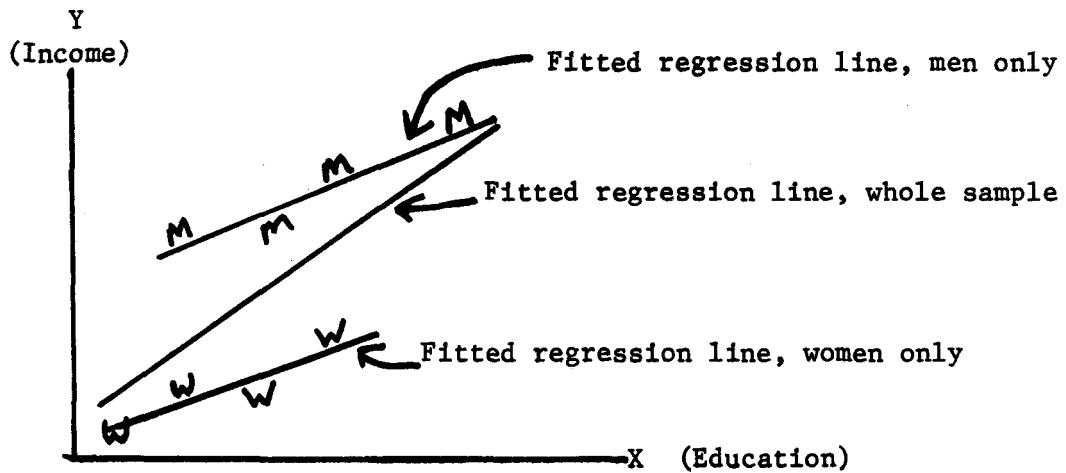
How valid is this procedure? The answer has three parts. First, when the labor force is grouped according to endogenous income-determining factors, if there is no mobility between groups, and if the labor force is homogeneous with respect to omitted variables, then intragroup regressions provide valid estimates of the effect of education on income in each occupation. The reason why intragroup estimates are valid under the stated assumptions is that the labor market is completely segmented, so that otherwise identical workers receive different wages depending solely upon the segment of the labor market in which they are first employed, with no opportunity to move from the poorer to the better segment. If the stated assumptions do not hold, however, the intragroup regressions are not valid.

Hence, and second, when the labor force is grouped according to endogenous income-determining factors, if workers move within groups, then intragroup regressions provide invalid estimates of the effect of education on income in each occupation. The simple intuitive explanation is that any degree of mobility between the segments means that some of those who start in group i move up to group j, and this mobility is ignored in within-group regressions. The result is sample selectivity bias: looking only at the incomes of those individuals who end up in group i underestimates the income expected by individuals who started out in that group.

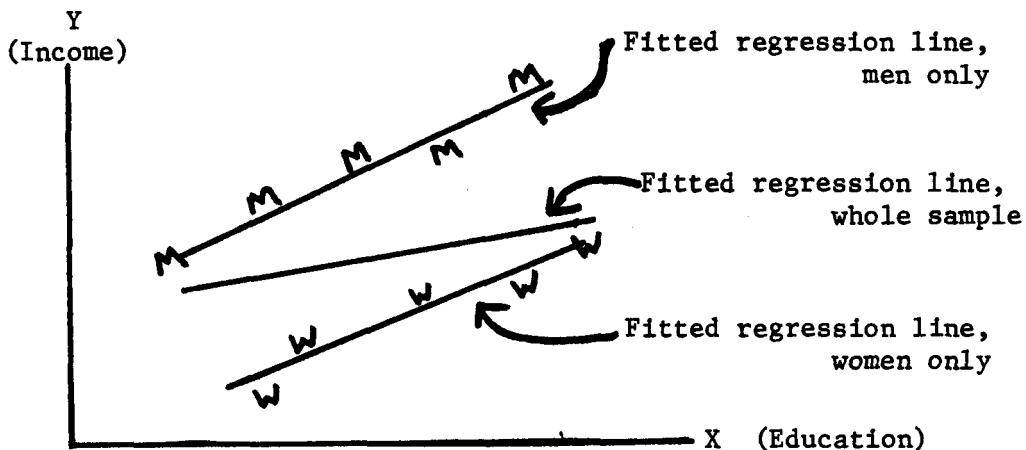
Figure 2:

BIAS FROM OMITTING OR FAILING TO STRATIFY BY AN
EXOGENOUS INCOME-DETERMINING VARIABLE

Case A:
higher-paid group has higher average education



Case B:
higher-paid group has lower average education



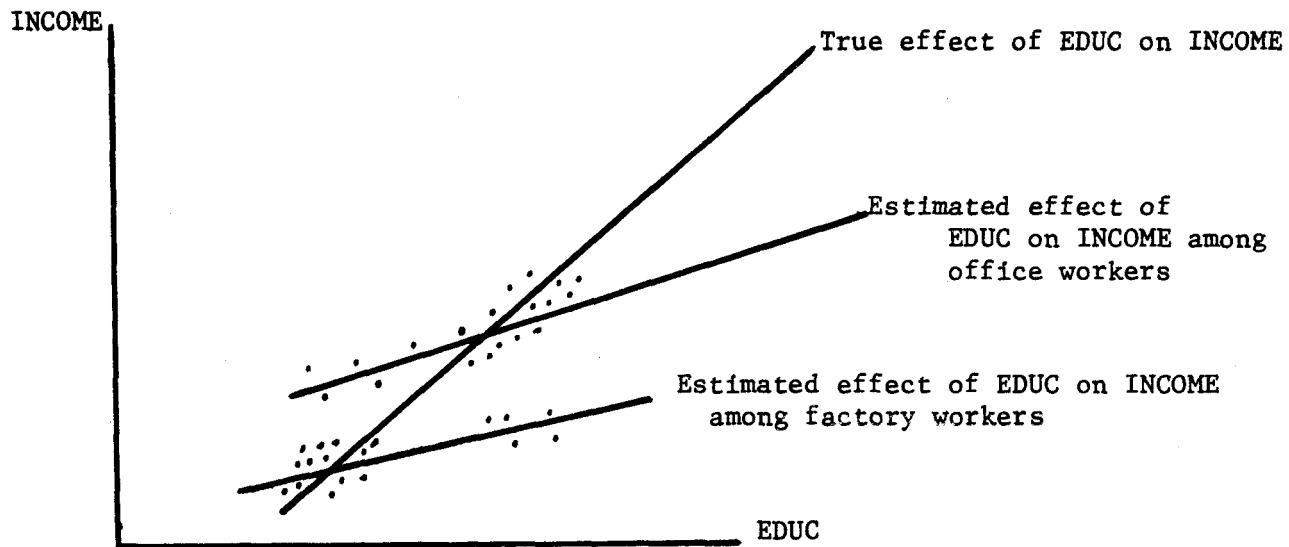
Third, when the labor force is grouped according to endogenous income-determining factors, if the labor force is heterogeneous with respect to omitted variables, and if the effects of these unmeasured variables are ignored, then intragroup regressions provide invalid estimates of the effect of education on income. Take ability as an unmeasured variable. It is well-known that to ignore ability in earnings functions, in the absence of ability measures, imparts an upward bias to the estimated coefficients of variables such as education, which are correlated with ability. This is because part of the estimated return attributed to education is in fact a return to superior ability. What happens if we stratify the sample and run separate earnings functions within each stratum, ignoring the unmeasured ability? The likely effect is to reduce the apparent contribution of education in determining earnings in the lower strata, even, in extreme cases, producing a seeming negative relation between education and earnings. One might tend to conclude from such evidence that education fails to raise incomes for workers in the lower earnings strata. This inference may be unfounded: those individuals still in the lower strata, despite a high level of education, are likely to have low ability -- otherwise, they would probably have been able to move to higher strata. Incomes are low among highly educated people working in the lower labor-force strata because their low (unmeasured) ability offsets their high (measured) education. Since this unmeasured variable, ability, remains unmeasured, however, we cannot detect the cause of the low income and so erroneously conclude that education does not pay off among this group of workers. 1/

To sum up the discussion on stratification by endogenous income-determining factors, these procedures yield valid results only under strong assumptions that do not hold. In each case, the problem is a form of selectivity bias brought about by truncation the sample: education tends to raise people's incomes by allowing them to move out of lower occupational or industrial categories into higher ones, and this effect is missed when income functions are estimated within an occupation. The result is that the effect of education on income may be substantially understated in the segmented earnings functions. Figure 3 illustrates this for a situation in which the better-educated individuals tend to be employed as highly paid office workers and the more poorly educated individuals tend to be lower-paid factory workers.

1/ For example, among traditional sector workers, the low incomes received by college graduates working as street vendors more probably reflect the peculiar (unmeasured) physical and mental limitations of those particular individuals, who are working in that occupation despite a lot of education, more than it reflects the lack of skills that could be acquired during sixteen years of schooling.

Figure 3:

BIAS FROM STRATIFICATION OF LABOR FORCE BY ENDOGENOUS
INCOME-DETERMINING VARIABLE



Stratification by the Dependent Variable (Income). Stratifying the labor force by the dependent variable entails running separate regressions for workers with incomes above and below a predetermined amount. This kind of segmentation produces estimates of the effect of education on income that are invalid. The estimates are biased downward for low-income workers for the reasons given in the preceding discussion of endogenous income-determining factors: one of the effects of education is to raise people's incomes and hence move them from the low-income sample to the high-income sample, and this effect is ignored when samples are stratified by the dependent variables. Figure 4 illustrates this problem.

The same problem arises if samples are stratified by income-determined variables, such as neighborhood. A correlation between benefits from education and neighborhood of residence is both expected and spurious.

In actual empirical research, the dangers of segmentation by the dependent variable are particularly acute. Figure 5 illustrates, for Bogota, how incorrect inferences might be drawn. We see that the benefits of education for low-income workers would be misstated if separate earnings functions were run within poverty and nonpoverty groups: in the sample as a whole, each year of education raises incomes by about 15 percent; yet, within the higher-income sample, the income gain is attenuated because low-income workers are systematically excluded; and, in the low income sample, the apparent effect of education on income is negative! Segmenting by the dependent variable understates the effect of education on income for every segment and ought not to be done.

Figure 4:

ILLUSTRATION OF TRUNCATION BIAS:
STRATIFICATION OF LABOR FORCE BY DEPENDENT VARIABLE (INCOME)

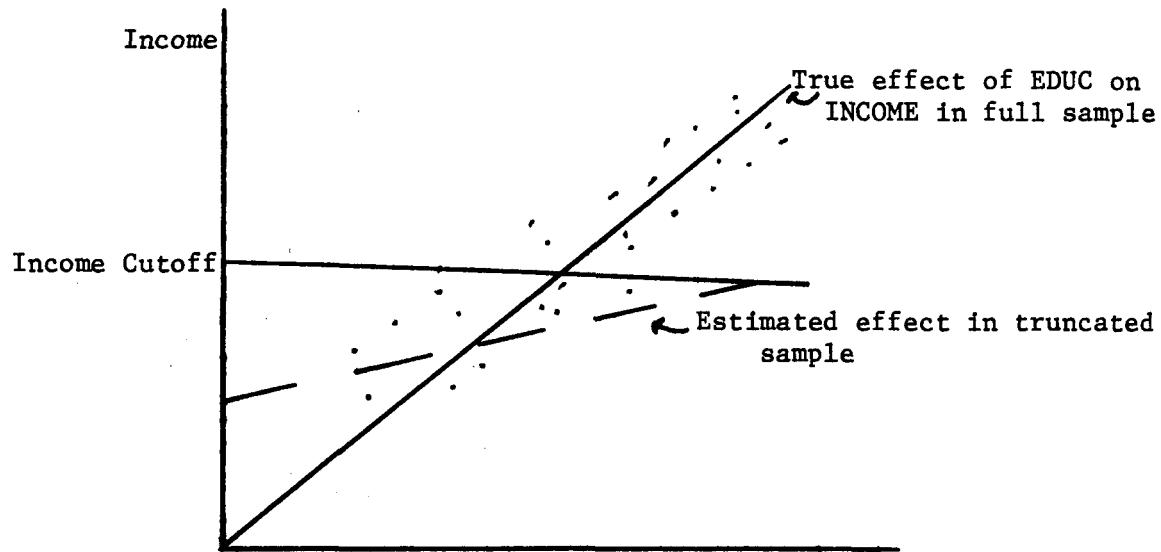
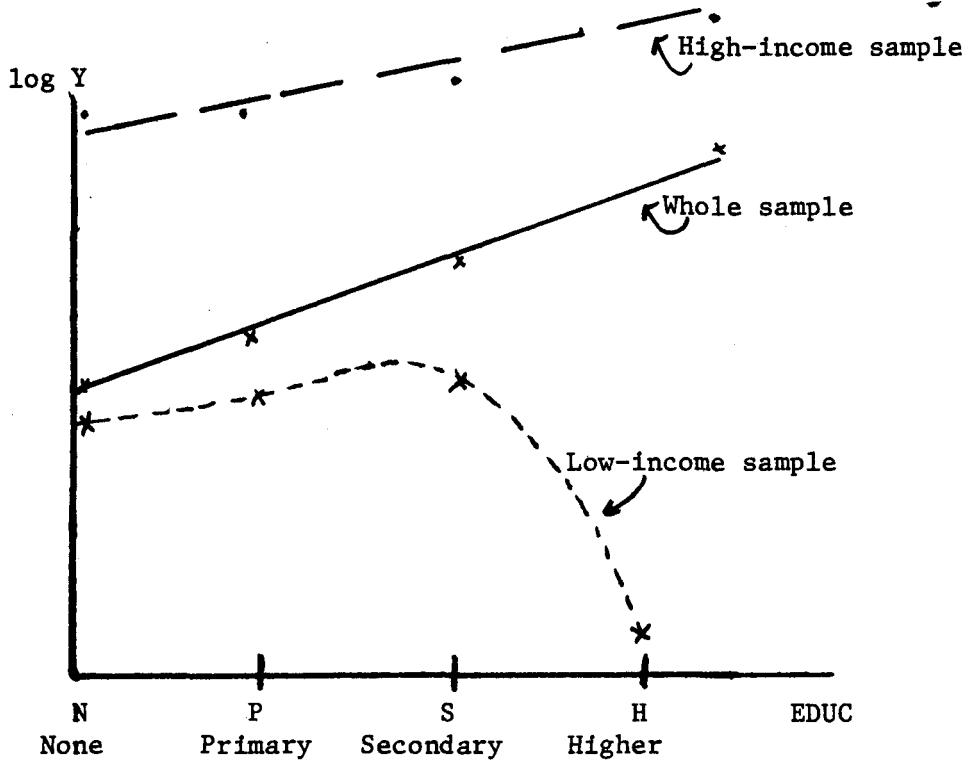


Figure 5:

ESTIMATED EDUCATION-INCOME RELATIONSHIPS
FOR WHOLE SAMPLE AND TRUNCATED SAMPLES IN BOGOTA



C. Conclusions on Different Benefits of Education for Different Groups

In light of the interpretative issues raised in section B, what lessons are we to draw from the empirical evidence in section A? We may legitimately conclude from the available evidence that the benefits of education are greater for some groups than for others. The evidence may properly be interpreted as showing that, given the same measured education and skills, men earn more than women in most if not developing countries; some racial groups in some countries do better than others; in-migrants in several countries fare as well as comparable lifelong residents at destination; and workers from poor socioeconomic backgrounds in several countries do as well as workers with the same education and experience who come from more advantaged backgrounds. These conclusions are derived from single-equation earnings functions which contain shift variables for exogenous income-determining variables.

When samples are stratified by these exogenous variables (see Table 7), it may legitimately be inferred that the benefits from education are greater for men than for women in many countries, for Malays as compared with non-Malays in Malaysia, and for non-African workers in Tanzania.

There are indications of other earnings differences among groups defined according to endogenous income-determining variables, which include occupation, industry, firm size, and region. Although biased to a certain degree, the estimated coefficients on these variables in single-equation earnings functions, and the estimated earnings functions themselves, differ so markedly as to suggest that education indeed receives more rewards in certain sectors of employment or regions than in others. Among the apparent findings of the studies noted in Table 7 are larger returns to education among modern sector workers versus traditional sector workers in Colombia and Singapore; among white-collar versus blue-collar workers in Malaysia; among urban versus rural workers in Colombia; for various occupational groups in Brazil, Colombia, Iran, Malaysia, Peru, Thailand, and Vietnam; for workers in various industries in Brazil, Chile, India, and Malaysia; and for persons in various regions of Colombia and Yugoslavia.

The relationship between returns to education and income itself also demands attention. It may correctly be said from the available evidence that, given the same education, the children of the poor generally do as well in the labor market as the children of the nonpoor. Moreover, despite some authors' claims to the contrary, existing studies have not established that the poor themselves have less to gain from further education than have others.

IV. WHO RECEIVES HOW MUCH EDUCATION AND WHY?

A. Differential Participation in Education

Education in developing countries is highly valued for the income and nonincome benefits it brings. Still, very many children receive little or no education. One reason for this is the favored access to education enjoyed by some individuals and the lack of school spaces for others. Another reason is that, even if school spaces are available, parents may choose not to send their children to school. This may be because of the need for their children's labor in family farms or businesses, inability to pay school fees, or lack of conviction that expenditures on education will prove to be worthwhile (for example, because the family is part of a group that is discriminated against). Research studies have demonstrated that all these factors contribute to explaining patterns of school attendance and absence. 1/ However, the relative strength of supply-side and demand-side factors has not yet been analyzed definitively.

From the point of view of income distribution, given that only some people get educated, an important aspect is which people get educated how much. Unesco publications and other data sources document that educational systems in developing countries cater more to some groups than to others.

1. Males and Females

Table 8 shows that in developing countries, parents tend to favor the education of their sons over their daughters. For developing countries as a group, the probability of a male in the school age group (6-23 years old) being enrolled is about 40 percent higher than that of a female. Wider differences also exist in some regions; for example, in the Arab states this figure reaches 70 percent.

The table also shows that educational opportunities by sex are even more pronounced at older ages, which correspond to the higher educational levels. Again for developing countries as a group, the probability of a male being enrolled is higher than that of a female, by 30 percent for the first age group (6-11 years), 48 percent for the second (12-17 years), and 84 percent for the last (17-23 years).

The evidence in Table 8 also shows that, with the expansion of the educational systems in the last fifteen years, these differentials have been reduced noticeably. Nonetheless, the gaps that remain are large and unfortunate.

1/ A review of this literature is now being prepared by Mary Jean Bowman and C. Arnold Anderson.

Table 8

ENROLLMENT RATIOS BY AGE GROUPS AND SEX,
DEVELOPING COUNTRIES, 1960 & 1975

Age Groups

Year	6-11			12-17			18-23			6-23			
	MF	M	F	MF	M	F	MF	M	F	MF	M	F	
Developing countries	1960	46.8	56.1	37.2	21.6	28.3	14.9	3.6	5.2	1.9	26.6	32.9	20.1
	1975	61.8	69.8	53.5	35.3	42.0	28.3	9.0	11.6	6.3	38.7	44.8	32.3
Africa (excluding Arab states)	1960	30.1	37.1	23.1	17.4	23.0	11.9	1.4	2.2	0.6	18.0	22.9	13.2
	1975	48.9	55.4	42.5	30.7	37.7	23.7	3.9	5.8	1.9	30.7	36.1	25.3
Latin America	1960	58.5	59.0	58.0	36.2	38.7	33.5	6.3	7.8	4.9	37.3	38.8	35.8
	1975	77.9	77.7	78.2	56.5	58.4	54.4	19.7	22.0	17.5	54.7	55.9	53.4
Asia (excluding Arab states)	1960	53.9	64.8	42.6	25.8	32.9	18.5	3.9	6.0	1.8	30.5	37.7	23.1
	1975	63.6	72.8	53.8	35.0	42.0	27.6	8.1	11.1	4.9	38.9	45.7	31.6
Arab states	1960	39.1	49.9	27.9	18.0	25.7	10.0	3.9	6.4	1.3	22.6	30.2	14.8
	1975	59.1	71.8	46.0	34.6	44.6	24.2	12.3	17.1	7.2	38.5	48.2	28.5

Source: Unesco Statistical Yearbook, 1976.

2. Ethnic and Religious Groups

Table 9 shows that some ethnic or religious groups within developing countries have less access to education. Contrast, for example, the distribution by educational levels of the white and the nonwhite population in Mozambique, or in Peru, that of Spanish-speaking people and those whose maternal language is indigenous. These are also some wide educational differences among ethnic groups in Sri Lanka. Less clear are the differences in educational attainment between Malay and Chinese employees in Malaysia. Although idiomatic and cultural differences probably account for a significant part of the inequality in educational attainments, unequal opportunities and discrimination against certain groups probably hold the key to understanding the observed patterns.

3. Urban and Rural Areas

In most developing countries, urban children have many more opportunities to attend school than rural children. Some regions have virtually no upper-level schools or persons educated up to the secondary level or beyond. Although rural parents may express less demand for education than urban parents, the main reason for the disparity in rates of education between urban and rural children appears to be that more resources for education are provided in urban areas - hence, more schools are built and more school spaces are available.

These differences are reflected in the educational composition of the urban and rural labor forces, for which evidence is presented in Table 10. For the fourteen developing countries covered, we can clearly see that wide disparities exist between urban and rural areas. The proportion of people in the rural areas with no schooling is always higher than that of the urban areas, whereas the opposite is true for secondary and postsecondary levels. Clearly, the lack of rural educational opportunities and selective rural-urban migration of the highly educated combine to leave the rural areas with only limited human resources.

4. Socioeconomic Status

There exists substantial evidence that poorer families are unable to enroll as large a proportion of their children in school as are the more advantaged groups. Moreover, children coming from well-to-do families are significantly overrepresented at the higher educational levels. The reasons for these disparities are addressed in Section IV.B.

Table 11 presents, for four developing countries, the proportions of children enrolled broken down by parents' socioeconomic status. In all cases it is evident that enrollment rates are higher the better the position of the parents. In Colombia, for example, the lowest 60 percent of the families (with annual per capita income less than 36,000 pesos) enroll fewer than 50 percent of their children in education, whereas the enrollment rates among the top 7 percent (more than 120,000 pesos annually) rise to more than 60 percent.

Table 9:

EDUCATIONAL ATTAINMENT BY RACE, TRIBE OR RELIGIOUS GROUPS, SELECTED DEVELOPING COUNTRIES

Country and source	Group	Educational attainment (percent)			
		No schooling	First level	Second level	Post- secondary
<i>1954</i> <i>Source: UNESCO Statistical Yearbook, 1976)</i>	Total population a/	79.8	18.1	1.7	0.4
	Moslem population a/	92.7	7.2	0.2	0.0
<i>1974 b/ Source: Mazumdar 1979)</i>	Males, Kuala Lumpur	No formal schooling	Primary school	Some or completed secondary	Post- secondary
	Malay	2.0	42.7	48.7	6.6
	Chinese	3.5	43.5	47.9	5.2
	Males, East Coast towns				
	Malay	9.4	55.2	33.4	2.0
	Chinese	4.1	40.0	52.4	3.8
	Females, Kuala Lumpur				
	Malay	1.5	25.7	66.2	6.6
	Chinese	7.1	39.0	51.6	2.3
	Females, East Coast towns				
	Malay Chinese	14.8	10.9	50.6	3.7
	Chinese	7.7	30.9	57.7	1.9
<i>1955</i> <i>Source: Population Census, 1955)</i>	Total population c/	Illiterate	Literate	Primary	Secondary
	White	26.8	27.7	32.8	11.0
	Yellow	16.7	27.7	36.5	16.3
	Indians	38.5	27.0	28.7	5.5
	Mixed	36.7	30.7	25.1	7.1
	Blacks	41.7	26.4	28.6	3.2
		35.2	28.4	34.2	2.2
<i>1972</i> <i>Source: Oficina Nacional de Estadísticas y Censos, 1974)</i>	Maternal language	Without schooling	Primary	Secondary	Higher
	Total d/	30.2	51.2	14.8	3.0
	Spanish	21.6	54.5	19.1	3.9
	Quechua	50.3	43.7	4.8	0.7
	Aymará	42.2	51.7	5.0	0.6
	Other autochthonous	56.9	35.7	3.1	0.6
	Foreign	6.2	27.8	37.5	3.7
<i>1967</i> <i>Source: cited in Honor 1977)</i>	Ethnic group	Population e/	University admission		
	Sinhalese	71.0	84.1		
	Ceylon Tamil	11.1	14.1		
	Muslim	6.7	1.4		
	Burgher	0.4	0.1		
	Indian Tamil	10.6	0.1		
	Other	0.2	0.2		
	Total	100.0	100.0		
	Religion				
	Buddhist	66.3	79.2		
	Hindu	18.4	10.9		
	Muslim	6.9	1.4		
	Christian	8.3	7.8		
	Other	0.1	0.7		
	Total	100.0	100.0		

Refers to population 25 years or older.

Information is on employees only.

All civilized population.

Includes population 5 years or older.

Distribution of population by ethnic group corresponds to 1963.

TABLE 10

Distribution of Population by Educational Attainment in Urban and Rural Areas
Selected Developing Countries
Highest Educational level attained

Country	Year	Area	No schooling	First level	Secondary level	Post-secondary
Algeria	1971	Total	84.4	13.0	2.2	0.3
		Urban	73.5	20.5	5.2	0.8
		Rural	89.9	9.2	0.6	0.1
Kenya	1969	Total	75.9	20.5	2.8 a/	0.8 a/
		Urban	46.9	37.0	5.3 a/	10.7 a/
		Rural	79.5	18.5	1.1 a/	0.9 a/
Tunisia	1966	Total	89.1	7.1	3.0	0.7
		Urban	78.4	13.7	6.3	1.7
		Rural	96.4	2.7	0.8	0.1
Dominican Republic	1970	Total	40.1	45.9	12.1	1.9
		Urban	22.9	49.5	23.5	4.1
		Rural	52.8	43.2	3.7	0.3
Guatemala	1973	Total	93.9		4.9	1.2
		Urban	85.2		11.8	2.9
		Rural	98.7		1.1	0.2
Chile	1970	Total	13.1	61.0	22.2	3.8
		Urban	8.3	60.1	27.0	4.8
		Rural	29.8	64.2	5.4	0.6
Colombia	1973	Total b/	22.4	55.9	18.4	3.3
		Urban b/	14.2	54.8	26.1	4.9
		Rural b/	38.4	58.0	3.5	0.2
Paraguay	1972	Total	19.6	68.0	10.3	2.1
		Urban	11.2	63.6	20.4	4.8
		Rural	25.5	71.1	3.1	0.2
India	1971	Total	72.2	22.7	3.9	1.1
		Urban	46.6	36.8	12.3	4.2
		Rural	78.6	19.2	1.8	0.3
Indonesia	1971	Total	55.3	39.1	5.1	0.5
		Urban c/	22.0	56.9	14.1	7.0
		Rural c/	45.2	51.4	2.1	1.3
Korea	1970	Total	72.6		21.8	5.6
		Urban	53.0		36.0	11.0
		Rural	86.2		12.0	1.8
Malaysia (West Malaysia)	1970	Total d/	40.6	44.6	9.3 a/	5.5 a/
		Urban d/	32.2	42.7	14.0 a/	11.1 a/
		Rural d/	43.9	45.4	7.4 a/	3.2 a/
Sri Lanka	1971	Total	29.5	58.9	9.4	2.3
		Urban	20.6	58.8	16.8	3.9
		Rural	32.3	58.9	7.1	1.7
Yemen, Democratic Republic	1973	Total c/	72.9	22.1 e/		5.1 e/
		Urban c/	59.1	30.2 e/		10.7 e/
		Rural c/	80.0	17.9 e/		2.1 e/

Source: UNESCO Statistical Yearbook, 1976

- Note: a/ Those persons with completed secondary education are also included in the post-secondary figures.
 b/ Considers population of more than 20 years old.
 c/ Considers population of more than 10 years old.
 d/ Considers all population.
 e/ Those persons with completed primary education are also included in the post primary figures.

Table III:

ENROLLMENT RATIOS BY PARENTS' SOCIOECONOMIC POSITION, SELECTED DEVELOPING COUNTRIES

<u>Country and Source</u>	<u>Socioeconomic indicator</u>	<u>Enrollment (percent)</u>	
	<u>Socioeconomic group of head of household</u>	<u>Average monthly earnings (cruzeiros)</u>	<u>Enrollment ratios in basic education a/</u>
<u>Brazil, 1970</u> (Source: Jallade 1977)	Total males (nonfarm) Migrants from urban areas Migrants from rural areas Low socioeconomic background	873 688 691 247	77.5 79.9 69.1 63.1
	Total males (farm) Migrants from rural areas Low socioeconomic background	252 316 91	45.0 45.8 37.2
	Total females (nonfarm) Migrants from urban areas Migrants from rural areas Low socioeconomic background	380 520 247 187	76.8 77.5 66.7 64.4
	Total females (farm) Migrants from rural areas Low socioeconomic background	112 96 64	44.5 43.2 37.2
<u>Colombia, 1970 (Urban)</u> (Source: Jallade 1974)	Income bracket (pesos yearly)		<u>Enrollment ratios in all levels b/</u>
	0 - 6,000 6,000 - 12,000 12,000 - 18,000 18,000 - 24,000 24,000 - 30,000 30,000 - 36,000 36,000 - 48,000 48,000 - 60,000 60,000 - 72,000 72,000 - 84,000 84,000 - 120,000 120,000 - 180,000 180,000 - 240,000 Over 240,000		48.5 43.1 45.4 48.2 48.7 47.6 32.0 54.4 52.9 56.8 58.3 64.9 66.2 61.9
	Total		50.8
<u>Colombia, 1974</u> (Source: Selowsky 1979b)	Quintiles of household per capita income (poorest to richest)		<u>Enrollment ratios in primary education c/</u> <u>Enrollment ratios in secondary education c/</u>
	1 2 3 4 5 Average		72.2 17.1 84.0 21.9 86.6 28.2 95.1 43.8 89.8 62.5 82.9 31.5
<u>India, 1962 (Rural)</u> (Source: Datta and Meerman 1979)	Occupation (Cultivators)		<u>Enrollment Ratios in all levels d/</u>
	Big Medium Small Landless All groups		61.0 48.8 41.5 34.9 48.9
<u>Malaysia, 1974</u> (Source: Datta and Meerman 1979)	Quintiles of household per capita income		<u>Enrollment ratios in primary education e/</u>
	1 2 3 4 5 Mean		.85 .86 .93 .99 .90 .90

a/ Enrollment ratios are for children 6-14 years old, apparently classified by socioeconomic group of head of household; basic education includes primary and lower secondary levels.

b/ Enrollment rates are for children 5-25 years old, classified by family income.

c/ Enrollment rates are for children 6-12 years old for primary level and 13-19 years old for secondary level; in both cases children are classified by family per capita income.

d/ Enrollment rates are for children 5-15 years old, classified by family landholding status.

e/ Enrollment rates are for children of primary school age, classified by family per capita income.

Disparities among socioeconomic groups are even greater at the higher educational levels. As Table 12 shows, higher-level students are disproportionately from better-off families, whatever the measure of status.

It is noteworthy that participation in education thus appears to be more equally distributed than income. Differences in enrollment rates between socioeconomic groups are never larger than a factor of 2, whereas the incomes of the groups concerned vary by a factor of 10 or more.

It is also true that the educational systems in developing countries are not completely closed to children from a poorer socioeconomic background. If we look at the composition of the student body, we see that significant numbers of students from low socioeconomic backgrounds are enrolled in the higher levels of education. Note, for example, that in Colombia in 1967, 23 percent of the university students had parents with primary education or less; in Kenya in 1970, about 50 percent of students in the teaching training colleges had parents with no education (Table 12).

The distribution of education among a sample of 331 urban workers in Colombia and of those workers' parents is presented in Table 13. This data set shows that, although there is a pronounced relation between parents' and children's education, the correlation is far from perfect. There are large numbers of workers in the younger generation whose education greatly exceeds their parents', even after allowing for the general expansion of Colombia's educational system in the last generation; and at every educational level, considerable numbers of younger workers have attained less education than their parents.

Those who argue that educational systems are stratified and closed to the children of the poor see the facts in one way, and those who characterize developing countries' educational systems as vehicles for social mobility see the facts otherwise. There is truth in both perceptions.

5. Influence of Family Background on Achievement

In the earlier parts of this section, the emphasis was on quantity of education. If we look instead at the cumulative effects of quality, as measured by students' test scores, there seems to be a consensus that family background is a statistically significant determinant of students' measured achievement in school (Bhagwati 1973; Bowles 1971; Psacharopoulos 1978). The empirical evidence is less clear on the extent of this influence, not only in absolute terms but also as compared with other variables affecting achievement, such as student characteristics or school inputs.

An example of this evidence is reported by Leonar (1977) and is reproduced in Table 14. Students in four developing countries were given a common reading comprehension test. Students with more-advantaged socioeconomic backgrounds achieved higher scores in some of the learning categories, but in many more cases the differences in achievement were not significant. The evidence does not allow us to assess the importance of socioeconomic background in explaining the observed differences in scores.

Table 12:

DISTRIBUTION OF HIGHER EDUCATION STUDENTS BY PARENTS'
SOCIOECONOMIC BACKGROUND, SELECTED DEVELOPING COUNTRIES

Country and Source	Socioeconomic indicator	Distribution of education among students' parents (percent)		
		University students	Men, 40-59 years old	
<u>Colombia, 1967</u> (Source: Rama 1969)	<u>Level of instruc- tion of fathers</u>			
	Primary or less	23.0	89.4	
	Secondary	42.0	9.0	
	University, incomplete	8.0	0.3	
<u>India, 1954</u> (Source: cited in Bhagwati 1973)	<u>Average monthly income of family (Rs.)</u>	<u>College graduates</u>	<u>Income distribution of all families</u>	
	Below 200	29.1	80.3	90.6
	200-499	45.7	15.7	8.5
	500 and above	23.3	4.0	0.9
<u>(Source: Fields 1975b)</u>	<u>Not known</u>	1.9		
	<u>Occupational category</u>	<u>Primary TTCs a/</u>	<u>Secondary TTCs a/</u>	<u>University of Nairobi</u>
	High and middle level manpower	23	19	35
	Entrepreneurs, traders and businessmen	9	9	20
	Small-scale farmers	54	60	44
	Unskilled and traditional	14	12	1
	<u>Educational attainment</u>			
	None	49	48	21
	At least some primary	44	48	56
	Secondary or beyond	7	5	22
	<u>Percentage landowners</u>	87	87	73
	<u>Acreage of landowners</u>			
	0.1 - 4.9	34	32	15
	5.0 - 24.9	56	56	50
	25 and over	10	12	38
				52 d/ 41 d/ 7 d/
<u>Korea, 1970</u> (Source: Snodgrass 1977)	<u>Occupational group of students/household heads</u>	<u>University students</u>	<u>Male labor force</u>	
	Professional, technical and related	6.5	6.1	
	Administrative and related	5.9	---	
	Clerical and related	10.7	8.1	
	Sales	14.9	11.1	
	Service	4.4	4.4	
	Agricultural, fishermen, and the like	12.7	45.8	
	Production, transport, laborers	10.7	24.5	
	Others	34.0	---	

--- Not available

a/ TTC = Teacher Training Colleges.

b/ Reference group: all adult males.

c/ Reference group: all African males 40 years old and over.

d/ Reference group: percentage of number of landholdings.

Table 13:

EDUCATION OF PARENTS AND OF THEIR CHILDREN, FOUR COLOMBIAN CITIES, 1967

Education of younger generation (years)	Mean education of parents (years)						Average (total)
	0	1-3	3-5	5-8	8-11	11 or more	
0	3.6% (12)	0.9% (3)	0.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	4.8% (16)
1-3	7.5% (25)	10.0% (33)	4.5% (15)	0.9% (3)	0.0% (0)	0.0% (0)	23.0% (76)
3-5	3.6% (12)	11.5% (38)	13.0% (43)	1.5% (5)	0.6% (2)	0.0% (0)	30.2% (100)
5-8	0.9% (3)	4.5% (15)	8.2% (27)	3.0% (10)	0.9% (3)	0.0% (0)	17.5% (58)
8-11	0.3% (1)	2.7% (9)	5.4% (18)	3.9% (13)	2.4% (8)	0.6% (2)	15.4% (51)
11 or more	0.0% (0)	0.3% (1)	2.1% (7)	2.7% (9)	2.7% (9)	1.2% (4)	9.1% (30)
Average (Total)	16.0% (53)	29.9% (99)	33.5% (111)	12.1% (40)	6.6% (22)	1.8% (6)	100.0% (331)

Note: Numbers in parentheses are numbers of individuals in that cell.

Source: Fields (1976, Table 7).

Table 14:

STANDARDIZED MEAN SCORE DIFFERENCES IN READING COMPREHENSION
TEST BY SOCIOECONOMIC GROUP, SELECTED DEVELOPING COUNTRIES

Item tested	Children of professionals or executives vs. children of laborers				Children of professionals or executives vs. children of farmers or rural workers			
	Chile	India	Iran a/	Thailand b/	Chile	India c/	Iran	
Functional information	.031	.407 d/	.108	.012	.607 d/	.393	.071	
Comprehension	.725 d/	.211	.090	.162	.574 d/	.940	.163	
Application	.656 d/	.146	.015	.115	.607 d/	.653	.495	
Higher mental processes	.262	.104	.374 d/	.025	.561	.063	.204	

Note: The data represent the results from a common test applied by the International Association for the Evaluation of Educational Achievement in 21 countries. The population considered in the table are students in the last secondary grade.

Source: Leonor (1977).

/ Laborers are semiskilled workers.

/ Laborers are craftsmen and skilled farmers.

/ Rural workers are large-scale farmers.

/ Coefficients represent differences between the means (for the two classes being compared) divided by the standard deviation for the population. Significant at 5 percent level or better.

A different line of research on school achievement takes as its starting point the educational production function. These studies regress some indicator or indicators of educational performance against a set of variables which usually includes the student's personal and family characteristics, school inputs, peer or fellow student characteristics, and other relevant external influences.

The evidence from educational production functions in developing countries has been surveyed recently by Schieffelin and Simmons (1979). On the basis of twenty-six studies from more than twenty developing countries, they find that the socioeconomic status of the students' parents is a statistically significant predictor of school achievement in ten out of thirteen studies in which it is included. Moreover, many of these studies find that family background is the single most important determinant of school achievement. No indication is given, however, of how important the socioeconomic variable is, for example, in explaining differences in achievement among students, or in relation to other explanatory variables. Less clear is how these differences in school achievement affect future earnings. Empirical evidence in this respect does not exist for developing countries.

B. On the Intergenerational Correlation of Education and Income

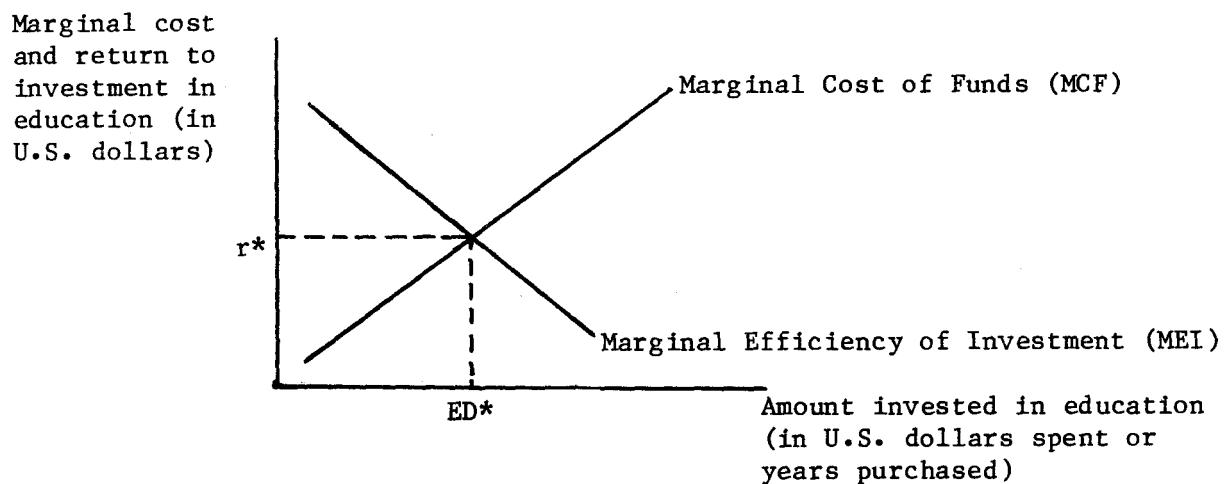
The association between parents' and children's educations across generations is well established from evidence such as that given in the foregoing section. Nobody questions that the children of the poor get less education on average than the children of the well-to-do. The question is why.

The literature offers varying interpretations for the intergenerational correlation of educational attainments and for education's role in transmitting economic status across generations. These fall into two general classes: human capital theories and social stratification theories.

The human capital theories emphasize the private benefits and costs associated with personal investments in education as the cause for intergenerational correlation of educational attainments and incomes. Individuals (or families acting on behalf of their children) are thought to choose that level of education for which the present value of expected future income (or utility) is maximized. The reason why some individuals get more education than others in human capital theory is that persons differ in their ability to benefit from education or in the costs they must pay to acquire the education, or in both. Imperfections in capital markets, lack of schools in a particular locale, or other barriers to investment in human capital - if they are considered at all in human capital theory - are typically considered as of secondary importance.

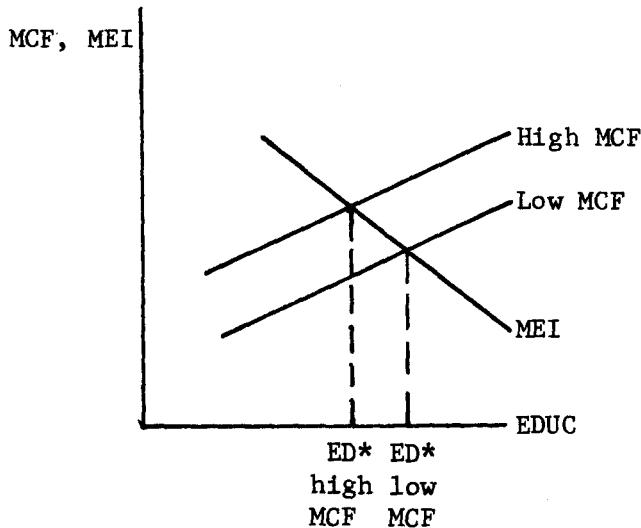
As formulated by Becker (1964 and second edition 1975; 1967) and amplified by Becker and Chiswick (1966), the human capital model closely parallels basic investment theory. The functions describing the private benefits and costs from investment in education correspond to the marginal efficiency of investment and marginal cost of funds schedules in the standard theory of investment. The marginal efficiency of investment function (MEI) gives the return on the marginal dollar spent on the last year of education. This function is thought to slope downward because of diminishing returns. The marginal cost of funds (MCF) function represents the cost of the funds

needed to pay for the education. This function increases with the amount of education, reflecting both increasing opportunity costs (because the better-educated forgo more income during the marginal year of school than do those with less education) and increasing direct costs (moving from the range where educational fees are paid for by the state, then to forgone consumption, then to withdrawals from savings, and then to increasingly expensive sources of borrowing). The downward-sloping MEI schedule and upward-sloping MCF schedule confronting a particular individual are illustrated in the following figure:



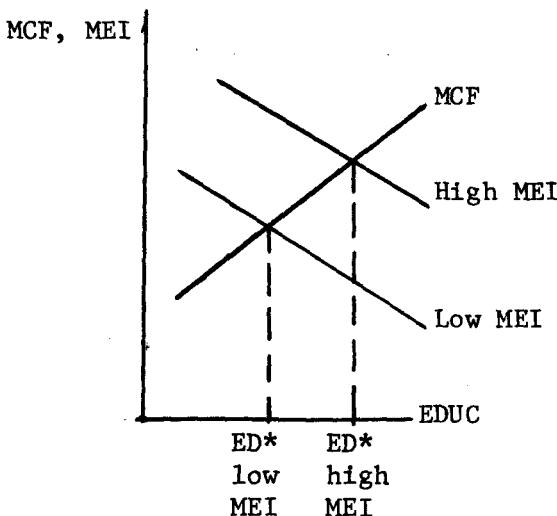
According to human capital theory, the individual in question would choose a quantity of education (ED^*) and earn a marginal rate of return (r^*) on his investment, because that is the level at which the marginal benefits and marginal costs of educational investment are equalized.

Intergenerational aspects enter in by considering how the MCF and MEI functions are linked with parents' education and other aspects of the person's socioeconomic background. Well-to-do parents are apt to be better educated. These well-to-do parents presumably face lower costs than do poor parents, probably in absolute terms and certainly in relation to their income. They are much less dependent on their children's labor; they can reduce consumption while the poor must reduce savings; draw on savings while the poor must borrow at high rates of interest; or borrow at whatever rate while the poor cannot borrow at all. Thus, the marginal cost functions are likely to be systematically higher for the children of the poor than for children from more favorable socioeconomic backgrounds. Individuals with high marginal cost functions, who must pay more to finance their education, would be expected to invest less in it than individuals with low marginal cost functions, as shown in the following figure:



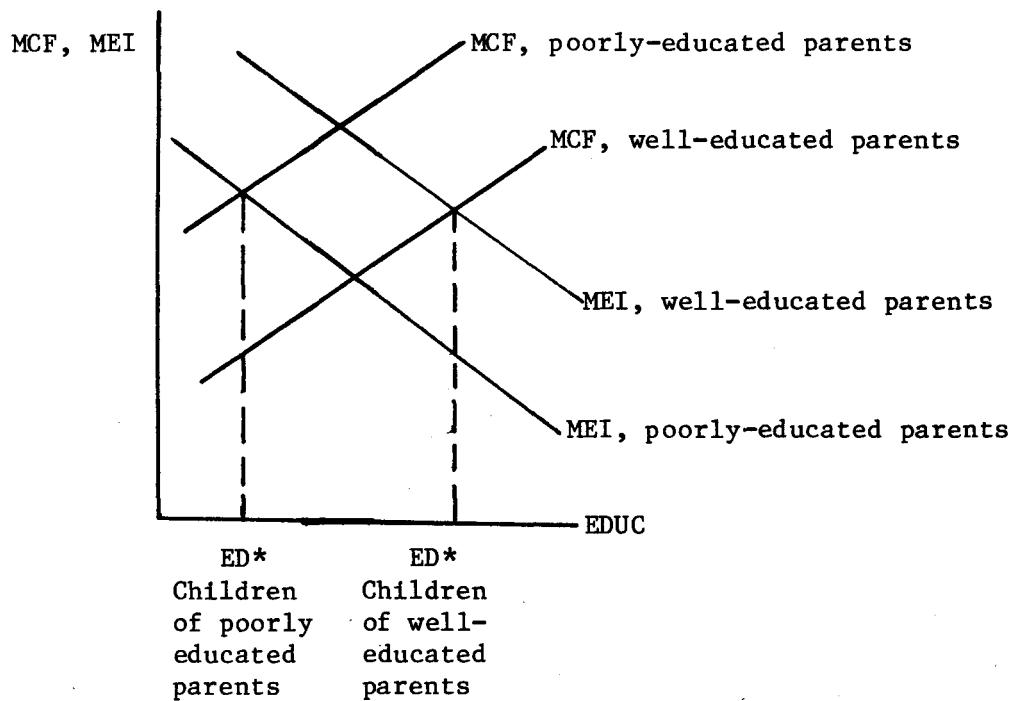
This is one reason why, in human capital theory, a correlation in educational attainments across generations would arise: poor parents must pay more and so they invest less; the less-educated are more apt to be poor, hence the less-educated parents have less-educated children.

The other set of explanations offered by human capital theory for the perpetuation of relative educational positions across generations is on the benefit side. Some individuals earn more than others in the labor market because of superior intelligence, greater socialization toward acceptance of traditional lines of authority, better contacts with potential employers, or by discrimination against others unlike themselves. Such individuals gain more from the same education than do others, and so presumably invest more in education, as the following figure illustrates:



These same well-to-do individuals are able to transmit these advantages to their children in a variety of ways -- including genetic inheritance, type of upbringing, resources available in the home, favoritism in the job market. Hence it is reasoned that children from advantaged backgrounds benefit more from education and so invest more; better-educated parents are more apt to be well-to-do, therefore better-educated parents have better-educated children.

The arguments from the two preceding paragraphs are combined in the following figure:



This summarizes how human capital theorists explain inequality in educational attainments, the correlation between parental and child education, and the perpetuation of such patterns over time. According to human capital theorists, differences in education within a generation are explained by market opportunities; across generations, market forces explain why the children of highly educated parents are themselves more likely to be highly educated.

In each generation, people with more education earn higher incomes. Better-educated parents are apt to have both higher incomes and better-educated children. These better-educated children, in turn, are more likely themselves to have higher incomes. Consequently, a high correlation between parents' incomes and children's incomes is expected. Hence, human capital theory offers strong market-based explanations of why education transmits economic status across generations. If the cycle is to be broken, there is a need for market intervention on behalf of the children of poorly-educated parents, at a minimum by lowering the marginal cost of funds (MCF) they must pay, if not also by reducing differences in the marginal efficiency of investment (MEI) by breaking down discrimination and other barriers to their opportunities in the labor market.

Social stratification theories emphasize other aspects of the intergenerational transmission of economic position and the role of education in that process. Social inequality theorists place heavy weight on the role of intergenerational transmission of values: well-to-do parents inculcate their children with initiative, perseverance, appreciation of education, and acceptance of the existing socioeconomic order. Analysts of class structure, many of them radical in their orientation, note that individuals often agree, tacitly if not formally, to band together to advance their own group's interest. Examples are the exclusive job networks in which nepotism and favoritism are central in determining access to employment opportunities. Theorists who argue that the labor market is segmented focus on the barriers faced by the poor, who for example lack access to schools and therefore are not free to choose their level of education.

Together, these alternative theories challenge the human capital theorist's premise that educational outcomes reflect different individuals' assessments of the marginal costs and marginal benefits of further educational investments. Human capital theorists would respond by observing that even the least advantaged members of society usually could choose to invest in the education of their children at some price, though the price might be many times larger than the family's resources and thus would be prohibitive.

From my reading of the various literatures on the causes of inequality, I conclude that the various approaches are rather similar in their accounts of the proximate reasons for inequality and education's role in it. Analysts of various persuasions generally agree that the monetary costs and benefits of education are central to determining which parents spend how much on the education of their children; and education is usually seen as the most important determinant of a person's economic position (whether gauged by income, occupation, or some other measure).

The human capital and social stratification theories appear to differ in two important dimensions: stratification theorists go further than human capital theorists by looking to the functioning of the economic system and the social and historical context in which it operates to understand the root causes of inequality, and stratification theorists are less willing than human capital theorists to regard the resulting pattern of income distribution as just simply because market forces provide powerful explanations for the observed outcomes.

These various approaches have led to different hypotheses about the relationship between distribution of education and distribution of income. In the human capital tradition, Mincer (1970) and Chiswick (1971) reasoned that the degree of income inequality in a country should be related positively to at least four factors: (1) the level of education in the population, (2) the dispersion of education in the population, (3) the rate of return to educational investments, and (4) the dispersion in rates of return

to educational investments. 1/ I shall not try to develop these models here; the interested reader is referred to Mincer's (1976) and Rosen's (1977) survey papers for reviews of the relevant literatures.

An alternative is the so-called job competition model (see Thurow 1975), by which an expansion of the educational system only affects the distribution of workers within the queue for jobs. Thus, if the distribution of job opportunities does not change, the overall income distribution does not change if more people are educated. All that happens is that the newly educated workers get jobs at the expense of those persons who do not get additional education. Moreover, Thurow's specific version of the model predicts that more people being educated would widen the wage differentials between the more educated and less educated, though other models similar to the job competition model suggest otherwise. 2/

A more radical approach associated with the names of Bowles, Gintis, and Carnoy has also been propounded. 3/ The essence of these views is a theory of class: the educational system helps to legitimize the positions of the elite at the top of the social structure and to perpetuate the existing social hierarchy and modes of production. The author say the educational system does this by establishing a meritocracy, by inculcating pupils with attitudes of acceptance toward the prevailing socioeconomic order, and by providing greater access to education for the children of more favored parents. Thus, in the radicals' conception, schooling (and its expansion) perpetuate income and class differences across generations. 4/

1/ The specific equation (from Chiswick, 1971) is:

$$\text{Var}(\ln Y) = k [N^2 \text{Var}(r)^2 + r^2 \text{Var}(N)^2 + 2N^2 r^2 \text{Var}(N) \text{Var}(r)]$$

where Y is individual earnings, k is the rate of human capital investment, N is the average number of years of training in the population, and r is the average rate of return to investment in training.

2/ Cf. the "bumping model" in Fields (1974).

3/ Early statements of these views may be found in Carnoy (1971) and Bowles (1971). More full developed treatments are the books by Carnoy (1972) and Bowles and Gintis (1975). Among their most recent works are Carnoy (1977) and Bowles (1978).

4/ In Bowles' words (1978, p. 784): "In this interpretation, the state serves to reproduce the social relations which define the position of the capitalist class and other dominant groups of the society... The educational system, as an important influence on political life, ideology, and the development of labor power as an input into the production process, is one of the main instruments of the state. The 'output' of school is the reproduction or transformation of social relations...."

To validate any of these alternative hypotheses, information is required on changes in income inequality in relation to changes in the distribution of education. So far, the data available are too scanty to permit systematic analysis.

C. Conclusions on Who Receives How Much Education and Why

It is clear from the evidence presented in this section that educational opportunities differ among different groups in developing countries. Whether stratified by sex, racial or tribal group, geographic location, or parents' socioeconomic status, differential participation in the educational system is a very important cause of income inequality and of its perpetuation over time. It has also been recognized that the children of the poor learn comparatively less well according to various measures of learning achievement. No direct evidence exists, however, on how such differentials affect income inequality in developing countries.

This section has considered alternative theories of the intergenerational correlation of educational attainments and of education's role in transmitting economic status across generations. Among the reasons why the least-advantaged groups invest less in the education of their children are market conditions that work against the poor and limitations on opportunities imposed by the class structures of stratified societies. Alternative theoretical paradigms lead to different predictions about whether income inequality will rise, fall, or remain unchanged as educational opportunities expand. Empirical testing, however, awaits better data.

V. THE SOCIAL BENEFITS OF EDUCATION

Given the evidence on the large private returns to education in developing countries, it would seem at first that the social benefits of education ought also to be considerable. The private benefits are frequently used with modification to approximate the social benefits of devoting further resources to education. This section reviews estimates of social returns to education in developing countries, summarizes the disagreement in the literature over the usefulness of the standard calculations, and considers another kind of social benefit -- reduced income inequality.

A. Education and the Incidence of Poverty

The evidence linking increased education with higher income and lower incidence of poverty is considerable. For 41 developing countries, Table 15 shows a clear correlation between the proportion of poor in a country (defined as persons with annual incomes below US\$50 per capita) and the educational attainment of its citizenry (as measured by the proportion of adults with no schooling). For the countries in the table, the correlation coefficient between the percentage poor and the percentage unschooled is +0.45. But it is also evident that both measures are highly correlated with the level of gross national product (GNP) per capita; the respective correlation coefficients are -0.67 between the proportion of poor and GNP, and -0.51 between the proportion of adults with no schooling and GNP.

Table 15:

EDUCATION AND THE INCIDENCE OF POVERTY, SELECTED DEVELOPING COUNTRIES

	1969 GNP per capita (U.S. dollars)	Percentage of total population with annual incomes per capita below US\$50	Percentage of adult population with no schooling a/
<u>Latin America</u>			
Argentina	1,054	...	8.3
Brazil	347	14.0	42.6
Chile	751	...	13.1
Colombia	347	15.4	22.4 c/
Costa Rica	512	2.3	20.6
Dominican Republic	323	11.0	40.1
Ecuador	264	37.0	32.9
El Salvador	295	13.5	54.7
Guyana	390	9.0	12.9 b/ d/
Honduras	265	28.0	65.9 b/
Jamaica	640	10.0	18.8 b/
Mexico	645	7.8	89.8 c/
Panama	692	3.5	24.9
Peru	480	18.9	35.0
Puerto Rico	1,600	...	14.4
Uruguay	649	2.5	14.1 b/
Venezuela	974	...	49.1 b/
<u>Asia</u>			
Burma	72	53.6	67.0 e/
India	100	44.5	72.2
Iran	350	8.5	88.5 f/
Iraq	316	24.0	94.9 f/
Korea	224	5.5	72.6
Malaysia	323	11.0	40.6 g/
Pakistan (East and West)	100	32.5	85.6 b/
Philippines	233	13.0	19.8
Sri Lanka	95	33.0	29.5
Thailand	173	26.8	34.1
Turkey	290	12.0	58.0 f/
<u>Africa</u>			
Chad	75	43.1	94.4 b/ h/
Gabon	547	15.7	87.6 b/ h/
Ivory Coast	237	7.0	95.0 b/ h/
Madagascar	119	53.8	66.5 h/
Niger	94	33.0	98.6 b/ h/
Rhodesia	274	17.4	43.0
Senegal	229	22.3	94.4 b/ h/
Sierra Leone	165	43.5	94.4 b/ h/
South Africa	729	12.0	49.5 b/
Tanzania	92	57.9	71.9 h/
Tunisia	241	22.5	89.1 f/
Uganda	128	21.3	71.8
Zambia	340	6.3	63.9

... Negligible.

Sources: For data on 1969 GNP and percentage of population with low annual income per capita, Ahluwalia (1974, p. 12); for percentage of population with no schooling, UNESCO Statistical Yearbook, 1976.

- a/ Adult population refers to persons of 25 or more years old; information is for circa 1970.
- b/ Circa 1960.
- c/ Population 20 or more years old.
- d/ Population 15 or more years old.
- e/ Only urban areas, 1953.
- f/ For 1965 or 1966.
- g/ Includes all ages.
- h/ Illiterates in the population 15 or more years old.

At the regional level within countries, Table 16 shows for nine Latin American countries that differences in poverty rates between urban and rural areas are associated with rural-urban education differences. Notably more poverty and greater illiteracy were observed in rural areas.

The whole literature on the relationship between education and poverty at the aggregate level is plagued by a persistent difficulty: the problem of two-way causation. One possibility is that the negative correlation between education and poverty arises primarily because a better-educated populace contributes to economic growth. This would be the position of human resource optimists. But there is another possibility. Undoubtedly, some poor countries spend little on education because they cannot afford to spend more. With economic growth comes the ability to spend more on both investment and consumption goods; education fits into both categories. Assuredly, educational growth causes economic growth and economic growth permits educational growth, but the relative importance of these two simultaneous effects has not yet been demonstrated satisfactorily.

In short, with more education comes less poverty, whether at the level of the nation, the region within a country, the family, or the individual. But, to repeat an earlier observation, the existing literature has not established to what extent education is the cause of poverty reduction and to what extent the result.

B. Social Rates of Return: The Evidence

Social rates of return are the standard approach in the economics of education for evaluating countries' past educational performance and in planning education for the future. I should say at the outset that I have serious conceptual reservations about the validity of these calculations for developing countries. But before I go into the reasons, let us look at the numbers.

Social rates of return have been calculated for many countries, both developed and developing. The available evidence has been synthesized by Psacharopoulos (1973) and is reported in Table 17.

Three findings of Table 17 are of interest. One is that, for nearly all countries at all educational levels, the private rate of return exceeds the social rate. For higher education, the difference is 6.2 percentage points (between an average private rate of return of 17.5 percent and an average social rate of 11.3 percent). For secondary education, the difference is smaller but still noticeable: 2.8 percentage points (the private return averages 16.3 percent, while the social return is 13.5 percent). That private returns are larger than social returns reflects society's subsidization of education, so that costs are borne partly by taxpayers and not fully by the students themselves. This is often thought necessary because individuals would otherwise invest too little in education compared with the true social payoff. Reasons for this claim are listed in Thurow (1970, Chapter 7).

Table 16:

EDUCATION AND THE INCIDENCE OF POVERTY: REGIONAL COMPARISONS WITHIN
NINE LATIN AMERICAN COUNTRIES

	Percentage of households below the poverty line a/			Percentage of pop population that is illiterate b/		
	Urban	Rural	National	Urban	Rural	National
Argentina	5	19	8	5.8 c/	18.1 c/	8.6 c/
Brazil	35	73	49	20.0	53.6	33.8
Colombia	38	54	45	11.2	34.7	19.2
Costa Rica	15	30	24	4.9	17.0	11.6
Chile	12	25	17	7.6	27.2	11.9
Honduras	40	75	65	26.1 c/	64.6 c/	55.0 c/
Mexico	20	49	34	21.3 c/	48.9 c/	34.6 c/
Peru	28	68	50	12.6	51.9	27.6
Venezuela	20	36	25	20.9 c/	62.7 c/	36.7 c/

Sources: Altimir (1978) and UNESCO, Statistical Yearbook, 1976.

a/ 1970 estimates.

b/ The reference group is population 15 years or older; estimates
are for the early 1970s except when noted.

c/ Circa 1960.

Table 17:

SOCIAL AND PRIVATE RATES OF RETURN BY EDUCATIONAL LEVEL AND COUNTRY,
SELECTED DEVELOPING AND DEVELOPED COUNTRIES
(Percentages)

		Rate of return by educational level			Private	Private	High
		Primary	Social	Higher			
United States	1959	17.8	14.0	9.7	155.1	19.5	13.6
Canada	1961	...	11.7	14.0	...	16.3	19.7
Puerto Rico	1959	17.1	21.7	16.5	> 100.0	23.4	27.9
Mexico	1963	25.0	17.0	23.0	32.0	23.0	29.0
Venezuela	1957	82.0	17.0	23.0	...	18.0	27.0
Colombia	1966	40.0	24.0	8.0	> 50.0	32.0	15.5
Chile	1959	24.0	16.9	12.2
Brazil	1962	10.7	17.2	14.5	11.3	21.4	38.1
Great Britain	1966	...	3.6	8.2	...	6.2	12.0
Norway	1966	...	7.2	7.5	...	7.4	7.7
Sweden	1967	...	10.5	9.2	10.3
Denmark	1964	7.8	10.0
The Netherlands	1965	...	5.2	5.5	8.5
Belgium	1967	9.3	10.4
Germany	1964	17.0
Greece	1964	...	3.0	8.0	...	5.0	14.0
Turkey	1968	8.5	...	24.0	26.0
Israel	1958	16.5	6.9	6.6	27.0	6.9	8.0
India	1960	20.2	16.8	12.7	24.7	19.2	14.3
Malaysia	1967	9.3	12.3	10.7
Singapore	1966	6.6	17.6	14.6	...	20.0	25.4
The Philippines	1966	7.0	21.0	11.0	7.5	28.0	12.5
Japan	1961	...	5.0	6.0	...	6.0	9.0
S. Korea	1967	12.0	9.0	5.0
Thailand	1970	30.5	13.0	11.0	56.0	14.5	14.0
Hawaii	1959	24.1	4.4	9.2	> 100.0	5.1	11.0
Nigeria	1966	23.0	12.8	17.0	30.0	14.0	34.0
Ghana	1967	18.0	13.0	16.5	24.5	17.0	37.0
Kenya	1968	21.7	19.2	8.8	32.7	30.0	27.4
Uganda	1963	66.0	28.6	12.0
N. Rhodesia	1960	12.4
New Zealand	1966	...	19.4	13.2	...	20.0	14.7

... Negligible

Source: Psacharopoulos (1973, p. 62).

Table 18:

DIFFERENCES BETWEEN PRIVATE AND SOCIAL RATES OF RETURN TO EDUCATION
IN DEVELOPED AND DEVELOPING COUNTRIES
(Percentages)

Country type	Educational level					
	Secondary			Higher		
	Private	Social	Difference	Private	Social	Difference
Developed	11.9 (7)	9.5 (8)	2.4	11.9 (11)	9.4 (10)	2.5
Developing	18.5 (14)	15.2 (18)	3.3	22.0 (14)	12.3 (8)	9.6
All	16.3	13.5	2.8	17.5	11.3	6.2

Note: Numbers of countries are in parentheses.

Source: Psacharopoulos (1973, p. 67).

A second finding is that developing countries have higher rates of return on average than developed countries, as can be seen from Table 18. This finding is offered by some as evidence for the proposition that poor countries are underinvesting in education compared with richer countries (and, for that matter, compared with the opportunity cost of capital). One policy implication of this view might be to direct a large fraction of the world's resources toward education in low-income countries.

A third general pattern in Psacharopoulos' data is that primary education generally has a higher social rate of return than secondary and higher education, as Table 19 indicates.

Table 19:

RELATIVE RANKING OF SOCIAL RATES OF RETURN BY EDUCATIONAL LEVEL

Educational level	Number of developing countries by rank of social rate of return		
	1st	2nd	3rd
Primary	14	1	3
Secondary	4	9	5
Higher	--	8	10

Source: Psacharopoulos (1973, P. 66).

This is often taken to imply that these countries should invest a larger proportion of their educational budgets in lower levels of education. Some would even go so far as to say that the education sector is misallocating its resources if it puts money into higher education when the highest rate of return is elsewhere.

I agree with the practical conclusions of the preceding paragraphs but not for the reasons given. My reasons are given in the following section.

C. Critique of Social Rate of Return Analysis

Social rate of return analysis is predicated on the assumption that differences in incomes among individuals with different educational attainments reflect differences in their social marginal productivity, and that those differences are because of the education they have received. This assumption is indefensible, I submit, in the circumstances of substantial unemployment and underemployment that characterize most developing countries' labor markets. It is a matter of some debate whether social rates of return are even approximately valid under the conditions prevailing

in the developing countries' labor markets. I think not, for reasons given below. Mine is, however, an unusually critical position. The mainstream view is more positive--see, for example, the survey paper by Berry and Sabot (1979) and the other papers in this volume.

A thorough social rate of return analysis would contain at least the following features:

- o Identifying the Beneficiaries. Educational programs are usually justified on the basis of the number of beneficiaries. But also important here is a characterization of the beneficiaries by socioeconomic status. It should be shown that the beneficiaries are drawn from the selected group; fears that educational expansion caters mainly to the elite should be allayed.
- o Measuring Size of Benefits. To assess the economic benefits, information is needed on what the newly educated persons are doing. What kind of work do they find and how much do they earn from it? How much more productive are they in that work after education than before? Are others without education being displaced, and, if so, what are they doing instead?
- o Quantifying magnitude of costs. Account must be taken of both the direct costs of education and the opportunity costs. Often, for an educational program, the relevant comparison is with the costs of some other educational program. For example, the opportunity cost of educating one additional student for one year at a university is that of X fewer elementary school pupils.
- o Estimating incidence of costs. School fees are typically a fraction of the total cost. The incidence of fees and forgone earnings parallels the incidence of benefits. But the incidence of other direct costs must also be estimated. This is where such features of the tax structure as its progressivity or regressivity, and overall budget surplus or deficit, enter in. It is probably the case in many developing countries that taxpayers as a group, including many poor families, help to subsidize the education of the few, who are drawn disproportionately from the middle and upper classes.
- o Consideration of other social benefits. In concentrating here on the economic benefits, other social benefits should not be disregarded. These benefits should be considered, even though they probably cannot be precisely quantified.

Compared with this list, cost-benefit analysis of education as actually practiced (see Table 20) is strikingly deficient. It should be evident from Table 20 that the so-called "social rates of return" to investments in education leave a great deal to be desired. As conventionally computed, the average social rates of return neither indicate all the right questions nor measure all the right phenomena. A detailed critique of the usual methods appears in the appendix to this paper.

Table 20:

COST-BENEFIT ANALYSIS OF EDUCATION IN PRACTICE

<u>Aspect of cost-benefit analysis</u>	<u>Treatment in literature</u>
Identifying the beneficiaries	Number of beneficiaries usually is taken into account; composition of beneficiaries is usually ignored
Measuring size of benefits	Usually assumes that marginal benefits = average benefit; this is unjustifiable in cases of labor surplus (see appendix)
Quantifying magnitude of costs	Usually done well
Estimating incidence of costs	Sometimes included as an afterthought; most frequently is ignored
Consideration of other social benefits	Sometimes is done; may be used to override cost-benefit calculations

D. Distribution of Education and Inequality of Income

An important social benefit of education may be to affect the income distribution in such a way as to reduce income inequality. The available evidence is of two kinds: international cross-section at a single point in time, and intertemporal comparisons within countries. 1/

1. Cross-Sectional Studies

The earlier empirical studies, some in the human capital tradition and some not, performed cross-sectional analyses relating education variables to different countries' income inequality at a single point in time. One set of studies examined educational levels (as measured by school enrollment ratios, literacy rates, or average educational attainment) and consistently reported a negative relation between educational level and income inequality. 2/ Adelman and Morris (1973), using a sample of forty-three developing countries, concluded that the "rate of improvement of human

1/ In presenting this evidence, I pass over the question of how inequality is best measured. The inequality indices in common use are satisfactory for the purposes at hand.

2/ The reader may have noticed that the Mincer-Chiswick model leads to the prediction that level of education is positively related to income inequality, whereas the empirical evidence shows a negative relation. These are not necessarily inconsistent findings, since Mincer and Chiswick's predictions relate to ceteris paribus effects and the empirical evidence reflects the effects of everything, including changes in the education level.

resources" (as measured by the school enrollment rate) was a significant negative determinant of income inequality. A similar negative relation between school enrollment and income inequality was found in subsequent research by Chenery and Syrquin (1975), who used a somewhat larger sample of developing countries. Consistent with these results are the findings of Ahluwalia (1974, 1976a, 1976b), based on a sample of sixty-two developing countries, that higher levels of literacy are associated with lower relative income inequality in the cross section.

I am aware of three studies that have looked at the dispersion of education and its relation to income inequality. One is that of Chiswick (1971). Because of data limitations at the time, he was restricted to a cross section of just nine countries, four of them developing. Using three different inequality measures, he found a statistically significant relation between income inequality and the variable measuring inequality of educational attainments, with the anticipated positive sign in two out of three cases. The other study is that of Psacharopoulos (1978) - which for forty-nine countries (eleven of them developed), showed that educational inequality, was positively and significantly associated with the Gini coefficient of income inequality, even after controlling for the level of per capita income.

Further evidence on the relations between the level and dispersion of schooling and income distribution has been presented recently by Winegarden (1979). Using data from thirty-two countries (eighteen of them developing), he regressed the share of income of the bottom four-fifths of households in each country against the mean and variance of educational attainment of their population. His results were consistent with those of previous studies. Both the level and the dispersion of education are significant in explaining income inequality: the mean educational attainment is negatively related to income inequality, and greater inequality in educational attainment is associated with higher income inequality.

To summarize the cross-sectional evidence, studies to date suggest that those developing countries with higher levels of education exhibit less income inequality. With respect to the dispersion of education, the three studies reviewed above report that greater inequality of educational attainments is associated with greater income inequality.

2. Intertemporal Studies

Turning to intertemporal comparisons within countries, one finds that the evidence is limited. A number of observers (e.g., Jallade 1979; Carnoy 1977) have called attention to a seeming paradox: despite the rapid growth of educational systems in developing countries, there has been at best little reduction in income inequality in those countries. An analysis (Fields 1978b) for five developing countries (Brazil, Costa Rica, India, Philippines and Sri Lanka) concluded that there is "... a closer relationship between educational performance and aggregate economic growth than between educational performance and distribution (in terms either of relative inequality or of absolute poverty)."

These facts should not be regarded as anomalous, since it is the distribution of education, much more than the level of education, that we would expect to be associated with income inequality.

A more systematic method for investigating the relationship between education and income inequality has been applied by Langoni (1972) and Fishlow (1973) for Brazil. In trying to explain the increased inequality in incomes in Brazil over the 1960s, both studies decompose the change in income inequality, as measured by the log variance indicator, into three components: changes in the educational composition of the labor force, changes in the average incomes received by each educational group, and changes in income inequality within each educational group. 1/ According to Langoni and Fishlow, the changes in each of these components led to greater income inequality in Brazil. However, both authors strongly differ in how they interpret these changes. On the one hand, Langoni (1972) argues that increased inequality is a natural, but temporary, result of the speed at which the Brazilian economy grew, especially at the end of the 1960s. By this reasoning, increased income inequality should not be considered an undesirable aspect of economic growth over the period. On the other hand, Fishlow (1973) emphasizes the role of governmental policies, which favored a select few, as the main cause of the increase in income inequality. In his view, rising inequality offsets the welfare gains associated with income growth, so that it is even questionable whether welfare increased at all.

What this debate points out, for our purposes, is that it is of primary importance to understand the causal mechanisms by which education and income distribution are related. Only with this understanding can the contribution of education to income equality (or inequality) be fully assessed.

1/ Chiswick and Mincer (1972) developed a different framework to explain changes in income inequality over time while working with a dynamic version of the basic human capital equation. The four human capital variables in their analysis are the level and dispersion of education and the level and dispersion of rates of return to education. If those four factors enter into the determination of income inequality at a single point in time, then, by first differencing, it follows that changes in income inequality over time can be explained in part by changes in those four factors, by the levels of those factors, and by the correlations among them. Chiswick and Mincer used this framework to analyze changes over time in income distribution in the United States. These authors are strong advocates of the human capital approach to income distribution analysis, which many students of developing countries find to be of positive but limited value. Logically, one need not adhere to all the premises of human capital analysis--in particular the strong market orientation and marginal productivity assumptions--to accept the Chiswick-Mincer formulas as a point of departure for empirical research.

E. Conclusions on the Social Benefits of Education

One social benefit of education is higher national income. Another is a lower incidence of poverty. The associations between the amount of education (as measured by school enrollment ratios, literacy rates, or average educational attainment), the level of national income, and the incidence of poverty are well documented. At the national, regional, or even micro level, when education goes up, aggregate income goes up and poverty goes down. But association is no proof of causation, since it is true both that a high level of education causes higher national income and reduced poverty and that higher national income and reduced poverty permit a high level of education. Researchers have not yet resolved which of these two simultaneous effects is relatively more important. But even if it were demonstrated that the principal reason for the observed correlations is that educational growth causes higher national income and reduced poverty, this would be presumptive but insufficient grounds for deciding to expand education, since the costs of further education have yet to be entered into the calculation.

The private benefits and costs of education are sometimes used with modification to approximate the social returns to devoting further resources to education. The consensus in the literature is that private rates of return to education appear to exceed social rates, that developing countries have higher rates of return on average than developed countries, and that primary education generally has a higher social rate of return than secondary or higher education. Though these conclusions may be right, they are based on what I consider to be a weak methodological foundation. There is some disagreement in the literature on the usefulness of standard social rate of return calculations under the labor market conditions that prevail in developing countries. I personally regard the estimates as so distorted that they greatly overstate the true social returns to higher levels of education, but my position is not generally shared. Although social cost-benefit analyses indicate the right questions, they must do a better job of answering them.

Another possible social benefit of education is diminishing income inequality. For evidence on the relations between education and income inequality, we must rely primarily on cross-sectional patterns. These patterns, though only suggestive, are consistent on two points: those countries with higher levels of education exhibit less income inequality on average; and, on balance, greater disparities in educational attainments among the population are associated with greater income inequality. Little evidence on inter-temporal change is available, and what evidence there is is inconclusive. Systematic procedures have still to be applied to analyze the growth of education and changing income inequality in developing countries.

VI. EDUCATIONAL FINANCE AND INCOME DISTRIBUTION

Another way in which educational systems may affect the distribution of income is by charging some income groups a larger share of the costs of education than their children receive in benefits and by using the proceeds to subsidize the education of others. This chapter discusses how educational systems in developing countries are financed and how the costs and benefits of education are distributed across income groups.

A. Educational Finance

Are the costs of education in developing countries distributed equally? Or do some groups pay more than others? The answer may be found by estimating the social costs borne by different socioeconomic groups or income classes at different levels of education.

A first point is how much the educational system is financed directly by the students and their parents and how much it is supported publicly. Of course, in any given country, the answer depends on the extent of private vis-a-vis public education and on the amount of subsidization the government provides to each. A piece of evidence in this respect is presented in Table 21 for three Eastern African countries: Ethiopia, Kenya, and Tanzania. Some of the conclusions that can be drawn from these data are:

- (1) In the three countries large proportions (90 percent or more) of the expenditures on education are directed to the public educational systems.
- (2) The public educational systems are financed mainly by the government. In Ethiopia and Kenya public financing by the national government provides 70 percent of the total resources of the system. In the case of Tanzania the corresponding figure exceeds 90 percent.
- (3) Household resources supply a relatively small proportion of the financing of public educational systems. Household resources are most important in Kenya, where they make up 17 percent of the financing of public education; in Ethiopia and Tanzania they provide only 1 percent of the total.
- (4) Private educational systems are financed predominantly or exclusively by households' direct contributions. The respective proportions are 50 percent in Ethiopia, 90 percent in Kenya, and 100 percent in Tanzania. In all cases public financing of private educational systems is negligible.
- (5) From (1) and (4) above, since most educational resources in these countries are spent on public education and since public education is funded predominantly by public financing, it follows that public taxes are the main source of educational finance in these countries.

Table 21

DISTRIBUTION OF TOTAL EXPENDITURES ON PUBLIC AND PRIVATE EDUCATION
BY SOURCES OF FUNDS, THREE EAST AFRICAN COUNTRIES

Sources of financing	Ethiopia 1970-71 (millions Ethiopian dollars)					Kenya 1970-71 (millions Kenyan pounds)					Tanzania 1970-71 (millions Tanzanian shillings)				
	Public educational system	Private educational system	Total	%	Public educational system	Private educational system	Total	%	Public educational system	Private educational system	Total	%			
National resources	93.2	8.9	102.1	72.4	37.9	5.8	43.7	89.7	548.3	16.8	565.1	97.3			
Public financing	91.7	0.4	92.1	65.1	30.0	0.0	30.0	61.6	541.8	0.0	541.8	93.3			
Household resources	1.3	8.2	9.5	6.7	7.1	5.5	12.7	26.1	6.1	16.8	22.9	3.9		-287-	
Other private resources	0.2	0.3	0.6	0.4	0.8	0.3	1.0	2.0	0.4	0.0	0.4	0.1			
Foreign Resources	31.4	7.7	39.0	27.6	4.7	0.3	5.0	10.3	15.6	0.0	15.6	2.7			
External Loans	4.0	0.0	4.0	2.8	0.1	0.0	0.1	0.2	2.2	0.0	2.2	0.4			
External assistance	27.4	7.7	35.0	24.8	4.6	0.3	4.9	10.1	13.4	0.0	13.4	2.3			
Total	124.5	16.6	141.1	100.0	42.4	6.1	48.7	100.0	563.9	16.8	580.7	100.0			

Source: ter Weele (1975): Tables 2-8, 3-9, 4-9.

These conclusions hold qualitatively for most developing countries. This being the case, it is important to determine who pays the taxes and who pays the fees that finance the private educational systems.

Studies of the incidence of taxes in developing countries have been synthesized in a review paper by de Wulf (1975), to which the interested reader is referred. It is beyond the scope of this paper to analyze in detail the methodology underlying the conclusions obtained. For our purposes it will suffice to extract the main conclusions, which are based on forty-four studies covering twenty-two less developed countries:

For twelve of these studies, owing to their specific approach or their limited coverage, no general impression of suggested rate progression could be obtained. Of the remaining thirty-two studies, twenty-two suggested some progressivity in the effective tax rate schedule. This progressivity pattern was often an uneven one and frequently did not extend up to the highest income or expenditure brackets or started only from the second or third income class. The degree of progressivity of the tax rates also varied from steep (however defined) to moderate. The results of eight other studies could be characterized as suggesting some wandering proportionality in the rate pattern. These countries are mainly in Latin America... The taxes of only two countries (Greece and the Philippines) could be characterized as regressive.

The general impression left by the studies surveyed here is that the tax system in developing countries tends to burden the incomes of rich families relatively more than the incomes of poor.

These studies are not without their limitations, as de Wulf himself points out. Despite the tentative nature of their results, however, it is fair to conclude that the higher income groups pay more absolutely, and an equal or higher proportion of their incomes relatively, to finance school costs as compared with the lower income groups.

A second issue is whose children attend private schools. A detailed study of Colombia by Jallade (1974) (see Table 22) clearly shows that, at all levels of education, those families in the higher income brackets are more apt to enroll their children in private schools. For example, in the top 20 percent of the families (annual incomes 60,000 pesos or more) 50-90 percent of the children at primary and secondary levels are in private schools, whereas in the lower 60 percent of the families (annual incomes less than 36,000 pesos) the comparable figure never exceeds 20 percent and is much lower in most cases. Moreover, if we consider that school fees vary widely from one private school to another and that families from the highest income brackets tend to send their children to the most expensive schools, we may infer that the distribution of fee payments in private schools is much more concentrated at the top of the income scale than the enrollment rates show.

Table 22:
DISTRIBUTION OF ENROLLMENT IN PUBLIC AND
PRIVATE SCHOOLS BY FAMILY INCOME LEVEL, URBAN COLOMBIA
(in Percentages)

Annual income bracket (pesos)	Educational level					
	Primary		Secondary		Higher	
	Public	Private	Public	Private	Public	Private
0- 6,000	95.0	5.0	95.0	5.0	--	--
6,000- 12,000	90.0	10.0	90.0	10.0	100.0	--
12,000- 18,000	85.0	15.0	85.0	15.0	100.0	--
18,000- 24,000	89.1	10.9	79.9	20.1	100.0	--
24,000- 30,000	89.1	10.9	81.0	19.0	95.0	5.0
30,000- 36,000	89.5	10.5	81.0	19.0	90.0	10.0
36,000- 48,000	64.8	35.2	58.9	41.1	85.7	14.3
48,000- 60,000	54.6	45.4	49.7	50.3	86.3	13.7
60,000- 72,000	42.5	57.5	38.7	61.3	67.1	32.9
72,000- 84,000	34.5	65.5	31.3	68.7	54.3	45.7
84,000- 120,000	22.4	77.6	20.3	79.7	35.2	64.8
120,000- 180,000	20.3	79.7	18.4	81.6	32.0	68.0
180,000- 240,000	11.9	88.1	11.1	88.9	19.2	80.8
Over 240,000	12.0	88.0	11.0	89.0	19.3	80.7
Total Enrollment	<u>72.5</u>	<u>27.5</u>	<u>49.0</u>	<u>51.0</u>	<u>54.8</u>	<u>45.2</u>
Number (thousands)	1,316	500	341	355	46	38

Source: Jallade (1974, Table 3.11).

To sum up, the evidence presented thus far shows that the financing of the educational systems in less developed countries is borne more than proportionally by the higher income groups. This is for two reasons.

Public Education. Public educational systems are heavily subsidized by governments. Thus, who bears the financing of public education depends mainly on the tax structure, which in turn seems to be proportional or even progressive to some degree in most less developed countries.

Private Education. Private educational systems draw students disproportionately from the upper income groups. Because private educational systems are in general financed through direct fees paid by the students (or their parents), and because the children of the higher-income families tend enroll more frequently in private schools, it follows that the higher-income groups pay a disproportionately large share of the costs of private education.

The above conclusions pertain only to the incidence of the direct costs of financing the educational systems. There exist, however, opportunity costs borne by the students, or their parents, that are also relevant. These opportunity costs consist of the income the students could earn if they were working instead of being enrolled in schools. The richer families bear a more than proportional share of these opportunity costs, since a disproportionate number of students are from richer families because of the higher enrollment rates among the well-to-do. This is strengthened by the fact that opportunity costs increase with the level of education, and disparities among enrollment rates tend to be greatest at higher educational levels.

We may therefore conclude that both direct and indirect costs of education in developing countries are borne more than proportionally by upper-income families.

B. Distribution of Costs and Benefits of Education

In this part, the question under investigation is: how do the costs of education borne by parents in various income groups compare with the benefits received by their children? This requires us to compute the distribution of costs according to parents' income, the distribution of benefits according to parents' income, and then to compare the two. The studies reported below share this methodology.

The studies differ, however, in what specifically is included under costs and benefits. Some view the educational system primarily as a fiscal program that grants subsidies (benefits) to pupils and pays for these subsidies (costs) out of current tax revenues. Others also consider additional costs and benefits -- in particular, future income gains and opportunity costs that come from attending school. The inclusion of these other items in the comparison leads to a more comprehensive research approach.

The remainder of this section reviews studies of the distribution of educational costs and benefits in three countries: Kenya (Fields 1975b), Colombia (Jallade 1974), and Chile (Foxley et al. 1976, 1977a, 1977b). 1/

1. In Kenya

My study of the higher educational system in Kenya (Fields 1975b) was done at the same time as Jallade's work on Colombia (see the next subsection). Some methodological differences bear highlighting. I attempted to estimate broadly the social costs and benefits of education received by different income classes, where Jallade (and most authors after him) have limited attention to public sector subsidies and taxes. Because of data limitations, however, my work was restricted to higher education, whereas Jallade and others have been able to study primary and secondary education also.

Table 23 presents the estimated values of direct costs and benefits of investing in the three levels of higher education in Kenya (primary and secondary teacher training colleges, and university). Earnings data were based on public service salary scales. The system is fully subsidized, so no direct private costs need be imputed. The remaining cost items consist of the implicit subsidy given by the government (rows 1 and 4) and the direct opportunity costs borne by the students. Both figures are large relative to family income. Forgone earnings are at least Shs. 9,000 annually (the entrance salary for public service), which corresponds to the top 2 percent of the distribution of income (see Table 24). Still, these costs are small when compared with the benefits of attaining a high educational level. The additional income obtained by those who continue their education after secondary school is so large that it yields a rate of return of about 30 percent annually. Thus, higher education in Kenya is a lucrative investment that yields large benefits and places an individual at the very top of the income distribution. 2/

1/ Two other studies dealing with the comparison of costs and benefits of education across income groups are not reviewed here. One of them is Jallade's (1977) work on Brazil. His study has a fundamental methodological problem: conclusions about different benefits for different groups are based on the individual's own household's characteristics, rather than those of his parents' household. The second study is that by Szal (1979) on rural Botswana. This work has not been included because of doubts regarding the quality of the underlying data expressed by those in the World Bank familiar with it. Two studies dealing with the distribution of benefits (subsidies) from education have been published recently: Selowsky (1979b) for Colombia and Meerman (1979) for Malaysia. Neither addressed the distribution of the costs of education, therefore they are not included here. Finally, all the studies that are presented below deal only with the redistributive effect of the financing of public educational systems. I am not aware of any study that tries to assess the costs and benefits accruing to different income groups whose children are enrolled in the private educational systems.

2/ Benefits here are defined as the net present value of attaining the higher educational level -- that is, present value of increased income less direct costs (only forgone earnings in the case of Kenya).

Table 23:
COSTS, BENEFITS, AND PRIVATE RETURNS TO DIFFERENT
EDUCATIONAL INVESTMENTS IN KENYA, 1971
(Kenya Shillings)

Item	Educational attainment		
	Primary TTCs	Secondary TTCs	University of Nairobi
Average annual social cost ^{a/}	3,140	5,600	17,740
Direct private cost	0	0	0
Total forgone earnings (undiscounted)	18,160	27,600	47,100
Total direct subsidy after Form 4 ^{b/}	6,280	16,800	55,600
Present value of private benefits compared with Form 4: ^{c/}			
r = 0%	302,820	549,660	771,880
r = 5%	99,852	192,184	277,182
r = 10%	37,626	82,882	120,818
Private internal rate of return over Form 4 (percent)	28	33	31

Note: One Kenya shilling = US\$0.14 in 1971; TTC = teacher training college.

Source: Fields (1975b, Table II).

a/ Average annual social cost = (recurrent expenditures + amortization of current development expenditures + depreciation on existing capital stock) ÷ number of pupils.

b/ Form 4 is the last level of secondary school.

c/ For the details on the calculations, see the source.

Who receives the benefits and who pays the taxes? The relevant data are given in Table 24. Columns 2 and 3 show the distribution of taxpayers and of taxes by income class. Columns 4, 5, and 6 present the distribution of students at the three levels of higher education by their parents' income class. Because at each level of education the direct costs and benefits are the same for all students, the last three columns also represent the distribution of benefits by income class.

These data can be evaluated with three different criteria:

Equal Opportunity. By this criterion the system is equitable if each income group has access to higher education equal to its proportion in the population. As Table 24 shows, this condition is not satisfied; the proportion of students coming from low-income families is less than the proportion of low-income families in the total population. From this observation it may be concluded (Fields 1975b, p. 256) that "...Kenya's higher education is found to be inequitable intergenerationally, since the few who are favored are disproportionately the children of the well-to-do, whether measured by income class, or various indices of socioeconomic status".

Cost-Benefit. By this criterion, the system is equitable if each group pays a proportion of the costs equal to the proportion of the benefits it receives. On this definition, the system appears to be close to equitable, although there is some tendency to favor middle-income groups as against the highest income groups.

Ability to Pay. By this criterion, the system is equitable if the cost-benefit ratio rises as a function of income. Comparing column (3) of Table 21 with columns (4) through (6), we find that the richest receive a much larger share of the benefits than the proportion they pay of the costs. The patterns for the other income classes, which contain the majority of families, are mixed. The approximate proportionality over those ranges might be regarded as inequitable if ability to pay is used as the standard.

These somewhat contradictory conclusions suggest that the way in which the data are analyzed is important in coming to qualitative conclusions about the equity of educational finance. Each of the preceding criteria applies to the questions of vertical equity -- that is, the fairness of different groups' contribution to the costs of education in relation to the benefits received. A less ambiguous conclusion, which is equally relevant to other countries, pertains to horizontal equity (Fields 1975b, p. 257): "...The main inequity in Kenya's higher educational system is horizontal. A select few receive a very large payoff and, if they were not relatively rich when they started their higher education, they will be relatively rich when they complete it. In other words, the system is horizontally inequitable ex post though less so ex ante." (Emphasis in the original.)

2. In Colombia

For Colombia, Jallade (1974) took the subsidies received by students as the benefits of education and used the tax cost of these subsidies as a measure of the costs of education. His estimates of costs and benefits for

Table 24:

INCIDENCE OF TAXES AND DISTRIBUTION OF HIGHER EDUCATION
BY INCOME OF STUDENTS' PARENTS, KENYA 1971
(in percentages)

Annual Income Bracket (Shs) (1)	Distribution of taxpayers (2)	Distribution of taxes (3)	Distribution of students by parents income class		
			Primary TTCs (4)	Secondary TTCs (5)	University of Nairobi (6)
0- 2,400	90.5	67.9	70.7	74.7	60.2
2,400- 3,600	5.4	8.8	3.8	4.0	2.2
3,600- 4,800	1.3	2.2	6.2	4.9	2.2
4,800- 6,000	0.7	1.4	5.6	4.4	11.8
6,000- 8,400	0.5	1.5	6.2	4.7	11.8
8,400- 12,000	0.5	2.4	1.9	1.8	2.2
12,000- 16,800			3.4	0.9	
16,800- 24,000	1.1	15.7	0.8	5.6	2.2
Over 24,000			1.4	2.4	
Total	100.0	100.0	100.0	100.0	100.0

Source: Fields (1975b, Table III, p. 252).

urban Colombia are presented in Table 25. 1/ Columns (2) and (3) show the proportion of taxes paid by the different income classes under two alternative assumptions regarding tax incidence. The distribution of public subsidies by educational levels across income groups is presented in columns (4) through (7). Columns (8) and (9) measure, under two alternative assumptions, the ratio of public subsidies for education to that group's total tax burden.

By the criterion of ability to pay, the financing of Colombia's educational system appears to be highly progressive: the proportion of benefits received by the poor is much higher than their share of the costs [as shown by the indices greater than 100 in columns (8) and (9)], and the ratio of benefits to costs decreases steadily as income rises. We may conclude from these observations that the system of educational finance in Colombia redistributes significant amounts of income from richer families to the poorer groups.

A closer examination shows, however, that the redistributive effects vary across educational levels. In Jallade's own words (1974): "...it is clear that the positive effect of the public financing of education in Colombia is only due to the financing of primary education which strongly benefits the poor. This positive effect is partially but not wholly offset by the negative income-distributive effect of the public finance of secondary and higher education which benefits most of the lower and upper middle class, respectively..." (Emphasis in the original.) 2/

When the criterion of equal opportunity is applied -- that is, the proportion of the overall benefits received by the poor is compared with their share in the population -- Jallade's data suggest that the poor share less than proportionately in the benefits of education. But this conclusion has been challenged recently by Selowsky (1979b), who used data from Colombia for 1974, ordered households by their per capita income rather than their total income, and found that the distribution of benefits closely corresponds to the income distribution of households. A comparison of the results of both studies is presented in Table 26. The discrepancy can be fully explained by the reordering of households from one income concept to the other. 3/

To sum up, the evidence for Colombia shows whether or not the financing of public education appears equitable depends on the criterion used to compare the costs and benefits received by the different income groups.

1/ Jallade also reports results for rural and all of Colombia but he expresses less confidence in the quality of the rural data. Because the general conclusions do not change qualitatively, only the results for urban areas are presented here.

2/ The shares of the educational levels in total expenditures on public education were: 41.0 percent for primary, 31.4 percent for secondary, and 27.6 percent for higher.

3/ Similar evidence on this point has been illustrated by Datta and Meerman (1979), who used Malaysian data. It is likely that this discrepancy also characterizes the studies of Kenya and Chile presented in this section.

Table 25:

URBAN COLOMBIA: ALLOCATION OF TAXES AND PUBLIC SUBSIDIES
FOR EDUCATION AMONG INCOME GROUPS, 1970
(in percentages)

Annual income bracket (pesos)	Distribution of families (1)	Allocation of taxes		Allocation of public subsidies for education				Subsidies received as proportion of taxes paid	
		Alt.1 (2)	Alt.1 (3)	Primary (4)	Secondary (5)	Higher (6)	Total (7)	Alt.1 (8)	Alt.1 (9)
0-	6,000	2.1	0.2	0.1	3.3	1.7	-	1.9	309
6,000-	12,000	12.6	1.5	0.9	11.9	1.7	1.0	5.7	119
12,000-	18,000	15.2	3.6	2.4	17.0	6.7	2.2	9.7	84
18,000-	24,000	15.1	5.3	3.5	18.6	15.1	5.4	13.9	81
24,000-	30,000	10.0	4.5	3.1	14.8	14.1	1.1	10.8	74
30,000--	36,000	7.5	4.4	3.0	9.9	9.9	6.8	9.0	63
36,000-	48,000	9.5	7.7	5.4	9.6	15.0	14.1	12.5	50
48,000-	60,000	7.3	6.7	4.6	4.6	11.9	18.6	10.8	50
60,000-	72,000	4.3	5.5	4.0	3.1	6.7	16.5	7.9	45
72,000-	84,000	3.6	5.0	3.6	2.3	4.8	6.6	4.3	26
84,000-	120,000	5.9	12.1	8.9	2.0	5.1	9.8	5.1	13
120,000-	180,000	3.7	11.4	14.8	1.6	3.9	11.1	4.9	13
180,000-	240,000	1.9	8.5	12.7	0.6	1.8	3.0	1.6	6
Over	240,000	1.3	23.5	33.0	0.6	1.6	3.8	1.8	2
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	31
									30

Table 26

DISTRIBUTION OF PUBLIC SUBSIDIES FOR EDUCATION
BY HOUSEHOLDS' INCOME AND PER CAPITA INCOME, COLOMBIA

Household income (thousands of pesos)	Jallade, 1970		Selowsky, 1974	
	Distribution of households (%)	Distribution of subsidies (%)	Quintiles of households' per capita income	Distribution of subsidies (%)
0- 6	19.0	5.9	Lowest	19.8
6-12	20.2	9.5	Second	20.2
12-24	24.9	23.7	Third	18.6
24-60	22.9	38.7	Fourth	20.1
over 60	13.0	22.2	Highest	21.3
Total	100.0	100.0		100.0

Source: Selowsky (1979b, Table 3.20).

3. In Chile

A study of fiscal incidence in Chile may also be used to compare various groups' educational costs and benefits. Foxley, Aninat, and Arellano (1976, 1977a, 1977b) derived data by income class on the distribution of fiscal expenditure on education along with taxes (see Table 27). These authors used basically the same methodology as Jallade. Benefits were evaluated at the cost of government subsidies and were assigned to the enrolled students, whose distribution by parents' income class was known.

By the criterion of ability to pay, the educational financing in Chile appears to be highly equitable: as column (8) of Table 27 shows, the cost-benefit ratio increases steadily as income rises. However, we also observe that the proportion of benefits accruing to the lower 60 percent of the households is smaller than these households' share in the population, which means that the equal opportunity criterion is not met and the educational system is regressive by that measure.

When the data are disaggregated by educational level, it appears that the bulk of the benefits reaching the lower-income groups accrues through the subsidization of primary schooling. ^{1/} Moreover, at higher educational levels, a larger fraction of the benefits accrue to middle- and higher-income groups. This reflects the fact that the children of the poor participate relatively less in the higher levels of education.

C. Conclusions on Educational Finance and Income Distribution

In summary, we may draw the following conclusions from these studies of Kenya, Colombia, and Chile:

- o Public educational systems are heavily subsidized by governments. Thus, who supplies the financing of public education depends mainly on the tax structure, which in turn seems to be proportional, or even progressive, to some degree in most developing countries.
- o Private educational systems draw students disproportionately from the upper income groups. Because private educational systems are, in general, financed through direct fees paid by the students (or their parents), and the children of the higher income families tend to enroll more frequently in private schools, it follows that the higher income groups pay a disproportionately large share of the costs of private education.
- o The distribution of the benefits from education in developing countries appears to be highly inequitable by the criterion of equal opportunity. That is, in all cases in which households are ordered by their total income, the proportion of benefits accruing to

^{1/} The shares of the educational levels in total public educational expenditures were: 36.3 percent for primary, 18.4 percent for secondary, 27.2 percent for university, and 18.1 percent for other expenditures.

Table 27:

CHILE: DISTRIBUTION OF TAXES AND PUBLIC EXPENDITURES
IN EDUCATION BY INCOME CLASS, 1969

Household annual income (in minimum annual income units)	Distribution of households (1)	Distribution of direct and indirect tax burdens (2)	Primary (3)	Secondary (4)	University (5)	Other educational expenditures ^{a/} (6)	Total (7)	Cost-benefit ratio, total (7)/(2) (8)
0 - 1	29.8	7.6	19.5	11.1	6.2	21.4	14.7	.52
1 - 2	31.6	18.1	38.4	31.0	27.8	36.1	33.8	.54
2 - 3	17.6	17.3	23.6	29.0	16.1	22.0	22.3	.78
3 - 4	7.4	9.6	10.4	12.3	13.8	9.9	11.6	.83
4 - 5	4.5	7.7	3.5	5.6	7.3	3.8	5.0	1.54
5 - 6	2.9	7.0	1.2	2.0	4.0	1.4	2.1	3.33
6 - 8	2.7	7.8	1.3	3.8	6.4	1.9	3.2	2.44
8 - 10	1.5	6.5	0.6	1.5	1.9	0.7	1.1	5.91
10 or more	2.0	18.2	1.5	3.7	16.5	2.8	6.2	2.94
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

Sources: Columns (1) and (2): Foxley, Aninat, and Arellano (1977a, Table 13);
Columns (3) through (7): Foxley, Aninat, and Arellano (1977b, Table 14).

a/ Includes expenditures on technical and vocational training, provision of free lunch for primary students, other programs of financial assistance, and expenditures on school buildings.

students from the lower income groups is much smaller than the share of lower income groups in the population. In Colombia, however, when households are ordered by their per capita income, the system appears broadly equitable by the equal opportunity criterion.

- o Although the poor participate less in the benefits of education, they also bear a lower proportion of the costs.
- o On balance, the costs of education rise with income faster than do the benefits of education. Thus the cost-benefit ratios are higher for the richer groups in the countries examined, and hence fiscal financing of public education appears to be effective in redistributing income from the rich to the poor.
- o This redistributive effect varies across educational levels. As the studies for Colombia and Chile show, most of the redistribution toward the poor takes place through primary education; the financing of secondary and higher education tends to benefit disproportionately the middle- and higher-income classes.

APPENDIX:

CRITIQUE OF SOCIAL COST-BENEFIT ANALYSIS IN EDUCATIONAL PLANNING

Social cost-benefit analysis is often used as a criterion for social decision-making in the field of education. This is done in either of two ways. One way is to estimate the net present value of benefits minus costs using an appropriate social discount rate. The social value of education is then estimated as the dollar difference between the discounted streams of benefits and costs. If this number is positive, the investment is said to be profitable; if negative, not profitable. The other way of conducting social cost-benefit analysis is to find that internal rate of return which equates the present values of benefits and costs. With this method, the social value of education is estimated as a percentage rate of return per dollar invested. This is then compared with the interest rate on the best alternative investment.

We economists pose the right question when we ask what additional benefits will result for a given extra expenditure of funds. But the economics of education has difficulty in translating this general principle into operationally meaningful terms. To evaluate the social cost-benefit studies, several issues arise. Are most if not all of the social costs and benefits enumerated? Are these benefits and costs evaluated correctly? What is the proper social interest rate to be used for comparison?

In actual practice, the general cost-benefit principle (that society should allocate resources to that activity with the largest marginal social benefit per dollar expended) is usually compromised, often severely. The result, too frequently, is neglect or misevaluation of the most important costs and benefits of education. On occasion, these studies are worse than useless: they may be downright misleading. My reasons for this critical assessment are explained in what follows.

I have two principal worries. One is that standard rate of return studies are only indirectly linked to development objectives such as poverty alleviation or inequality reduction. My other concern is that the benefits of education may be seriously misestimated by established procedures.

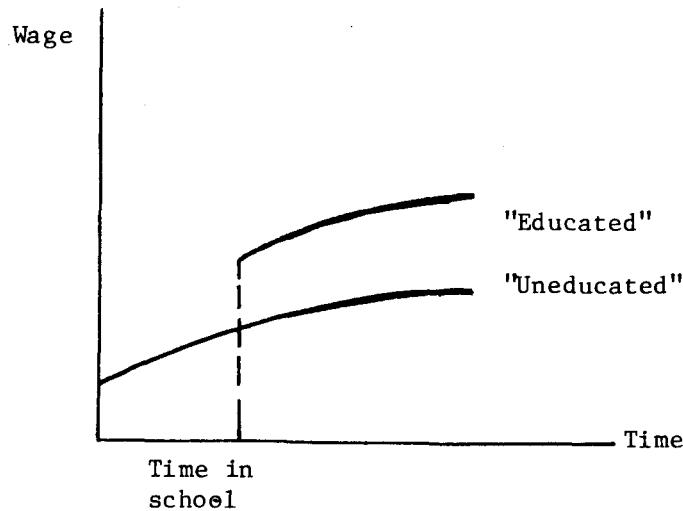
Before passing judgment on the costs and benefits actually included in social return to education studies, we must be clear on prevailing practices. In actual studies, on the cost side, social costs include the direct costs of education (teachers' salaries, amortization of school buildings, books and supplies, etc.) plus the indirect opportunity cost of income foregone while students are in school (approximated by the income earned by a representative individual in the labor force who had not completed that schooling level). On the benefit side, the social gain from education is taken as the difference in income between individuals with and without the education level in question. Sometimes, this differential is multiplied by a more or less arbitrary proportionality factor designed to adjust for selection and self-selection of students according to ability.

After itemizing factors which are taken into account in social return to education studies, it should be clear that much is missing. When education is considered as an indicator of progress and commitment toward development, much weight is given to the participation of the poor in education. In contrast, conventional social rate of return studies ignore who the beneficiaries of education are and who pays the costs. Without this kind of information, it is impossible to weigh the contribution of education to development as compared with, say, public health programs or rural electrification. The success of an antipoverty or pro-equality program cannot be judged by comparing aggregate costs with aggregate benefits alone.

It is also evident that many of the presumed noneconomic benefits of education are not dealt with. Most economists would not worry too much about this. They would say that the economic benefits are fairly well enumerated and evaluated. Thus, most economists would regard conventional social rate of return estimates as a reasonable approximation to the economic returns to social investments in education; but since noneconomic returns are neglected, they would consider the true social return to education to be greater. Hence, if social rates of return are calculated in the usual way and are found to be high, their presumption is that investment in education is worthwhile, both economically and socially. On the other hand, if the estimated social rates of return are found to be low, educational programs must be justified on some other, noneconomic grounds. It is in this way that virtually all education economists use social rates of return estimates for policy evaluation and planning.

I disagree with accepted practice on this. While incomplete enumeration of social benefits may lead to an underestimate of the actual returns to education, my concern is that the usual way of evaluating social benefits is improper and leads to an overestimate of the economic returns, conceived of as the gains in output produced by a more educated labor force. To see why the accepted evaluation procedure may be unjustified and misleading in a less developed country context, we must look carefully at the way social benefits to education are evaluated in the standard literature.

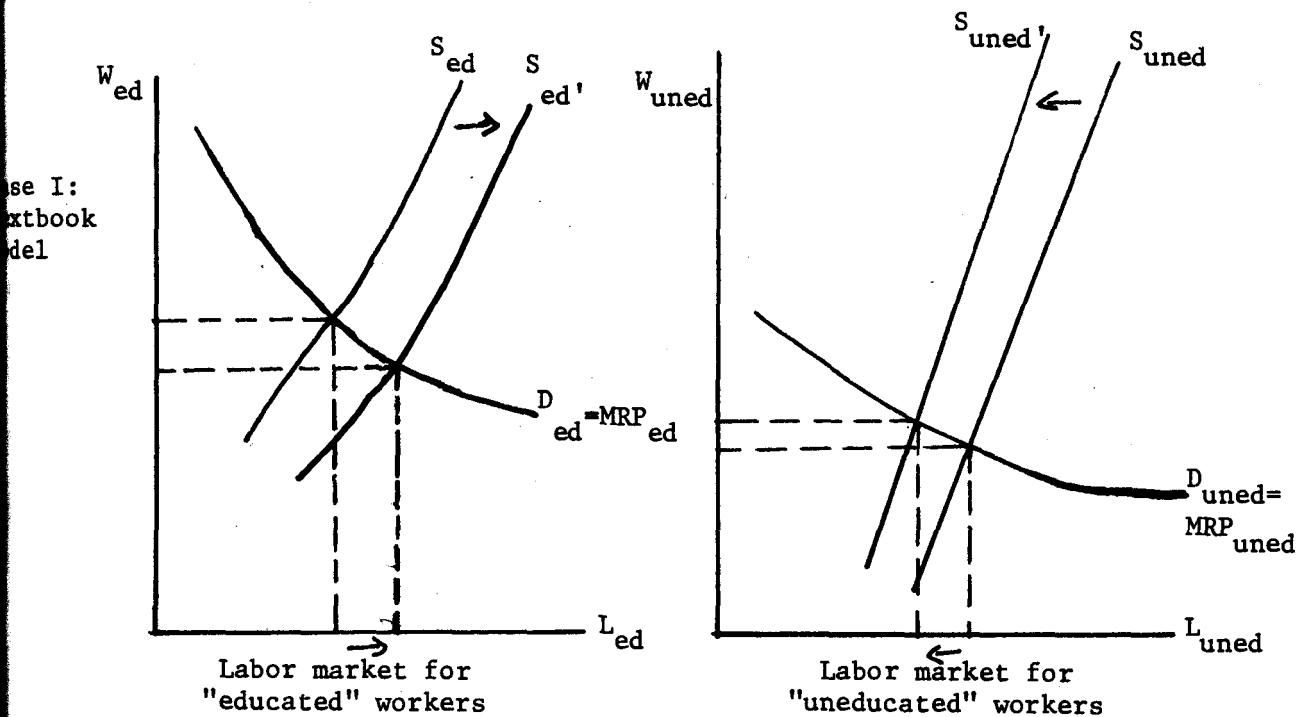
Customarily, the benefits of education are found by comparing income profiles of persons with and without a particular level of education (for simplicity, termed "educated" and "uneducated" respectively). These profiles may look like this:



This diagram depicts profiles for the average individual. Rates of return based on such profiles are therefore average rates.

As always in economics, for policy purposes, the interest is in the marginal expenditure, in this case, the marginal dollar spent on education or the marginal individual who receives that education. That is to say, the question for social decision-making in the education field is this: if society invests \$X in more education, what is the extra benefit?

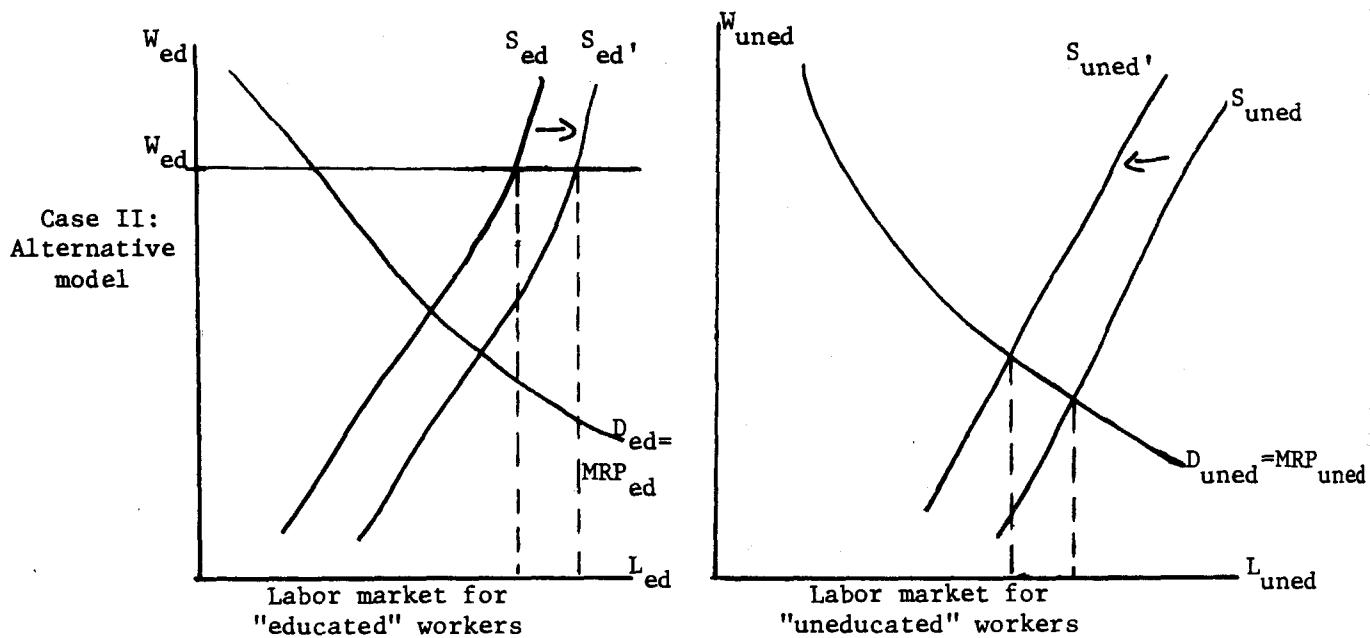
The conventional assumption maintained in the literature is that the marginal and average benefits from education are approximately equal, as are the marginal and average costs. On the cost side, this assumption poses little problem. On the benefit side, the assumption of equal marginal and average benefits is correct if the labor market works in the standard textbook fashion, i.e., wages and employment are both determined by supply and demand:



Educating an additional person shifts the supply of educated labor by one unit to the right and shifts the supply of uneducated labor by one unit to the left. The newly-educated worker is employed at the educated worker's wage (W_{ed}), which is only slightly different from the wage received previously by other educated workers. Likewise, the wage for uneducated workers changes slightly, but only by a small amount. Under the maintained assumptions of the textbook model--that the demand for labor reflects the marginal revenue product of labor and that the labor market is in full competitive

equilibrium--the average wage differential between educated and uneducated workers then approximates the gain in social output due to the education of an additional worker.

Now, I contend that the textbook model does violence to the actual workings of labor markets in many less developed countries. Often, these countries are characterized by a surplus of educated labor (surplus in the sense that more educated persons are available for work at the prevailing wage than are demanded at that wage). Graphically, the situation looks like this:



Unlike the competitive model where both employment and the wage are determined by supply and demand in the labor market, I think it is more realistic to view the causal ordering as follows:

- (i) the wage is determined above the market-clearing level by some combination of institutional and market forces;
- (ii) firms determine employment in the textbook way by hiring until the marginal revenue product of labor equals the wage; and
- (iii) the supply of labor is a function of both the wage received while working and the volume of employment.

Suppose now that one more person is educated. If the labor surplus situation holds, the newly-educated individual enters the educated labor market (shift of the supply curve from S to S'). But unlike the textbook case, he will not be employed, since the wage does not fall to accommodate him. No new output is gained. The marginal social benefit in economic terms is zero. On the other hand, output is foregone (approximately MRP_{uned}) and real resources are used to educate him. The marginal social return (marginal social benefits of education minus marginal social costs) is negative, at least in familiar output terms.

A numerical example may help illustrate these points. Consider a simple case of two types of labor (skilled and unskilled) and two occupations: clerks (the skilled occupation) and gardeners (the unskilled occupation). Wages for the two occupations are taken as given. Assume that education is required for a job as a clerk and is preferred for a job as a gardener. This means that in a labor surplus situation, the educated workers compete amongst one another for jobs as clerks, but any educated person who seeks a job as a gardener is hired preferentially at the gardeners' wage.

Suppose the state of the economy is:

Wage of clerks (dollars per day)	\$20
Employment of clerks	50
Supply of clerks	100
Wage of gardeners (dollars per day)	\$10
Total employment of gardeners	40
Supply of educated gardeners	25
Employment of uneducated gardeners	15
Supply of uneducated gardeners	75

The question is whether additional investment in education is profitable. It would appear from these data that the answer is yes. Educated workers employed as clerks receive twice the wage of uneducated workers employed as gardeners, and educated workers have three times the probability of being employed at all. It might be presumed, therefore, that educational investment is worthwhile for society. But still, we should carry through the appropriate calculations.

To compute private and social rates of return to education, (ignoring still who receives the benefits and who pays the costs) we need three additional pieces of information: a projection of future labor market conditions to gauge the private benefits, a measure of the educated-uneducated productivity differential to gauge the social benefits, and knowledge of the costs of education.

Concerning the future state of the labor market, let us make the simplest possible assumption: that current labor demand conditions (i.e., number of workers demanded in each occupation and the wage paid in each) will remain the same forever. This implies:

- (i) The current expected income differential between educated and uneducated workers (\$8 per day = \$2,000 per year) is expected to prevail throughout the individual's working life.

On the cost side, let us assume:

- (i) It takes one period to educate a person; and
- (iii) The private cost of being educated (out-of-pocket cost plus foregone earnings) is \$1,000.

Equating the present value of private benefits with the present value of private costs, the private rate of return is given implicitly by

$$2,000 \frac{1}{1+r} + \frac{1}{(1+r)^2} + \dots + \frac{1}{(1+r)^T} = 1,000,$$

where T is the relevant time horizon, presumably retirement. For sufficiently large T , the left hand side is approximately $2,000/r$. We then find that the private rate of return to educational investment is 200 percent. It would be an understatement to say that education would be a very lucrative personal investment.

Consider now the social rate of return as conventionally computed. To compute the conventional social rate of return, we also need data on the social cost of education. To reflect the realistic condition that education in LDCs is typically highly-subsidized, assume:

- (iv) The social cost of educating one person is \$10,000.

The conventional social rate of return is given implicitly by

$$2,000 \frac{1}{1+r} + \frac{1}{(1+r)^2} + \dots + \frac{1}{(1+r)^T} = 10,000,$$

and is found to be 20 percent. By the customary calculations, educational investment would appear desirable, provided the return on other alternative investments were lower, say 10 percent. Some might even say that this hypothetical country is not fully committed to education, since it is foregoing a seemingly advantageous social investment.

The problem with the inferences of the previous paragraph is that they are based on average rather than marginal calculations. The marginal social rate of return is that internal rate which equates the marginal social benefits to the marginal social costs. This rate may be large, small, zero, or negative, depending on the size of the productivity gains resulting from education. Nothing in the data we have so far tells us which is the case (unless, that is, we make the assumption that an additional newly educated individual would be employed at the skilled wage; this assumption is inconsistent with the spirit of the labor surplus model under investigation).

The proper guide for assessing the economic costs and benefits of educational investment is the marginal social rate of return. To compute it, we need some assumption about the productivity of educated workers relative to uneducated ones in the unskilled occupation, since that is where the newly educated individual will be employed. 1/ Suppose in our example:

- (v) An educated gardener is 2 percent more productive
than an uneducated one.

The marginal social benefit is 2 percent of the gardener's wage, $2\% \times \$10/\text{day} \times 250 \text{ days/yr.} = \$50/\text{yr.}$ The marginal social rate of return is given implicitly by

$$50 \frac{1}{1+r} + \frac{1}{(1+r)^2} + \dots + \frac{1}{(1+r)^T} = 10,000,$$

the solution of which yields a marginal social rate of return of one-half of one percent. 2/ Despite the earlier findings that the average private and social rates of return are very high (200 percent and 20 percent respectively), we would probably all agree from this final calculation that educational investment would be undesirable, at least in a strict economic sense.

I would conclude from this theoretical exploration that the usual types of estimates of social rates of return to education in less developed countries are unreliable and possibly grossly misleading.

At least one real-world study supports this theoretical skepticism. I am familiar with only one empirical cost-benefit study of education which calculates a marginal social rate of return. In a study of Greece, Psacharopoulos (1970) constructed a linear programming model with different skill grades of labor and estimated the shadow wage rates for each. For our purposes, the most interesting conclusion is: "In the case of Greece, investment priorities with respect to investment in skills estimated on the basis of observed labour earnings would have suggested a change in the wrong direction of the educational output." (Emphasis added.)

Lest the critique of this appendix be misinterpreted, let me reiterate: the logic of social cost-benefit analysis in education is sound. Social cost-benefit analysis asks the right questions. It must do a better job of answering them.

1/ The reason he will be employed in the unskilled occupation is to maintain supply side equilibrium. The educated workers' labor market is in supply side equilibrium only when the expected wages are equal in the two alternative occupations, which they are in the hypothetical data. If a newly educated worker enters the skilled occupation (clerk), his presence there would depress the expected wage for clerks below the expected wage for educated gardeners; he (or someone like him) could gain by taking up employment as a gardener.

2/ It is mathematically impossible for the internal rate of return to be negative if T , the time horizon, is allowed to approach infinity in the limit.

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