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INVESTMENT IN EDUCATION IN DEVELOPING COUNTRIES. A CRITICAL REVIEW OF SOME ISSUES.

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Abstract

This paper first reviews a series of (apparently) conflicting views concerning the micro mechanism by which education affects growth as well as their implications for social and private choices concerning investment in education. A special effort is made to trace the effect of distorted labor markets and unemployment on the contribution of education to output; at the same time it is pointed out that these characteristics of labor markets can introduce an important gap between social and private rates of return to schooling.

Chapters B and C analyze the implications of reaching a consensus on two issues: first, the need of an elementary schooling level whose main objective is to equip individuals with a minimum basket of attributes so as to neutralize differences in their initial (environmental) conditions. Second, a system of higher education which ought to be "more self sustained" not only financially but also in terms of decision making. This would allow the transfer of resources and "public decision making or planning abilities" from higher education to this basic elementary level of schooling.

The message is that higher education ought to take care of itself and release public funds and planning abilities to the "bottom," where private choices are not a substitute for social action.

April 1973

INVESTMENT IN EDUCATION IN DEVELOPING COUNTRIES*

A Critical Review of Some Issues

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INTRODUCTION

1. This study does not attempt to overview all issues relevant for education policies in less developed countries. It is more an attempt to identify areas where some consensus could be reached in view of the current thinking in this field and also to identify some areas of apparent disagreement and their implications for future research. With respect to the latter, the emphasis is to explore to what extent these disagreements are generated by a genuine conceptual difference in approach and to what extent they are differences in degree resulting from an insufficiency of the available data base or empirical knowledge we have for the relevant variables.

To a large extent this paper is a reaction to the issues raised in "Education and Development Reconsidered," a Conference sponsored by the Rockefeller and Ford Foundation held in May 1972 in Bellagio, Italy. This Conference provides a useful "point of reference" in identifying areas of agreement as well as areas where conflicting views appear to be important.

2. This paper does not arrive to clear and direct policy implications for international donor agencies concerning the educational sector of developing countries. This can only be done on a country by country basis.

Our emphasis has been basically to identify certain general issues, to organize them in an analytical framework and to

explore their implications for further research and data requirements at a country level.

3. Some of the topics to be discussed are particularly relevant to Latin America, the region we are more familiar with. However, many of the issues are common to all less developed countries and to that extent we expect the discussion to be useful for other regions.

4. The study is organized as follows:

Chapter A attempts to make explicit the source of (apparently) conflicting views or judgments concerning the micromechanism by which education affects growth as well as their implications for social and private choices concerning investment in education. We hope that an effort to make more explicit these differences can help future dialogue as well as the design of future research in the field.

Chapters B and C analyze the implications of reaching a consensus on two issues: first, the need of an elementary schooling level whose main objective is to equip individuals with a minimum basket of attributes so as to neutralize differences in their initial (environmental) conditions. Second, a system of higher education which ought to be "more self sustained" not only financially but also in terms of decision making. This would allow the transfer of resources and "pub-

lic decision making or planning abilities" from higher education to this basic elementary level of schooling.

The message is that higher education ought to take care of itself and release public funds and planning abilities to the "bottom," where private choices are not a substitute for social action.

A. AREAS OF APPARENT DISAGREEMENT AND THEIR IMPLICATIONS FOR FURTHER RESEARCH: A CRITICAL REVIEW

I--INTRODUCTION

1. During the last decade the concept of human capital in general, and investment in education in particular, has been a useful tool in the explanation of a variety of economic phenomena, i.e., sources of past growth, the pattern of foreign trade, the size distribution of income, etc. On the other hand, to include human capital within a generalized capital accumulation approach to economic development would appear to have provided a consistent basis for planning future investment according to the relative productivity of different types of capital.

Recent studies on the role of education in less developed countries have raised a series of issues questioning or qualifying some of this earlier enthusiasm. It seems to us that this is needed; however, we find that the way some of the issues have been raised is not helpful for future dialogue; many of them have been presented as a general critique to the human capital approach to invest in education. It is our contention that a consistent application of human capital theory is able to take into account some of these qualifications that characterize less developed countries and that many of the apparent conflicting views are more a problem of orders of magnitude rather than a problem of method.

Some of the qualifying issues that have been raised are probably a reaction to unrealistic expectations about the future

importance of education, some of these expectations being perhaps based on the results of past studies on sources of growth. However, it is clear that the past contribution of education to growth, however large it was, is not per se, a basis for deciding about future investment in education.

Other issues being raised question the micro mechanism by which education affects growth, particularly in an environment of distorted labor markets and strong unemployment.[1/] We will argue, however, that to a large extent these considerations can be taken into account into a human capital approach to investment in education.

Finally, some authors appear to be disenchanted with the possibilities that the current work on economics of education could help decision making concerning the educational sector.[2/] Our contention is that the current state of research is providing no less valuable indeces of over or under-investment than the ones generated for other types of investment in other sectors of the economy.

[1/] See for example the provoking article by Edwards and Todaro. E. Edwards and M. Todaro, "Educational Demand and Supply in the Context of Growing Unemployment in Less Developed Countries," in Education and Development Reconsidered (Conference at Villa Serbelloni, Bellagio, Italy, May 1972). We quote their introduction: "the idea that education in abundance beyond literacy is an unmitigated social good and an engine for development deserves challenge. That challenge is taking the form in developing countries of growing open unemployment in urban areas...Moreover, the average level of education among the unemployed appears to be rising, suggesting that the growing investment in educational systems is increasingly an investment in idle human resources."

[2/] See Michel Debeauvais, "The Contribution of the Economics of Education to Aid Policies: A Critical Comment" in Education and Development Reconsidered, op. cit.

2. We think that a useful framework to identify areas of agreement and to make explicit probable areas of disagreement is to explore the following questions:

2a. Do we need to differentiate statements about education's contribution to past growth from statements concerning future policies of investment in education?

2b. Can we find an acceptable index of the productivity of investment in education?

2c. Can we reach a consensus on how to measure empirically such an index?

2d. What are the implications of 2c. for a better knowledge of the working of labor markets in less developed countries?

2e. What are the main sources of differences between such an index and the one that governs private decisions or the private demand for education?

2f. How sharply ought we to differentiate between recommendations regarding the educational system--recommendations that can be implemented by the policy instruments available to that sector--from recommendations regarding other parameters of the economy affecting the educational sector?

II--THE NEED TO DIFFERENTIATE BETWEEN STATEMENTS CONCERNING EDUCATION'S CONTRIBUTION TO PAST GROWTH FROM STATEMENTS CONCERNING FUTURE POLICIES OF INVESTMENT IN EDUCATION

Up to recent years most of the work on the contribution of education to growth referred to the United States and Western Europe [Jorgenson and Griliches (17), Schultz (29) and Denison (6)]. By now we have evidence for a couple of less developed countries; this is summarized in the following table:

Contribution of Education to the Past Growth Rate
(Figures represent the fraction of the growth rate due to education, %)

Brazil (1950-69)	20%
Chile (1940-64)	23%
Mexico (1940-64)	10%
Phillipines (1947-65)	10%*

Sources: Brazil, Langoni (20)
Chile and Mexico, Selowsky (30)
Phillipines, Williamson (34)

*It only includes the effect of increases in the average level of schooling.

We have to accept that these figures, however large they are, are only of historical interest. They are perfectly consistent with the fact that investment in education in those countries may not have been a "good" economic investment; in other words, if some of these funds had been invested in other sectors the observed growth rate could have been higher.

The reason for a relatively large contribution of education to growth stems either because "large" amounts were invested

in education, because the productivity of that investment was "high" or any combination of both. Therefore, it is perfectly possible that the observed contribution was large because of the amounts being invested and not because of a high productivity of that investment.

For future investment decisions however, what is relevant is the productivity of that investment vis a vis alternatives in other sectors of the economy. A large contribution of education to past growth is not a guarantee for a high productivity of the funds to be invested in education. Therefore, policies of expansion of the educational system cannot be directly justified by the observation that education was an important source of past economic growth.

III-AN ACCEPTABLE INDEX OF THE PRODUCTIVITY OF INVESTMENT IN EDUCATION

Let us assume for the moment (we will discuss this in the next section) that we can measure labor productivity differentials in workers of different levels of schooling, holding constant other variables that influence that differential. Can we define a helpful index of the productivity of investment in education comparable, in reliability and in the amount of information it provides for decision making, to similar indices of investment in other sectors of the economy? We think the current effort to compute rates of return to invest in education provides such an index.

It is clear that the manpower approach does not allow for a cost benefit analysis of investment in education and therefore does not provide information about the "optimality" of the present educational distribution of the labor force. Moreover, some recent studies have shown that the assumption of no substitutability among labor skills--implicit in the manpower approach--is not a very realistic one.

It seems the present disenchantment about the usefulness of computing rates of return rests in two types of considerations: first, the possibility of measuring empirically existing productivity differentials and second, once we have measured them, the policy recommendations one can draw from such rates. We will analyze this second aspect.

There are three considerations which seem to qualify the helpfulness of rates of return for policy recommendations: first the fact that they only measure present productivity effects as valued by the market; second, they do not take explicitly into account future productivity differentials and thirdly, they do not give precise policy recommendations about "how much" to invest in different levels of schooling (a magnitude that can be clearly derived in the manpower approach).

It seems to us these issues are not specific to the economics of education but are rather inherent to the actual state of the arts in the economic science and second, to the fact that economic considerations are only a part of the total considerations

that justify any policy action. Again it is a problem of expectations about the role of economists.

Current estimates of rates of return are based on present productivity differentials and if there is any projection it is simply of a trend type. Ideally we would like to solve for the future demand and supply of each type of skill as a function of the sectoral growth of the economy, technical change, etc., and also as a function of the expansion of the educational system itself [see Dougherty (7) and Selowsky (31)]; this would require a dynamic model of the overall economy. But this is true for any exercise in development planning where "dynamic" rates of return to invest in agriculture, in roads, industry are required. It is a problem based on the limitations about projecting the future, about the behavioral relationships of the economy and of the data restrictions.

A similar point can be made in relation to the fact that computed rates of return only show the direction of changes (less or more investment) and do not yield precise figures for the magnitude of these changes. To my knowledge very few answers of this type have been developed for other sectors of the economy; most of the time in order to gain this information those studies had to sacrifice the realism of assumption concerning aggregation or technology (as in the case of the manpower approach).

It is well accepted that education generates economic benefits that probably are not captured by productivity differentials and, what is more important, it also generates benefits that are outside the scope of current economic analysis and more of the realm of other social sciences. If we accept this fact we have also to accept that the economic considerations advanced by economists concerning investment in education will be, and ought to be only a part--maybe quite small--of the total considerations policy makers ought to have in deciding about investment in this sector. In this context the role of the economist is to provide policy makers better information about the trade-off between economic and non-economic considerations, i.e., the economic price of non-economic considerations.

Again, this problem faced by economists is not intrinsic to the economics of education. Take other fields of applied economics where, at first instance, it would appear economic considerations ought to be more important in decision making: industrial growth through tariff protection in less developed countries. Quite an elaborate theoretical framework to measure the economic costs of protection has been developed with quite precise policy implications: however, there is no doubt that countries are also taking into account a variety of other considerations when deciding about their policies of industrial protection.

IV--CAN WE REACH A CONSENSUS ON HOW TO MEASURE EMPIRICALLY RATES OF RETURN TO INVEST IN EDUCATION?

The concept of a rate of return to education is based on the hypothesis that labor markets provide a micro mechanism by which the amount of education of an individual determines, together with other characteristics of the individual, his productivity as a member of the labor force. Therefore the hypothesis to be tested is:

(1) $P = a_0 + a_s S + b_1 X_1 + b_2 X_2 \ldots b_n X_n + \mu$

where P is "productivity", S an index of schooling and X_1, $X_2 \ldots X_n$ are other variables characterizing the individual; μ represents the error term. From the point of view of the rate of return what is relevant is a_s, the coefficient of education (showing the impact of schooling on productivity holding constant the variables X).

The common empirical approach usually used to measure a_s can be written as:

(2) $w = \alpha_0 + \alpha_s S + \alpha_1 X_1 + \emptyset$

where w is the observed wage (or labor cost to the firm) and X_1 is the age of the individual.

A comparison of (2) and (1) provides a framework to analyze explicitly some of the current criticism of the use of wage dif-

ferentials by schooling as a measure of the impact of schooling. As we will see, most of them can be justified on the basis of insufficient data more than on a conceptual difference.

There can be two sources of upward bias in α_s, in the sense that it overstates the true coefficient a_s: first, to the extent that we do not include other variables X that affect productivity and are positively correlated with the level of schooling (with the variable S). Second, to the extent that observed wage overestimates the true productivity (i.e., because of market distortions) and where the magnitude of this bias is itself a function of the level of schooling of the individual.

To separate the two sources of bias between α_s and a_s we rewrite again (2) assuming $W = P$, in other words, we only include the "missing variables" source of bias:

(3) $\quad P = a'_0 + a'_s S + b'_1 X_1 + \emptyset'$

where $a'_s > a_s$.

The second source of bias comes because of the difference between the observed w and the "true" P:

(4) $w - P = \beta_0 + (\beta_1+\beta_2)S$

β_1 and β_2 show two separate hypotheses by which schooling affects the gap between the observed wage rate and productivity. β_1 is the "labor market imperfection effect" to the extent these imperfections are somehow correlated with the level of schooling of workers; β_2 summarizes the view that employers value and are willing to pay for schooling above the "pure" economic productivity of workers.

Substituting (3) into (4) we come to an expression for the estimated value of α_s equal to:

(5) $\alpha_s = \beta_1 + \beta_2 + a'_s$ Bias $= \beta_1 + \beta_2(a'_s - a_s)$

From (5) we can see that, to the extent market imperfections in the labor market are positively correlated with the level of schooling ($\beta_1>0$) and employers are willing to pay a premium for schooling far and above "pure economic productivity" ($\beta_2>0$), these considerations reinforce the bias between the estimated α_s and the true a_s due to missing variables.

Let us now explore through the above framework the current criticisms to the use of wage differentials in computing the economic benefits of education:

(a) "Wage differentials by schooling overstate the true effect of schooling because individuals of high income families

are more probable to occupy highly paid occupations, the level of schooling of the individual being correlated with the income of the family."

It is clear that the above criticism is not, per se, a criticism to the use of wage differentials by schooling to compute the benefits of education. It is a criticism to the use of wage differentials not corrected by a variable X (i.e., family status) which helps explain the productivity of the individual and at the same time is positively correlated with the level of schooling. It is a "missing variable bias" argument. However, this has been widely recognized in the literature; studies for which "family status" variables have been available have used these variables in the explanation of wage differentials.

(b) "Part of the wage differential by schooling are due to differential levels of "ability" positively correlated but not induced or caused by schooling itself."

This is again a "missing variable" bias argument. There is a missing variable X summarizing abilities of the individual that, (b') influences productivity, (b") it is positively correlated with schooling, (b"') cannot be attributed to the value added of the schooling system.

We can think of two mechanisms by which this can happen: first, we can think of the schooling system as a sorting device: only the individuals of higher levels of "innate ability" (some-

how defined) are able to reach progressively higher levels of schooling. The extreme version of this hypothesis would be that it is this differential ability the one determining wage differentials; the value added of the schooling system would be zero.

The testing of the above hypothesis would require an index of ability of the individual before he enters the schooling system. This information is difficult to generate and ought to be an important source of future research. To our knowledge the only study of this type, by Griliches (9) using Swedish data, reports that the introduction of the early ability variable--although it was significant-- did not affect the coefficient of the schooling variable.

Another way of thinking about the above bias is the following; first, there are some abilities influencing productivity which have been affected by informal education at home, and second, the amount of schooling of the individual is positively correlated to the amount of informal education at home. This is very plausible: probably higher income families provide more informal education at home; at the same time we know that family income determines the amount of schooling of the child.

Even the theoretical mechanism of this bias is different it cannot, from an empirical point of view, be distinguished from (a). In other words, proper inclusion of family status vari-

ables, influencing informal education and the amount of schooling, ought to correct for this bias.

(c') "Gaps between wages and labor productivity originated by imperfections in the labor market can make wage differentials a meaningless tool in evaluating the benefits of education."

It is important to realize that not all labor market imperfections generate a gap between wages and productivity. Such a gap implies that wages are not an observation on the demand for labor; only particular types of labor markets imperfection render this result.

Let us take minimum wage legislation: it introduces a distortion to the extent it is above the wage that clears the market for that type of labor; however, as long as firms have the freedom of deciding about the volume of employment, that wage will reflect the productivity of labor in that firm. We have a different case if, in a particular firm hiring labor in that market, there is a labor union deciding the volume of employment. In this case the wage rate and employment are exogenous to the firm; very probably the wage will not be an observation on the demand for labor, i.e., the productivity of labor will be lower than the wage rate.[1/] In our view market imperfections that introduce such a gap between productivity and wages

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[1/] However, in a competitive firm, this would be inconsistent with long run equilibrium. Eventually the firm will leave that industry.

have to fulfill the above condition: make the wage and the volume of employment exogenous to the firm. These situations are a subset of all the situations characterizing imperfections in the labor market.

Looking at expression (4) it is clear that a constant gap between wages and productivity--independent of the schooling of the worker ($\beta_0>0$, $\beta_1=\beta_2=0$)--does not generate per se a bias in the coefficient of the schooling variable. We need a positive β_1, a gap that is a function of the level of schooling.

The existence of a positive β_1 is an empirical problem; however, we do not find a priori reason why this ought to be so, at least in the light of the popularity of this argument. We could argue the reverse as well, that β_1 is negative; minimum wage legislation and strong labor unions many times characterize the situation of workers of low levels of schooling.

Very possibly the sign of β_1 will depend on the range of observations we are using in the regression analysis. Within relatively low levels of schooling perhaps it is positive, reflecting the fact that completely unskilled laborers are not unionized (i.e., construction workers). Within higher levels of schooling perhaps is negative, reflecting the fact that minimum wage legislation and labor unions do not characterize workers with high levels of schooling (i.e., professionals).

We could conclude by agreeing on the following: that labor market imperfections characterized by gaps between wages and productivity are not, per se, a source of upward bias in the current computation of wage differentials by schooling. A much richer amount of data is required to test such an hypothesis.

(d) "Employers tend to pay higher wages to individuals with higher schooling although this additional schooling does not contribute to higher productivity."

To a large extent statements of this type have been based on the casual observation that particular jobs could be performed by individuals with lower levels of schooling. A more serious empirical evidence is that wages reflect a strong premium to the completion of a particular level of schooling. This has been found in almost all studies on wage differentials by schooling.

There are two ways by which this empirical evidence can be rationalized so as to come out with the above statement: (d'), to assume some irrational behavior on the part of the employer (d"), to accept the fact employers have a more complex objective function than profits, i.e., some consumption aspects that can characterize the productive process (outside image, "smoothness" of labor relations, etc.) <u>together</u> with the judgment that these consumption considerations ought not be considered as part of the GNP.

The first argument is not an argument: it is perhaps a reaction to a very simplistic view of the inputs required in the production process. Discipline, capacity to interact and other characteristics influenced by schooling are perhaps highly valued for team work and difficult to grasp in casual observations about skill requirements of a particular job considered in isolation.

The second arguments rest on the judgment that the possible consumption effects at the firm level, out of hiring more educated labor, should not be considered as part of the usual index of aggregate welfare, namely GNP. However, this argument is indefensible in the light of standard applied welfare economics. Consistent application of such a criteria would take us to subtract from GNP the excess price paid for Bayer aspirin over ordinary aspirin or the excess price paid for identical meals in two different restaurants.

In the light of this discussion we will argue that the above coefficient β_2 is not a source of distortion, namely it ought to be included as a contribution of education to GNP. Therefore, we redefine our relevant index of productivity as:

(6) $\quad P' = P + \beta_2 S$

The true gap between the observed wage and the contribution of labor to output becomes therefore:

(7) $\quad w - P' = \beta_0 + \beta_1 S$

The true contribution of schooling to GNP is equal to $(a_s+\beta_2)$ and the estimated coefficient is equal to $(a'_s+\beta'_2+\beta_1)$. The bias becomes:

$$(8) \quad (a'_s+\beta'_2+\beta_1) - (a_s+\beta_2) = \beta_1+(\beta'_2 - \beta_2) + (a'_s - a_s)$$

We can see that β_2 affects the bias only through a "missing variable effect" and not as a measurement error.

V--IMPLICATIONS FOR A BETTER KNOWLEDGE OF HOW LABOR MARKETS OPERATE IN LESS DEVELOPED COUNTRIES

Current computations of rates of return are based on the existing average wage of working members of the labor force with different years of schooling. That average wage is a weighted average of the different wages people of equal education earn in different markets; the weights are based on the existing distribution of that particular type of labor in occupations and firms paying different wages.

What is relevant for new investment decisions in education is the typical wage of a newcomer into the labor force with a given amount of schooling. The above computed wage will be relevant for this decision if (a), the probability of open unemployment is zero and (b), the probability of earning a particular wage in a particular market is equal to the existing fraction of individuals with that level of schooling working in that particular market.

This difference between the "average rate of return" and the "marginal rate of return" will depend heavily on the characteristics of labor markets. We will attempt to explore how

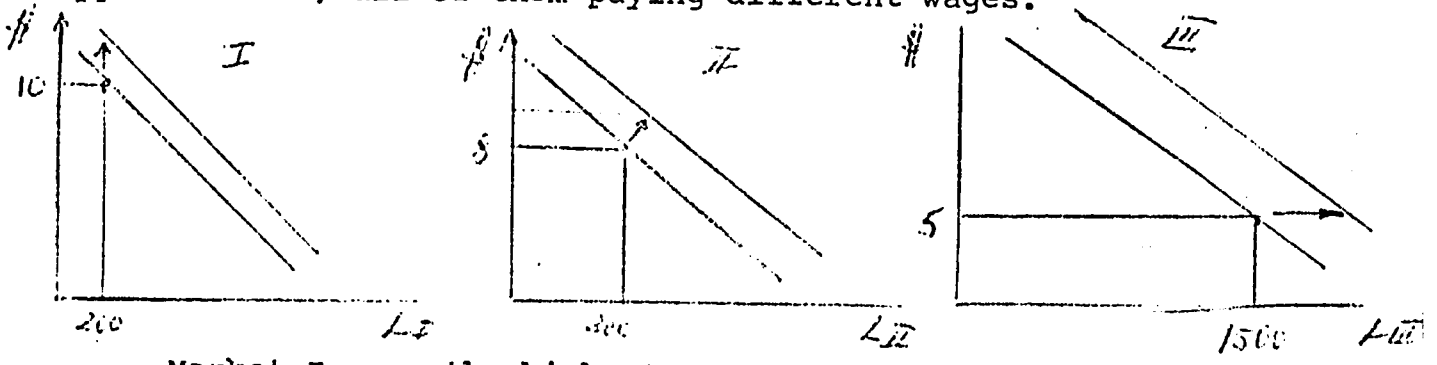
these characteristics can affect (a) and (b). We will begin by (b), assuming no open unemployment of labor.

1. Different Labor Markets for Labor with Equal Levels of Schooling

Let us assume we compute rates of return to a particular level of schooling based on wages obtained through a random sample of the working labor force. Denoting by W_i the average wage of individuals with i years of schooling we can write:

(9) $W_i = \beta_{ij} W_{ij}$

where β_{ij} is the fraction of individuals (in the sample) with the i^{th} level of schooling working in labor market j at a wage W_{ij}. We will expect the β_{ij}'s to reflect the distribution of the total labor force with i years of schooling. For example, assume we compute the average wage of individuals with high school education. There are three main markets employing this type of labor, all of them paying different wages.



Market I pays the highest wage and market III the lowest. We assume labor unions in I and II prevent any entry that could induce a decline in existing wages. Total employment is equal to 2000.

If our sample is a random one the computed average salary

for individuals with high school education will be equal to:

$$W_I \left(\frac{L_I}{L}\right) + W_{II}\left(\frac{L_{II}}{L}\right) + W_{III}\left(\frac{L_{III}}{L}\right) = 10 \cdot 0.1 + 8 \cdot 0.15 + 5 \cdot 0.75 = 5.95$$

Let us put these labor markets in motion so as to analyze the contribution to output of individuals that next year finish high school and enter the labor force.

The demand for labor will increase next year in the three markets. Assume market I has the strongest labor union in the sense that all increases in labor productivity are absorbed by higher wages with no increase in employment. This market becomes irrelevant for new entrants. Market II is characterized by somehow weaker labor unions; they succeed in obtaining higher wages but by less than the increase in the productivity of labor; part of this increase in productivity will be reflected therefore in an increase in employment.

Market III is characterized by competition and free entry and we assume, we think realistically, to be the largest in terms of employment. In this market increases in productivity is reflected in higher employment: competition among workers maintains the wage rate constant.

What is the contribution to output of a new entrant? If he gets employed in market II his productivity will be somehow above 8; if he gets a job in market III his productivity will be 5.

Assume he effectively gets a job in market II; although he will be competing for such a job with his senior colleagues

working in market III there is a positive probability he will succeed.[1/] Can we consider his productivity of 8 (or somehow higher) a genuine contribution of this additional labor to the economy?

Without this additional laborer an extra opening in market II would have been filled by a worker in market III, with a net contribution to output equal to (approximately) 3. In other words, 3 of the 8 earned by the lucky new entrant would have been generated anyhow by the induced labor mobility. Those 3 are a gain attributable to an improved resource allocation and independent of having an extra worker in the economy.

From this exercise we can see that the relevant measure of productivity for a new entrant ought to be his wage in the "relatively" free entry labor markets, those markets from which labor will be ultimately drawn when there is an opening in a more "protected" market. In this particular case this measure is equal to 5.

It is clear that 5 is substantially lower than the average wage computed from the existing distribution of workers with high school education. However, we are not interested so much in this gap between the average and marginal wage of a given type of labor but more on the differential gap for different types of labor classified by schooling. This is what is relevant in

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[1/] That probability will be a function of the ratio "openings in market II/employment in market III."

computing the true productivity differential and the rate of return. It is this differential gap the one that determines the bias in the rates of return when using existing observed average wages.

It can be shown that when most of the cost of an educational project are labor costs (foregone income and teachers' salaries) the rate of return is invariant to a given percentage bias in the measurement of the relevant wage figures.[1/]

Denote W_i^m and W_i^a as the (relevant) marginal and (measured) average wage of individuals with i years of schooling where:

$$W_i^m = \delta_i W_i^a \quad \text{(where } i=1,2,\ldots n \text{ years of schooling).}$$

If the δ's are equal for all i the use of observed average wages will not significantly bias the computed rates of return (see footnote 1).

[1/] This can be shown as follows: the internal rate of return of increasing the level of schooling of an individual from a to b years of schooling is r_0, the discount rate that equates:

$$\sum_{i=1}^{b-a} (W_i^a+\beta W_i^c)(1+r_0)^{-i} = \sum_{i=b-a+1}^{\infty} (W_i^b-W_i^a)(1+r_0)^{-i}$$

where the left-hand side represents the present discounted cost of schooling--foregone income plus teacher salaries--and the right-hand side, the present discounted value of the benefits or the wage differential. The terms W_i^a, W_i^b, W_i^c represent the yearly wages of individuals with a, b, and c years of schooling in the i^{th} year of the project. Individuals with c years of schooling are used as teachers in the (b-a) years of this schooling level with a student-teacher ratio equal to $1/\beta$.

Assume all wages are bias by a factor λ. This bias can be factored out on both sides of the expression, the value of r_0 remaining unchanged.

What becomes crucial is knowledge of marginal wage differentials, i.e., wage differentials by schooling in the "free entry" labor markets. These wages can be derived from observed average wages to the extent we have some idea about δ_i; a more direct alternative is to compute these wage differentials by applying regression analysis only to wage data out of "free entry markets." Whatever the method, it is clear we need a better knowledge of labor market so as to identify the "free entry" markets relevant for different types of labor classified by schooling.

However, it is clear that the current use of average wages is not, per se, a reason to overstate the true wage differentials and therefore the rates of return. This implicitly assumes the δ's become larger the higher the level of schooling. It is simply a hypothesis which needs to be substantiated by a better knowledge of the working of labor markets.

2. The Introduction of Unemployment[1/]

Let us introduce unemployment into the earlier analysis. We are not interested in "normal" frictional unemployment but in some kind of open unemployment which seems to characterize a large

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1/ This section draws heavily on two studies: the one by Todaro concerning the rural migration-urban unemployment relationship and the one by Harberger concerning the social opportunity cost of labor. See M. Todaro, (33), and Harberger (11).

fraction of less developed countries.

What is crucial in the following discussion is again to accept the existence of some "free entry labor markets" relevant to each educational category of labor. In other words, we assume that for each educational category there are different labor markets characterized by different wages and different restrictions to entry; however, we assume there always exist a free entry market characterized by the lowest wage for that educational category.

Within the above framework it is clear that

(a), observed unemployment cannot be an involuntary type of unemployment given that each skill has the alternative of a free entry labor market.

(b), unemployment becomes a rational choice and the problem becomes identifying the cost and benefits associated with that choice.

Suppose, following the earlier analysis, that a given educational category is being employed in three markets. The first market, as we saw before, becomes irrelevant given that increases in the demand for labor are transmitted into higher wages with no increases in employment. Only markets II and III become relevant; market II generates V vacancies (per year) at a wage around 8 and market III is characterized by free entry at a wage equal to 5.

New entrants into the labor force or laborers presently employed in market III have a probability of filling those vacancies. Unemployment of that particular labor can be rationalized if it increases that probability. In other words, unemployment becomes an investment in search that increases the probability of filling next year a vacancy in market II.

A simple way of exploring this idea without getting involved in complex problems of discounting is to use a two period analysis. Suppose that by being unemployed this year (year T) a laborer increases the probability of getting next year a job in market II from P_ϵ to P_μ. Therefore:

P_ϵ = probability of getting a job next year in market II if this year a laborer is fully employed in market III

P_μ = probability of getting a job next year in market II if this year the laborer decides to invest all of his time in search and therefore decides to become unemployed.

The choices are therefore: either to enter today market III and accept W_{III} or to become unemployed for a year. Both choices can be analyzed as a project, each of them with a given present value of benefits. We will call PV_ϵ and PV_μ both values; they can be written as:

$$(10) \quad PV_\epsilon = W_{III} + \frac{P_\epsilon \cdot W_{II} + (1-P_\epsilon)W_{III}}{1+r}$$

$$(11) \quad PV_\mu = \frac{P_\mu \cdot W_{II} + (1-P_\mu)W_{III}}{1+r}$$

where r is the relevant discount rate.

The net benefit of being unemployed is therefore $PV_\mu - PV_\epsilon$:

$$(11') \quad PV_{\mu} - PV_{\epsilon} = \frac{(P_{\mu}-P_{\epsilon})W_{II}}{(1+r)+(P_{\mu}-P_{\epsilon})} - W_{III}$$

The first term is simply the "demand price" (D_{μ}) for being unemployed this year; the second term is the cost or today's alternative to that decision, namely to enter market III and earn W_{III}.

If expression (11') is positive he will decide to become unemployed for a year; if it is negative he will enter market III and accept the wage W_{III}.

Assume (11') is positive: every member of the labor force not employed in market II will find it profitable to become unemployed for a year. What is the mechanism by which all this fraction of the labor force does not become totally enemployed this year?

To explore this issue let us define as $\hat{L}$ the labor force not employed in the restricted labor markets; therefore:

$\hat{L} = U + L_{III}$ where U is the number of unemployed workers.

The probability of next year's employment in market II is a function of the ratio between next year's expected vacancies and today's unemployment:

$$(12) \quad P_{\mu} = F(\frac{V}{U})$$

if P_{ϵ} is a fraction γ of P_{μ}:

$$(12') \quad P_{\epsilon} = \gamma P_{\mu} = \gamma F(\frac{V}{U})$$

then

$$(12") \quad (P_{\mu}-P_{\epsilon}) = (1-\gamma)F(\frac{V}{U})$$

In other words the increased probability of getting next year a job in market II--by being today unemployed--is also a function of V and U. This increased probability will decline with an increased volume of unemployment.

Finally, we have to accept that, given $\hat{L}$, the wage W_{III} will also be a function of the level of unemployment U.

We know:

(13) $W_{III}(L_{III})$ $\qquad W'_{III}(L_{III}) < 0$

(13') $W_{III}(\hat{L}-U)$

(13") $W_{III}(U)$ $\qquad W'_{III}(U) > 0$

We can now write expression (11') more generally:

(14) $D_{\mu}(r, W_{II}, \frac{V}{U}) - W_{III}(U)$

where:

$\frac{\partial D_{\mu}}{\partial r} < 0 \qquad \frac{\partial D_{\mu}}{\partial V} > 0$

$\frac{\partial D_{\mu}}{\partial W_{II}} > 0 \qquad \frac{\partial D_{\mu}}{\partial U} < 0$

We are now able to see the adjustment mechanism when (14) is positive: an increase in the number of unemployed induce a decline in D_{μ} as well as an increase in W_{III} up to the point where both are equal. At this point the incentives to become unemployed cease and we determine an equilibrium level of unemployment U* as well as an equilibrium level of employment in the free entry market III, L^*_{III}.

The value of U* will be determined when:

(14') $D_{\mu}(r, W_{II}, \frac{V}{U^*}) = W_{III}(U^*)$.

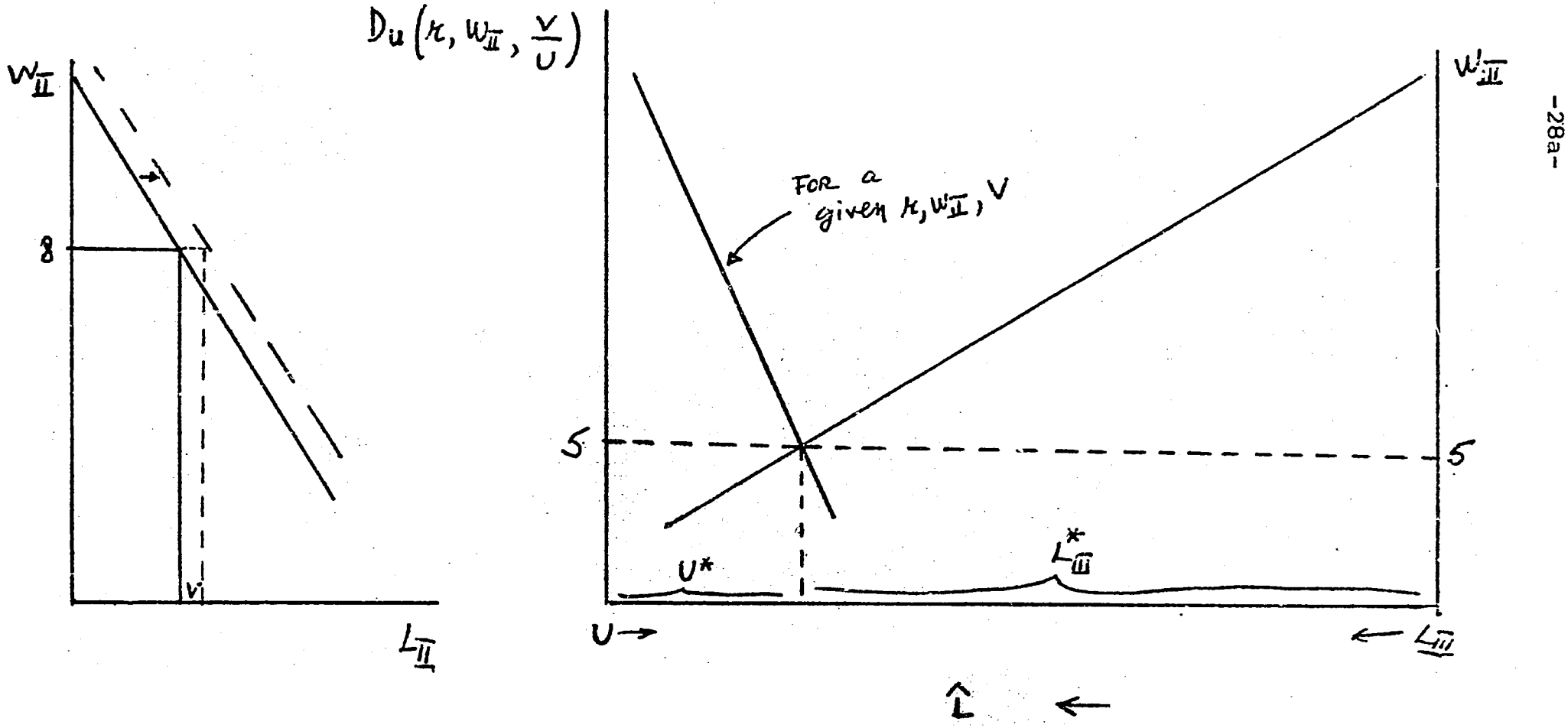
Condition (14') is shown graphically in next page where we assume that given $W_{II} = 8$ and given the values of r and V, the equilibrium value of U* and L^*_{III} takes place at a value of W_{III} equal to 5.

What is the marginal product of an additional laborer that enters the labor force? If he is lucky enough to fill one of the vacancies created in market II his marginal product will be 8. However, by entering market II he has substituted a potential candidate for that job already working in market III or a worker currently unemployed; in the absence of this new comer that job would have been filled by:

(a) either somebody working in market III; the contribution of that action to the economy would have been 3

(b) by an unemployed worker with a contribution to output equal to +8. However, this is not the end of the story: that worker leaves the rank of the unemployed and increases the differential probability of the remaining unemployed in obtaining a job in market II; the present value of being unemployed for a year becomes larger than W_{III} and therefore induces workers to leave their jobs in market III to become unemployed. Equilibrium will be reached when one worker leaves market III to become unemployed. The contribution to output of his action is -5.

The net contribution to output when a vacancy in market II


$D_u\left(\kappa, w_{II}, \frac{V}{U}\right)$
W_{II}
8
L_{II}
FOR a given κ, w_{II}, V
W'_{III}
5
5
U^*
L^*_{III}
U →
← L_{III}
$\hat{L}$ ←

is occupied by a currently unemployed worker becomes the sum of the effects of the above actions. It becomes again equal to +3.

From (a) and (b) it is clear that, in the absence of a newcomer, a vacancy in market II would have been filled by another member of the existing labor force with a contribution to output equal to 3. The net contribution to output of a newcomer filling that vacancy is equal to 5, the wage in the "free entry market."

If the newcomer is unable to find a job in market II his choices are to work in market III or to become unemployed. Our initial equilibrium condition means that he ought to be indifferent; if he enters market III his marginal product is 5; if he becomes unemployed he will induce, by the mechanism described before, another unemployed worker to become employed in market III; the marginal product of that action is again equal to 5.

From the above analysis we can conclude that the introduction of a concept of equilibrium unemployment does not change the conclusion of the earlier section: the marginal product of an additional laborer of a given skill is equal to the wage in the free entry labor market relevant to that skill.

These results depend critically on the existence of such free entry labor markets; our hypothesis is that such markets do exist; in this respect this analysis is somehow different to Todaro's and resembles more Harberger's in the sense that the

alternatives open to urban workers are wider.[1] The alternative to a highly paid, highly restricted modern sector is not unemployment but employment in lower paid free entry labor markets.[2]

The conclusion is again that rates of return ought to be computed with wage differentials by schooling derived from free entry labor markets. If those wage differentials (percentage-wise) are equal to wage differentials based on present average wages the average rate of return will be equal to the (for our purposes) relevant marginal rate of return. The extreme situation would be a case where wage differentials by schooling in free entry labor markets are roughly zero, i.e., all skills have only one and the same free entry labor market; in this case the marginal rate of return to schooling would be nil.

VI--SOURCES OF DIFFERENCES BETWEEN SOCIAL AND PRIVATE RETURNS

Government investment decisions in education usually follow the existing pressures for schooling or the excess quantity demanded for education.[3] This quantity demanded is based on individuals' calculations on the benefits and costs of schooling.

Taking as given that public investment

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[1] See Todaro, op. cit. and Harberger, op. cit.

[2] After this paper was finished an excellent study by G. Johnson concerning urban wages in Kenya was called to my attention. In that article, an empirical attempt to identify "free entry labor markets" is being made. See G. Johnson, "The Determination of Individual Hourly Earnings in Urban Kenya," Center for Research in Economic Development, University of Michigan.

[3] By excess quantity demanded we mean the quantity demanded over and above the existing capacity of the schooling system.

decisions are governed by this pressure for additional schooling the issue becomes to what extent governments, by following such a policy, are overinvesting in education, i.e., the net benefits governing private demand overstate the true benefits to society. The question becomes what are the sources of differences between private and social calculations.

The fact that public education does not charge the full resource cost of schooling becomes, on the cost side, the main difference between social and private calculations. This is well known and does not require further elaboration; what is required is more data able to identify the cost of education by schooling levels and by professions. The proper policy action is simply to charge a larger proportion of the true cost of that particular level of schooling or profession. On this we elaborate in chapter C.

Less obvious are differences arising on the benefit side, i.e., differences between the expected wage differential for a school graduate and the true productivity differential by schooling.

As we saw before, productivity differentials ought to be computed through wages earned in the "free entry markets" relevant to each educational category. This is true even if the new entrant into the labor force effectively obtains a job in a more restricted labor market; however, this possibility has a positive

probability and therefore enters into the private calculations of the expected wage of individuals deciding about schooling. It is this positive probability, irrelevant from a social point of view (from a social point of view it is a transfer), the one that can give origin to a difference between the private and social (percentage) wage differential.

Suppose we are interested in the wage differential between people with primary and secondary education. We denote W_p^e and W_s^e as the expected wage of individuals leaving school with primary and secondary education respectively; on the other hand, we denote as W_p'' and W_s'' the wages earned in the "restricted" or "protected" labor markets and by W_p' and W_s' the ones earned in the free entry markets.

The expected wage for a primary school graduate will be:

$$(15) \quad W_p^e = P_p \cdot W_p'' + (1-P_p)W_p'$$

where P_p is his subjective probability of getting a wage in the restricted market. If he does not get it (with a probability equal to $1-P_p$) he will either enter the "free labor market" or he will become unemployed; under an equilibrium level of unemployment both choices have a value equal to W_p' (see last section).

For a secondary school graduate we have:

$$(16) \quad W_s^e = P_s \cdot W_s'' + (1-P_s)W_s'$$

The difference between the social and private rates of return to secondary schooling--originated from differences on the

benefits side--will depend on:

$$(17) \quad \frac{W_s^e}{W_p^e} \gtrless \frac{W'_s}{W'_p}$$

where the left hand side expression shows the expected (private) wage differential and the right hand side expression the social wage differential. If W_s^e/W_p^e is larger than W'_s/W'_p the private return will tend to be larger than the social and vice versa.

Denoting $\frac{W''_p}{W'_p} = (1+d_p)$ $\qquad$ $\frac{W''_s}{W'_s} = (1+d_s)$

Expression (17) can be rewritten as:

$$(18) \quad \frac{(1+d_s)P_s + (1-P_s)}{(1+d_p)P_p + (1-P_p)} \gtrless 1$$

$$(19) \quad \frac{d_s}{d_p} \gtrless \frac{P_p}{P_s}$$

(a) Under $P_p=P_s$, the expected private return to secondary education will be larger than the social if $d_s>d_p$, the percentage wage difference between the restricted and non-restricted labor market is larger for secondary school graduates.

(b) For $d_s=d_p$, the expected private return to secondary education will be larger than the social if $P_s>P_p$, the subjective probability of obtaining a job in the "restricted" labor market is higher for secondary school graduates than for pri-

mary school graduates.

From (a) and (b) it is by no means obvious that expected private rates of return ought to overstate--due to differences on the benefit side--social rates of return. All depends on the characteristics of the labor markets relevant to each educational category and on the way individuals build their expectations about probabilities of employment in the restricted sectors (the P's). This becomes even less obvious if we accept the fact that $\underline{P}$ is not independent of $\underline{d}$, the probability of employment in the restricted market is not independent of the wage differential between the restricted and non-restricted labor market.

As we saw in the last section the equilibrium rate of unemployment of each educational category is a function of the wage differential between the restricted and the free entry labor market relevant for that category. On the other hand, the probability that a newcomer will find a job in the restricted market is a function of that level of unemployment. Therefore it must be true that the probability of employment in the restricted market will be a (reduced form) function of the wage differential between the restricted and free entry labor market.[1/]

[1/] That (reduced form) function includes parameters of the demand for labor (from the production function) as well as "psychological" parameters characterizing the subjective probability of obtaining a job as a function of the level of unemployment.

Suppose this function is the same for primary and secondary school graduates. In other words,

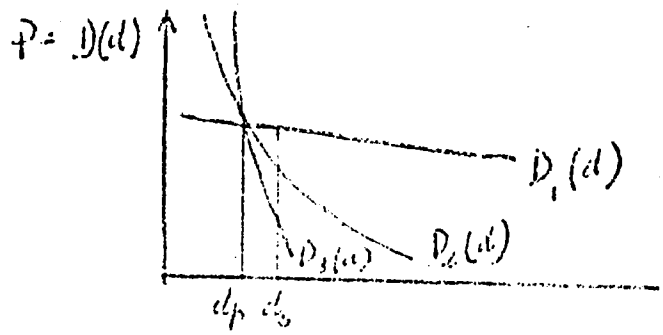
(20) $P_p = D(d_p)$

(21) $P_s = D(d_s)$ where $D'<0$.

The earlier expression (19) becomes therefore:

(22) $d_s D(d_s) \gtrless d_p D(d_p)$

The next figure shows three alternative forms of function D.



Assume $d_s > d_p$, "labor market distortions" are larger for more educated individuals. The effect of $d_s > d_p$ on inequality (22) will depend crucially on the shape of function D. Suppose $D_2(d)$ is a rectangular hyperbola; therefore we can have three cases:

shape of D	Inequality	Implications for returns to secondary schooling
$D_1(d)$	$d_s P_s > d_p P_p$	expected private returns > social returns
$D_2(d)$	$d_s P_s = d_p P_p$	expected private returns = social returns
$D_3(d)$	$d_s P_s < d_p P_p$	expected private returns < social returns

From the above table we can see that the direction of the bias between (expected) private and social rates of return will

depend on:

(a) the "differential wage differential" between the restricted and free entry labor market relevant to people with different education.

(b) the form of the function that relates expectations of getting a job in the restricted market to the wage differential between that market and the free entry market. More specifically, it will depend on the elasticity of the D(d) function.

VII--RECOMMENDATION CONCERNING THE EDUCATIONAL SECTOR AND RECOMMENDATIONS CONCERNING OVERALL ECONOMIC POLICY

The educational sector has essentially the role of mapping the supply of (potential) labor into a structure of supply that follows the structure of demand for labor. The rate of return to schooling is one criteria of determining such a mapping.

In this process the educational sector takes as given the supply of labor and the structure of demand together with all the distortions characterizing labor markets. These parameters condition the rate of return to schooling in general as well as the particular returns to specific levels of education.

To the extent rate of return to schooling are affected by a relatively low growth of the demand for skilled labor vis a vis the (potential) supply of labor, by the existing distortions in the labor markets generating wage differentials and unemployment, etc., the question becomes how much we ought to em-

phasize these issues in making recommendations relevant to the educational sector.

Most of the corrective actions concerning the above issues are desirable on their own merit and we expect that governments are already doing their best in that respect. On the other hand, most of the corrective policy instruments are out of the scope of action of the educational sector. For the reasons we do not think it is very helpful to spend much time discussing these aspects.

It is well known that governments' price policies concerning exchange rates in general and subsidized capital imports in particular, minimum wage legislation, etc., are affecting the growth of the demand for labor. On the other hand, lack of enough labor mobility, restrictions to entry, etc. are affecting the contribution to output of a given amount of labor. These are considerations that probably affect the rate of return to schooling; however, all of them are important on their own merit and we expect governments to be aware of them.

We think a more promising area is to question the premise that the aggregate supply of labor to be mapped by the educational sector is completely independent of the educational sector itself. In other words, to what extent the educational sector can affect, through some policies and programs, the rate of population growth.

This is an area we feel completely ignorant about and not in the position to elaborate much further on; however, we think something has to be said, perhaps in a wider context, in view that this issue was not at all mentioned in the Bellagio Conference.[1/]

The fact that employment as well as income distribution objectives ought to become more explicit goals in developing planning was one of the messages of the Conference. However, a population growth of 3% seriously limits the employment possibilities arising from any realistic increase in the growth rate of output or any corrective price policy concerning the relative prices of capital and labor. At the same time it limits the impact of any realistic program of income redistribution, however aggressive it is; this is particularly true when the highest rate of population growth is concentrated in the lower income groups of the population.

We think, therefore, it is proper to ask ourselves how the educational system could contribute in the medium run to an increase in individuals' choices regarding family planning. For example, how can we use the existing institutional structure--i.e., buildings, teachers--to organize family planning courses oriented for women? It is a question that ought to have first priority in any future research.

[1/] We are referring to "Education and Development Reconsidered," Conference at Bellagio, Italy, op. cit.

B. THE NEED FOR A MORE AGGRESSIVE APPROACH TOWARD BASIC ELEMENTARY EDUCATION

I. INTRODUCTION

Rates of return to primary schooling based on average wages and corrected by the probability of employment appear to yield high figures for several countries.[1/] Even if such corrections lowered the uncorrected rates, such a method does not represent a satisfactory solution to the problems discussed in section V.

However, a consensus can be reached that, independent of the economic benefits as measured by those rates, an expansion of this level is desired on a variety of other grounds: (a) it is perhaps one of the few mechanisms of redistributing wealth and opportunities that realistically can be sold politically in the short run, (b) it increases individual choices regarding health, family planning, social and political information, etc.

If we agree on these goals of the elementary levels of schooling we have to accept that our views on how to achieve them have been too simplistic. Often elementary schooling is considered the "literacy" sector, period; then we jump to a more lengthy analysis of higher levels of schooling, proper techniques of projecting demands for higher skills, etc. It is our view that this emphasis ought to change, at least on what can be called the public sphere of educational planning.

We will discuss the need for a more aggressive approach, in terms of research and overall resources, with respect to (a) implementation of supplementary nutrition programs at the school level, (b) a re-evaluation of the standard pedagogical

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1/These rates of return were 14% (2-4 years of primary schooling) in Kenya and 28% in Colombia. See Thias and Carnoy (32) and Selowsky (31).

practices so as to take into account the environmental deprivation of a large fraction of children attending school, (c) a policy of incentives to school attendance as a part of the overall policy of expansion of the elementary system.

II--THE NEED FOR SUPPLEMENTARY NUTRITION PROGRAMS AT THE SCHOOL LEVEL

1. The need for such a program derives from a growing empirical evidence on (a) a substantial fraction of children in (primary) school age in less developed countries have an insufficient diet and consequently are malnourished to different degrees, (b) an insufficient food intake in school age children can affect their performance at school (i.e., there is a complementarity between nutrition in school age and t other inputs of the primary school system), (c) primary schools appear to be the optimal institutional outlet to implement such programs.

2. Symptoms of malnutrition in children have been reported widely in less developed countries by the WHO reports. A survey of an impressive amount of case studies can be found in the NAS-NRC publication (23), the MIT Conference volume (28), in the surveys by Jelliffe (13), (14), (23), Guzman, Ascoli and Scrimshaw (10), Scrimshaw (27), etc.

In Latin America country-wide nutritional surveys conducted by INCAP (Institute of Nutrition of Central America and Panama) reports strong malnutrition in children in the rural areas of Guatemala and Panama. Monckeberg and collaborators

found a high incidence of malnutrition in a survey of children in the province of Curico, Chile (22). Similar findings for Mexico are reported in Burgess and Dean (3).

3. The relationship between malnutrition during school age and learning should be, at least from an analytical point of view, distinguished from the relationship between infant or preschool malnutrition (basically a lack of proteins during infancy) and future mental development. Even though both types of malnutrition are almost certainly very correlated (in most of the empirical observations) we are basically speaking about the first one.

There are several probable mechanisms by which malnutrition and hunger during school age can affect learning and performance at school. First, malnutrition increases the susceptibility to infectious diseases [Scrimshaw (26)] and therefore affects schooling performance through absenteeism and a decline in physical endurance and strength.[1/] Second, protein-caloric malnutrition also affects physical endurance but also affects behavior, especially inducing apathy and irritability. Thirdly, a deficiency in iron and vitamins can also affect behavior, especially attentiveness [Howell, (12)]. Fourthly, the feeling

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[1/] In a study of dropouts in primary schools in Peru, teachers in each school were asked the causes of dropping out among their pupils. Illness accounted for 14.7% of school desertion, particularly diseases like smallpox, scarlet fever, amoebic dysentery and tuberculosis. In jungle areas illness was the main reason of early leaving.

Source: A Cipriano, "La Desercion Escolar" in Peru, Educacion (Lima, 1960) quoted from (1).

Evidence about the effect of malnutrition and poor health on school performance in Asia can be found in UNESCO, "The Problem of Educational Wastage," Bulletin of the UNESCO Regional Office for Education in Asia (Bangkok, March 1967).

of hunger, per se, generates restlessness and lack of attention.

4. It is hard to find a better institutional mechanism to supplement nutrition in school age children than school itself. Direct income redistribution or "food bonuses" per family does not solve the "intra" family problem of distribution of food. Itis not obvious that children will receive their required share. Another advantage of using schools is its impact on the incentives to attend school, a point to which we will turn later on.

III--NEW INPUTS TO CORRECT FOR INITIAL CONDITION AND ENVIRONMENTAL DEPRIVATION

1. The role of elementary schools in correcting for environmental deprivation has been a source of an increasing debate in the U.S. [Coleman (4), Jensen (16), Jencks (15)]. It is surprising to find that almost no mention of this problem is made in the literature about investment in education in less developed countries. Obviously this is not less of an issue in these countries.

The importance of this depends on accepting the following set of proportions.

(a) The initial level of cognitive and emotional development of a child entering school will affect his performance at school.

(b) the deprivation that characterizes his out of school

environment will affect his performance at school.

(c): (a) and (b) are associated with low levels of family income and therefore characterize an important fraction of children in less developed countries. Moreover, to the extent that we expect poorer and poorer children will be drawn into the elementary schooling system in the future the frequency of finding children characterized by (a) and (b) will become more important.

2. There is a growing empirical evidence showing that preschool children from poorer segments of the population have a lower performance in any type of mental test that matching controls from higher income groups. Large part of this evidence has been generated in the attempt to isolate the fraction of that deficit that can be accounted by early malnutrition [see Monckeberg (21), Kardonsky (18), Craviotto (5) and Scrimshaw and Gordon (28)]. From our point of view it is irrelevant to separate the sources of this difference in performance: we can safely argue that it is due to a package of variables associated with the poorer segments of the population. Direct samples studies undertaken in school children of low income neighborhood of Santiago, Chile (a country that compares favorably with other less developed countries in terms of per capita income, income distribution and development of its educational system) have shown an important lag in cognitive and emotional develop-

ment [Kardonsky and collaborators (19)].

If we accept the above evidence as representative for a large group of less developed countries and if we can reach the consensus that the elementary school system ought to neutralize the effects of environmental deprivation we have to accept that our standard definition of this schooling level as the "literacy sector" is grossly oversimplistic.

The study of the additional school inputs required to neutralize the effects of initial conditions and environmental deprivation is beyond the scope of economic analysis. It is the field of educators and psychologists or the knowledge of what has been called "the educational production function" [Bowles (2)].

IV --PROGRAMS TO INCREASE THE INCENTIVES TO ATTEND SCHOOL

Although in most countries attendance to primary school is mandatory the final choice concerning school attendance rests with the family. Therefore an expansion of the capacity or the schooling system (in terms of buildings and teachers) has to be accompanied by policies to increase the demand for schooling.

Very probably the future expansion of enrollment of pri-

mary schools will be based in (a) drawing children from poorer or more isolated families in the country, (b) an increase in the retention rate, the fractions continuing in schools once enrolled. If this is the case a change in the composition of public spending will be required. An increase fraction of funds would have to be used in incentive programs to attend school.

Free transportation, school breakfast and lunches, are examples of these policies that have been quite successful (i.e. Chile). However, it would be worthwhile to undertake a more thorough research on what are the variables that determine parents' decisions in sending and keeping children at school.

IV--RECOMMENDATIONS FOR FURTHER RESEARCH

Most of the empirical evidence supporting the earlier set of hypotheses has been generated by research undertaken out of the field of education (particularly the ones related to the problem of malnutrition) and with objectives somehow different from the ones directly relevant to the educational sector.

Some of the few systematic pieces of research undertaken by educators in order to explain primary school performance also support some of our views. Robert Drysdale (8) attempted to identify the main variables affecting retention and dropout in rural schools in Colombia. It is worthwhile to summarize here his main results based on discriminatory analysis

Scaled Vectors, Linear Discriminant Function

	Grades 1-2 vs. Grades 4-5	Rank	Dropouts vs. Non-dropouts	Rank	Dropouts vs. Grades 4-5	Rank
1. Condition of house	.09	9	.31	5	.42	4
2. Father's occupation	.41	4	.28	7	.49	3
3. Parents' education	.36	5	.47	3	.56	2
4. Reading material	.19	8	.20	8	.38	7
5. Proportion out	-.49	1	-.67	1	-.76	1
6. Health	.46	2	.59	2	.42	5
7. Average number of days absent	.05	10	-.06	10	-.03	10
8. Average achievement Bogota	-.19	7	.07	9	.09	9
9. Popularity	.21	6	.32	4	.40	6
10. Distance	-.44	3	-.29	6	-.32	8

Source: Drysdale, Table 5, op. cit.

Note: Variable 5 represents the proportion of school age children not in school

Although the high ranking explanatory variables are collinear among themselves some of them, like health of the child, appear to have a reasonable independent explanatory power (the r^2 between health and other "high ranking" explanatory variables like parents' education and proportion not in school is only 13% and 4% respectively).

Future research to explain parents' behavior concerning childrens' school attendance ought to differentiate between explanatory variables that can be affected by policy from explanatory variables that have to be considered as given or difficult to change through public policy, at least in the short and medium run. Let us assume that school attendance (A) can be written as a function of parents' attitudes toward schooling (P) and the cost of attending schooling (C). This last element would include transportation to school, foregone income to the extent the child contributes to the family income, school materials, etc.).

(23) $A = F(P, C...)$

In the short run the main doors open to public policy, in order to increase A, is to operate via C (free transportation, free schooling materials, organizing the school year so as to not interfere with the cropping or harvesting season of the particular region, etc.). However, the success of such a policy would depend critically on how important are economic considera-

tions in parents' decisions concerning children's attendance (or the magnitude of $\frac{\partial A}{\partial C}$).

A different and perhaps more general way of looking at the hypothesis developed in sections II to IV is through the estimation of what can be called "an educational production function."

Assume we can write:

(24) $B = F(I_1, I_2, \ldots I_n; S_1, S_2, \ldots S_m; F_1, F_2, \ldots F_z)$

where B is some index of performance in a battery of achievement reflecting school output. I_i are variables measuring initial conditions of the child when he enters school, i.e., index of initial ability, health, etc. S_1 are variables indicating school inputs, i.e., "quality" of teachers, pedagogical techniques, lab facilities, etc. F_i reflect family or environmental variables outside school, i.e., education of the parents, reading material at home, etc.

Our earlier hypothesis can be summarized using framework (24):

(a) We think an important fraction of children in schooling age have a "low" value of variables I_i and F_i.

(b) In the short run the policy instrument available for social action are mainly instruments able to change variables S_i.

(c) In view of (a) and (b) the problem becomes:

(c') to identify those S_i that are significant in explaining B, holding constant variables I_i and F_i.

(c") to identify, among the significant S_i, the ones that have the maximum contribution to B per dollar spent in manipulating that particular S_i. In other words, a dollar spent in "improved" pedagogical techniques may have a larger contribution to changes in B than a dollar spent in better "physical" school facilities.

The data requirement of such a research are substantial. However, our guess is that the main requirement for such a research is not so much direct research funds but a proper logistic able to take advantage of the institutions of the school system itself. A large part of the data can be obtained through teachers by interviewing parents at schools. To the extent some countries have a national achievement test at the end of the elementary school level such a test could be used as a dependent variable.[1/]

[1/] This has been the approach of the only research of this type that, to my knowledge, is currently being carried out in Latin America. See Schiefelbein and Farrel (25).

C. TOWARD A MORE "SELF-SUSTAINED" SYSTEM OF HIGHER EDUCATION

1. It has become widely accepted that the present levels of public subsidy to higher education cannot be justified under equity or efficiency consideration. The main reason for such a subsidy is that students are not being charged for the true cost of higher education. In most countries there is no charge at all.

To the extent most of the students attending higher education belong to the higher income groups of the population such a subsidy is of a regressive nature. On the other hand, as we will see later, such a subsidy cannot be justified on the grounds that it allows the enrollment of lower income students, i.e., in the process of inducing the enrollment of 10 low income students the system subsidizes 50 high income students. Much more efficient policy instruments to achieve such a goal are available.

The fact that the (direct) cost of education is almost nil generates a quantity demanded for education (and a private rate of return) that is above the level that ought to be financed on a resource allocation basis (based on social rates of return).[1/] This (a) forces the educational system to use a

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[1/] It is interesting to note that the gap between the private and social rate of return to higher education is inversely correlated to the level of per capita income of the country in question. In other words, the poorer the country the larger the subsidy to higher education.

(CONTINUED ON NEXT PAGE)

mechanism of limiting admissions usually highly inefficient and arbitrary and (b), in a dynamic context transfers all decision-making concerning optimum expansion of the system to to the public sector, quite a difficult task. In other words, the public sector has to determine by itself what fraction of that excess demand for schooling ought to be financed i.e., what part of that excess demand would have existed even if the true cost of schooling had been charged.

This section explores how a system where the true cost of a particular career is being charged coupled with a system of loans can solve the efficiency andequity objectives of higher education. At the same time it would provide governments clear and simple signals or rules of thumb for an optimal expansion of that particular career or profession.

2. Suppose for the moment wage differentials between university graduates and secondary school graduates reflect true productivity differentials and that there are no differences between (private) perceived wage differentials and true differentials.

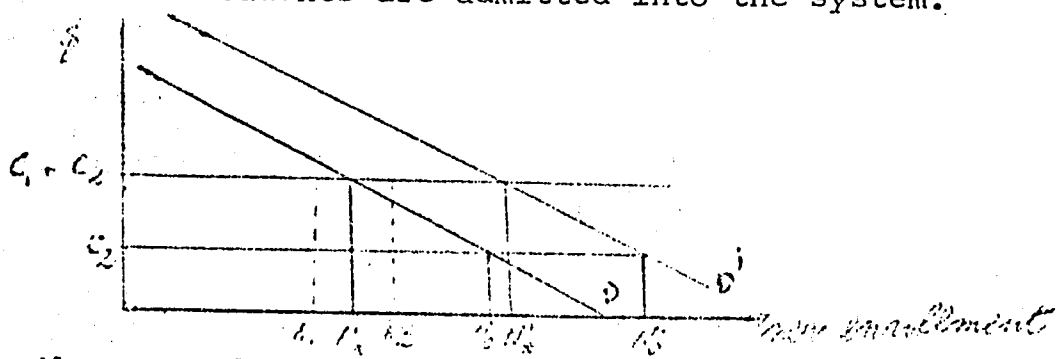
(CONTINUATION OF FOOTNOTE)

Per Capita Income $, 1968	Rates of Return to Higher Education (in %)	
	Social	Private
100	12.6	25.2
200	11.6	25.4
350	13.5	22.2
650	12.0	17.2
1600	9.0	12.3
220	9.8	11.5

Source: G. Psacharopoulos, (24).

Under these circumstances the private demand for higher education would represent the social demand. Such a demand is equal to the present discounted value of that wage differential over the lifetime of the individual; we assume that the private discount rate, implicit in that discounting, is the opportunity cost of capital, i.e., capital markets are perfect.

D represents the above demand for a given year; it is negatively sloped reflecting short run diminishing returns (wage differentials) to additional enrollment as well as the fact that less talented students are admitted into the system.



C_1 is the accumulated "direct" cost of schooling (teachers' salaries, depreciation and interest of the educational equipment) at the terminal year of the profession. C_2 reflects the same but for "foregone income." In both accumulation takes place again at the opportunity cost of capital.

Given that there are no charges for C_1 the demand for enrollment is N_0. Usually that demand is in excess of the existing capacity of the system so that capacity must be to the left of N_0. If it is at the left of N_* (i.e., N_1) the <u>net</u> present

value $D-(C_1+C_2)$ of schooling is positive, i.e., the marginal rate of return to higher education is above the opporutnity cost of capital. The reverse is true when the existing capacity of the system is between N_* and N_0 (i.e. N_2).

Independently of how "optimal" is the present capacity (in relation to N_*) the point is that a limiting device is required. This is the first source of inefficiency of the present system: there is no guarantee the best "potential" students demanding education will fill the existing vacancies.

Next year the demand for education expands to D'. An observed excess demand of $N_0'-N_1$ or $N_0'-N_2$ will be observed, depending on the intial capacity of the system. The optimal expansion ought to be lower, either $N_*'-N_1$ or $N_*'-N_2$.

Educational planners can have a pretty good idea of the observed excess demand for education by directly looking at the number of applications; however this is not true for the optimal level of expansion described above. Under the above scheme, knowledge of that magnitude implies a knowledge of N_* or the demand <u>schedule</u> for education. This means educational planners have to recompute the benefits of education <u>by careers</u> as seen by the demanders of education; they have to replicate the same calculations private individuals were doing except for C_1, the difference between private and social calculations.

By charging C_1, private computations of the costs and bene-

fits of schooling become equal to social computations and excess demands for schooling become optimal decisions rules for educational planners. As long as there is an excess demand for a particular career or profession that schooling level ought to expand; there is no need for a limiting device neither the need for estimating the demand for education and the social rates of return for each career.

3. The earlier analysis assumed that the discount rate used in the private calculation about benefits and costs of schooling was equal to the opportunity cost of capital, i.e., that capital markets for human capital do exist and are "perfect" in the sense that the interest charge is equal to the opportunity cost of capital to society.

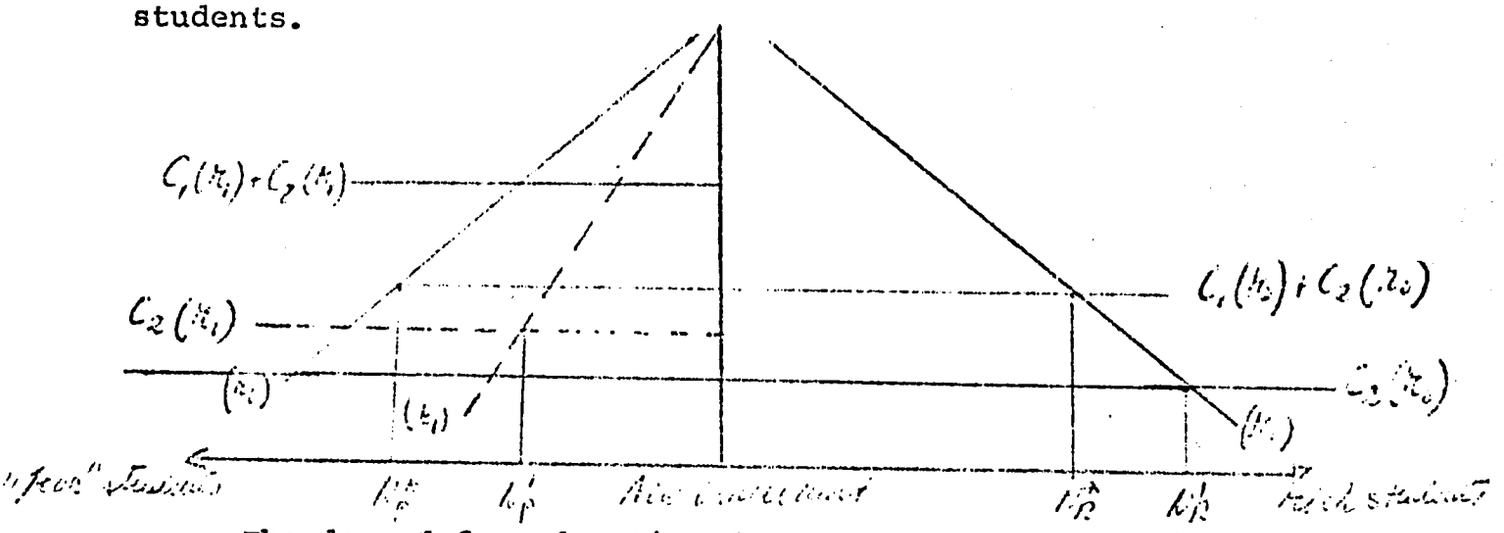
Even capital markets for human capital do not exist we could reach the agreement that the relevant discount rate for higher income families is lower--and more similar to the opportunity cost of capital of the economy--than the relevant discount rate of low income families. This means that the benefits or demand for higher education as well as the relevant (accumulated) cost of education ought to look differentialy to individuals of different income groups. What is the effect of this on the "optimum composition of admittance" into higher education?

Suppose we have two income groups, the rich and the poor.

The implicit discount rate for the richer group is equal to society's opportunity cost of capital (r_0); the one for the poorer group is much larger, (r_1).

Next figure shows the demand for enrollment and the relevant cost of both income groups. The right hand side shows the demand for schooling

as well as the relevant cost of education for the richer group. The benefits and costs are evaluated implicitly at r_0, the opportunity cost of capital to the economy. N_R^* ought to be the society's optimum admittance of higher income students.



The demand for education from lower income families (on the left hand side) is lower than the "social" demand, the one that would have existed at the true cost of capital to society. The reason is that their relevant implicit discount rate is r_1, higher than r_0. On the other hand, whatever cost they face (depending on whether the system charges or not C_1), it is higher than the true cost to society, or the one accumulated at

r_0. The "optimum admittance" of low income groups ought to be N_p^*.

Under the present system, no charges for the direct cost of schooling C_1, the composition of demand for education (N_R'/N_p') will reflect a higher "high income student" ratio than the optimum. Whatever mechanism of limiting admissions is being used it will reflect, or very possibly magnify, this distorted pattern of demand.

By charging C_1 the "non optimal" excess demand of high income families is reduced to N_R^*. However, this does not solve the "structure or composition of demand problem." The demand from lower income families will also decline.

To achieve both the optimum quantity of enrollment $(N_p^*+N_R^*)$ as well as the optimum composition of enrollment (N_R^*/N_p^*), the poorer group has to face a discount rate equal to the opportunity cost of capital r_0. In other words, what we need is a system that charges C_1 as well as offers loans at a rate r_0 to finance the total cost of schooling (including foregone income).

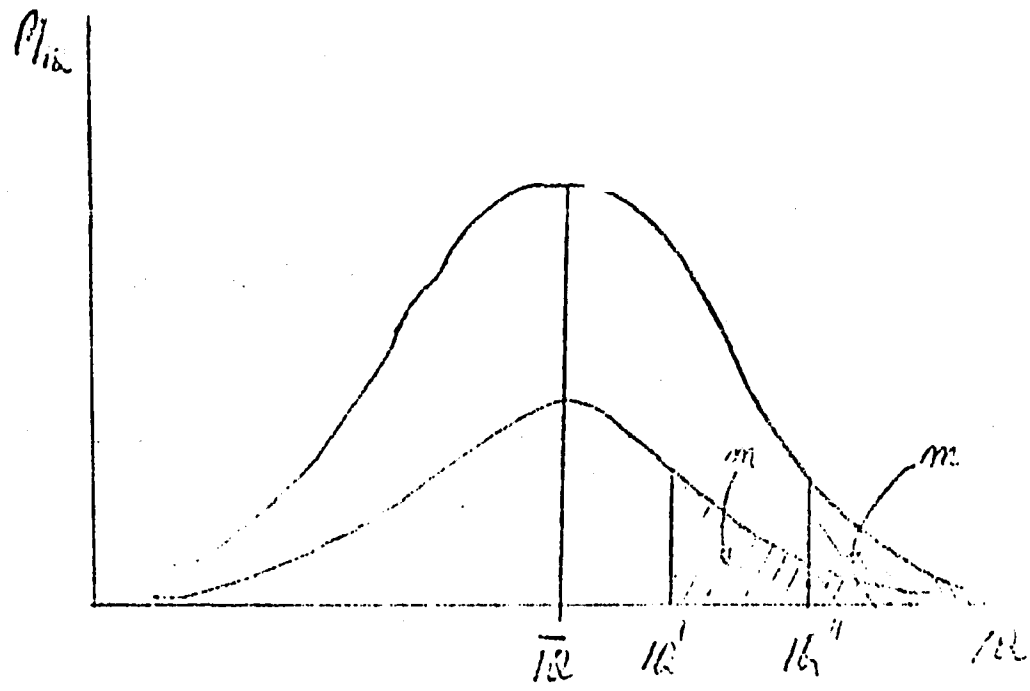
4. The "efficiency" effect of the loan program (which allows the change in the ratio N_R/N_p) can be easily seen in the earlier figure if we accept that diminishing returns to schooling are due to accepting less talented individuals into the system.

The loan program by approaching the existing ratio N_R/N_p to the optimum ratio N_R^*/N_p^* is substituting high income students with a "low" present value of education by poorer income students with a "higher" present value.

Another way of looking at this "efficiency effect" of the loan program is the following: suppose in a given year n students are graduating from high school; it is equal to the potential base of applicants for higher education.

Assume however that only n_1 students apply for admission; we assume these are the ones who can finance their foregone income while they study. They are the "high income" students. The remaining $n-n_1$ do not apply for admission given their inability to finance their foregone income.

Next figure shows the IQ distribution (or any other relevant index of ability) fo the high school graduates. The horizontal axis shows the level of IQ and the vertical one the number of students with that particular IQ.



The larger bell shaped curve shows the IQ distribution of the total number of students graduating from high school, n. We assume it is normal with a mean IQ equal to $\overline{IQ}$. The lower one shows the IQ distribution of the n_1 students currently applying for admission; we assume it has the same shape as the larger distribution, i.e., the IQ distribution of the n_1 applicants is equal to the one of the $n-n_1$ non applicants.

Suppose new admissions into higher education are equal to m, where $m<n_1$; those ones admitted will be drawn from the n_1 applicants and are represented by the shaded area under the lower curve. We assume there is a mechanism by which students of higher IQ are accepted; therefore the IQ of the last or marginal student being accepted is equal to IQ'.

Under the loan program all n high school graduates become effective applicants for higher education. All of them know that, if accepted, they will have the opportunity of obtaining a loan.

The m students admitted are now drawn from the overall base n and are represented by the shaded area under the higher curve. It is clear the IQ of the marginal student, equal to IQ", has gone up; so has the average IQ of the m students now being admitted.

The effect of the loan program will be therefore to increase the average level of IQ or ability of the students admitted; this effect will be more important the larger the variance of the IQ distribution and the higher the percentage of "poor students" in

the total base, i.e., the fraction of potential applicants that do not apply for admission under the present system.

How do we relate this to our earlier graph on page 55 ? If the net present value of higher education is positively related to an index of ability(or IQ of the incoming student) it will be true that, by substituting IQ' students by a IQ" students, the net present value or contribution of the resources presently used in higher education will go up.

This brings us to the following working hypothesis concerning the low social rates of return to higher education observed in many less developed countries:[1] to what extent those low rates are a result of an "exhaustion" of the average ability of admitted students in relation to the average ability of all potential candidates. It seems to us this is an hypothesis worthwhile to explore in any future research concerning higher education.

5. How many years would it take the higher education system to become self supporting under this scheme of full tuition plus loans We have constructed a hypothetical example to illustrate some orders of magnitude.[2]

For expository purposes we will distinguish between the institutions providing higher education (universities) from the

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[1] See Psacharopoulos, op. cit.

[2] See Appendix for the mathematical computations.

government (or the Ministry of Education). We define the present system as one that does not charge any tuition and where universities are completely financed by the government.

Suppose the cost to the budget per student year is equal to a. The public cost of higher education under the existing scheme will be, for any future year t, equal to $C_t = aS_t$ where S_t is the stock of students in the system in that year. Next figure shows the future path of C_t for Latin America (and where year 0 corresponds to 1971) assuming S grows at 11% per year and equal to the (compounded) rate of the period 1960-71. Given that we are interested in trends and not in the scale of the variables we simply assume a=1.

In year 0 the new scheme starts: a yearly tuition equal to a is being charged for each of the 5 years of higher education. At the same time loans to finance that tuition a plus the yearly foregone income b (where $b=\beta a$) are offered to "low income" students being accepted. These loans have to be repaid (after graduation) in 10 equal yearly installments at an interest rate of 10% per year.

The effect of the program is that now a fraction γ of the entering students will be "poor" students. After the 5th year the fraction of "poor" students in the stock will be equal to the fraction of "poor" students entering the system (in the flow of admittance) under the new program. $(1-\gamma)$ becomes the frac-

tion of rich students in the stock.

Under this scheme the cost to the government in any year t (after the 5th year) will be equal to the yearly loan program:

(23) $C'_t = (a+b)\gamma S_t$

if $b=\beta a$

(24) $C'_t = aS_t\gamma(1+\beta)$

(25) $C'_t = \gamma(1+\beta)C_t$

The new cost to the government, C'_t, will be higher or lower than the earlier one, C_t, depending on the values of β and γ.

We will use $\beta=0.6$, a figure based on Psacharopoulos' data, and two alternative values of γ; $\gamma=.5$ and $\gamma=.7$. With those figures we get two alternative values for C'_t:

$\gamma=.5$ $\qquad C'_t = .80C_t$

$\gamma=.7$ $\qquad C'_t = 1.12C_t$

For $\gamma=.7$ the new cost is higher. The reason is that a "high" γ means more "poor" students--to which loans have to be given--in relation to "rich" student from whom tuition is now being collected.

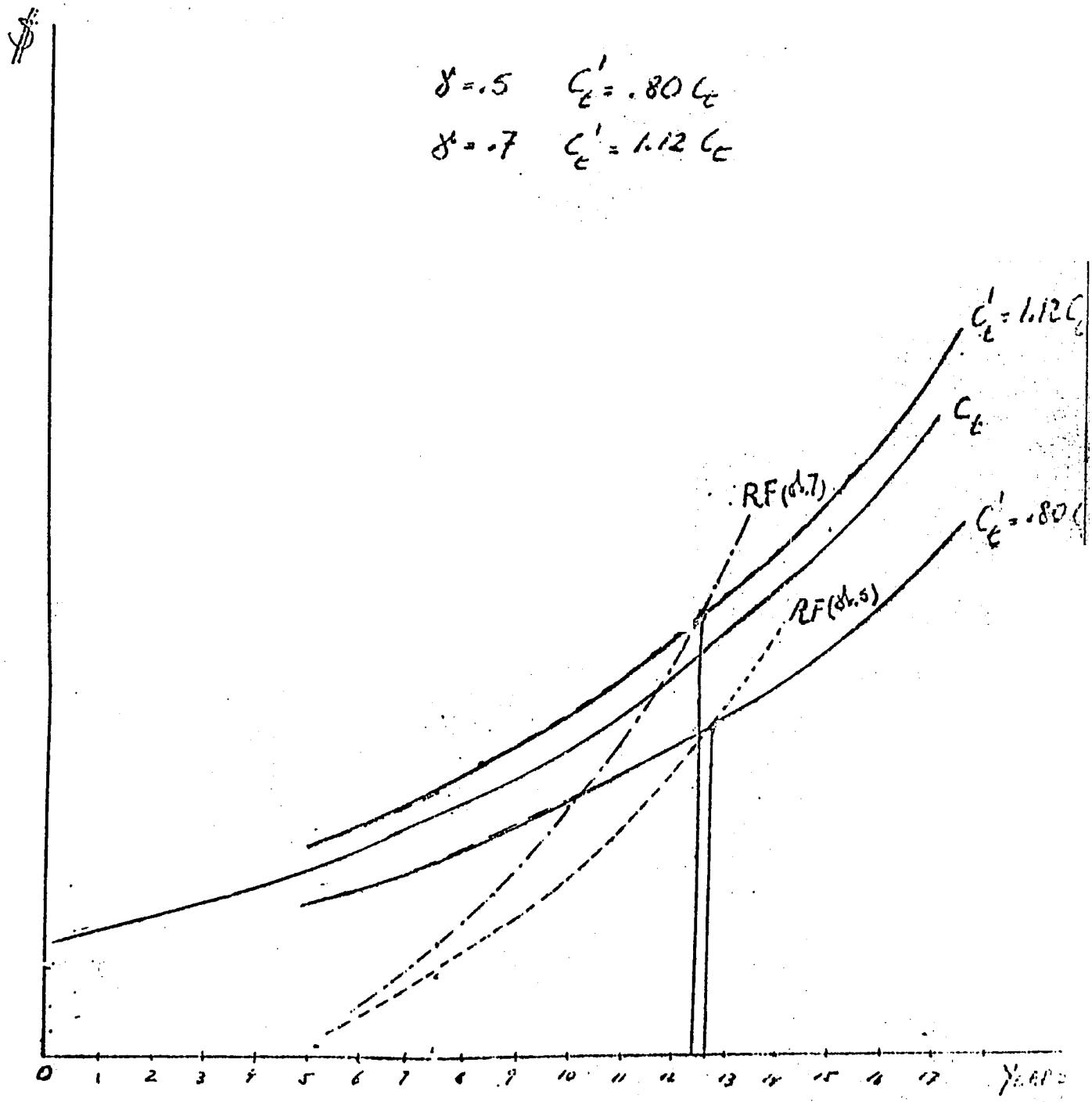
After five years the government begins receiving a repayment flow (RF) out of the graduating students to whom loans were granted. The larger the value of γ the larger this repayment flow.

1/ This is equivalent to $\frac{b}{a+b}$ equal to 0.375. See Psacharpoulos, op. cit., table 8-1.

From the attached figure we can see that the system becomes self supported between the 12th and 13th year after the program begins. This result seems to be relatively insensitive to the value of γ.

$\alpha = .10$

$\beta = .6$



Appendix
Computation of the Repayment Flow (RF)

A student that receives for 5 years a yearly loan of (a+b) will have, at graduation, a debt equal to:

$$(1) \quad D = (a+b)\sum_{i=1}^{5}(i+r)^{i} = (a+b)\frac{1}{r}(1+r)[(1+r)^{5}-1]$$

where r is the opportunity cost of capital. He is allowed to repay that debt in 10 equal yearly installments at an interest rate r. Define as $\delta(a+b)$ that (constant) yearly repayment; the present value of that flow is therefore:

$$(2) \quad \delta(a+b)\sum_{i=1}^{10}\frac{1}{(1+r)}i = \delta(a+b)\frac{1}{r}[1-\frac{1}{(1+r)10}]$$

Equalizing (1) and (2) we solve for δ:

$$(3) \quad \delta = \frac{(1+r)[(1+r)^{5}-1]}{[1-\frac{1}{(1+r)}10]}$$

for $r = 0.10$, δ becomes equal to 1.093.

Of the A_t newly admitted students in any year t, a fraction γ will be entitled to receive loans. If the loan program begins in year 0 the repayment flow will begin in year 5. The expression for that flow for any year T(where $T \geq 5$) is:

$$(4) \quad RF_T = \delta(a+b)\gamma A_0[\sum_{\substack{t=0 \\ t=T-14}}^{T-5}(1+\lambda)^{t}] \quad \text{where } t=0, \text{ if } T<14 \\ t=T-14, \text{ if } T\geq 14$$

where λ is the annual growth rate of new admittance and A_0 are new admissions when the program begins.

Recalling that $b=\beta a$ we can express (4) as a fraction of C_t or C'_t by just knowing λ and the fraction $\frac{A_0}{S_0}$, the ratio of new admittance to the stock of students in the base year.

For Latin America the value of λ is 17% for the period 1960-71; for $\frac{A_0}{S_0}$ the value for 1971 was used.

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