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SOCIAL RETURNS TO EDUCATION: CENTRAL PLANNING AND

LOCAL PLANNING PERSPECTIVES

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This paper is written for educationists and development planners. Its purposes are to familiarize policy makers, advisors, and analysts with the most important approaches to the economics of education and to evaluate the various approaches critically in the context of developing countries. Three topics are developed:

1. How social returns to education typically are calculated.
2. An evaluation of the conventional social return to education approach.
3. A comparison of central planning and local planning.

Before embarking on these topics, an important preliminary issue arises: Why conduct economic analysis of education at all? After all, might it not be crass to think of education in economic terms? Does not investment in education represent an obviously meritorious use of social resources? Is there not overwhelming evidence that countries that spend more on education are richer, at least materially? Wouldn't educational expansion be especially beneficial to the poorest citizens of a country---those who are most likely excluded from education when enrollment ratios are less than universal? How can educators and social scientists with Ph.D.'s even think it possible to have too much education?

The answers to all these questions are the same. Yes, education is a good, but it comes at a cost. To spend more on education is to forego expenditures on health care, housing, construction of infrastructure, or whatever else the resources might have been used for had they not been devoted to education. The concern is not whether more education would produce benefits,

more on education is the best use of resources, taking account of what must be given up to provide education. In deciding on the desirability of education and in planning educational systems, the benefits of education need to be assessed in relation to the costs. Never is economic analysis more important than when resources are scarcest, as in poor countries.

Recognizing, then, that an economic approach to educational planning is to be desired and not avoided, the appropriate question is how is it to be done? The answers are developed in the remainder of this report. Section I outlines the logic behind economic analysis of educational planning. Section II describes three approaches that have been taken in the literature: the manpower requirements approach, the social demand approach, and the social cost-benefit approach. Section III evaluates the social cost-benefit approach from a central planning perspective. The central planning perspective is contrasted with local planning perspectives in Section IV. Conclusions appear in Section V.

# I. THE LOGIC OF ECONOMIC ANALYSIS OF EDUCATIONAL PLANNING

## A. The Idea of Social Costs and Social Benefits

The economics of education compares the marginal social costs of education to the marginal social benefits. The term "social" is meant to indicate that the costs and benefits faced by all members of society, both students and others, should be included. Among the social costs are such items as buildings, teachers' salaries, pupils' fees, and the earnings foregone by students while in school. (Caution: Avoid double-counting.) The social benefits include many factors:<sup>1</sup> better jobs gained by the recipients of education; positive or negative effects of their employment on job opportunities for the less educated; higher on-the-job productivity; better ability to deal with disequilibria; enhanced social mobility; improved health, sanitation, nutrition and child-rearing practices; diminished birth rates; a more informed citizenry; greater community awareness and pride because of the presence of a school; and spillovers into other areas of effective local development efforts. The adjective "marginal" in "marginal social benefits" signifies that any educational project or program should be evaluated in terms of the extra benefits that would be expected to result relative to the extra costs.

Typically, educational systems are set up so that costs precede benefits. During the school years, society expends resources on education. The pay-off comes later, when the student is on the job and in the world. This time pattern is diagrammed in Figure 1.

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<sup>1</sup>For fuller discussions of the many social benefits that result from education, see C. Arnold Anderson and Mary Jean Bowman, Education and Economic Development (Chicago: Aldine, 1966), Lascelles Anderson and Douglas M. Windham, Education and Development (Lexington, Mass.: Heath Lexington Books, 1982), and World Bank, Education Sector Policy Paper (Washington, April, 1980).

The importance of this time pattern is that it enables us to draw upon a theorem in capital theory. The theorem states that when costs precede benefits, the two methods for evaluating investment programs---present value and internal rate of return---yield equivalent decision rules. Let us now briefly review these two methods.

### B. The Present Value Method

The present value method, as its name implies, determines the present value of future streams of costs and benefits. The descriptor "present" is meant to emphasize that a dollar today is worth more than a dollar in the future. Or put differently, a dollar accruing in the future must be discounted compared to a dollar offered at present. Denote the rate of discounting by  $r$ . Ordinarily, we would expect that the appropriate discount rate would be the market rate of interest,  $i$ .<sup>1</sup> For example, suppose  $i$  equals 10%. Then if I am offered the choice between receiving \$100 today or \$110 a year from now, I would consider these two income opportunities equally attractive.

Thus:

$$(1) \text{ Value of income this year} = \frac{\text{Value of income next year}}{1 + \text{discount rate}}$$

The present value of any project is the difference between the present value of benefits and the present value of costs:

$$(2) \text{ PV}_{\text{project}} = \text{PV}_{\text{benefits}} - \text{PV}_{\text{costs}}$$

The present value of costs is the sum of the costs in each time period,  $C_t$ , appropriately discounted:

$$(3) \text{ PV}_{\text{costs}} = C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \dots + \frac{C_T}{(1+r)^T}$$

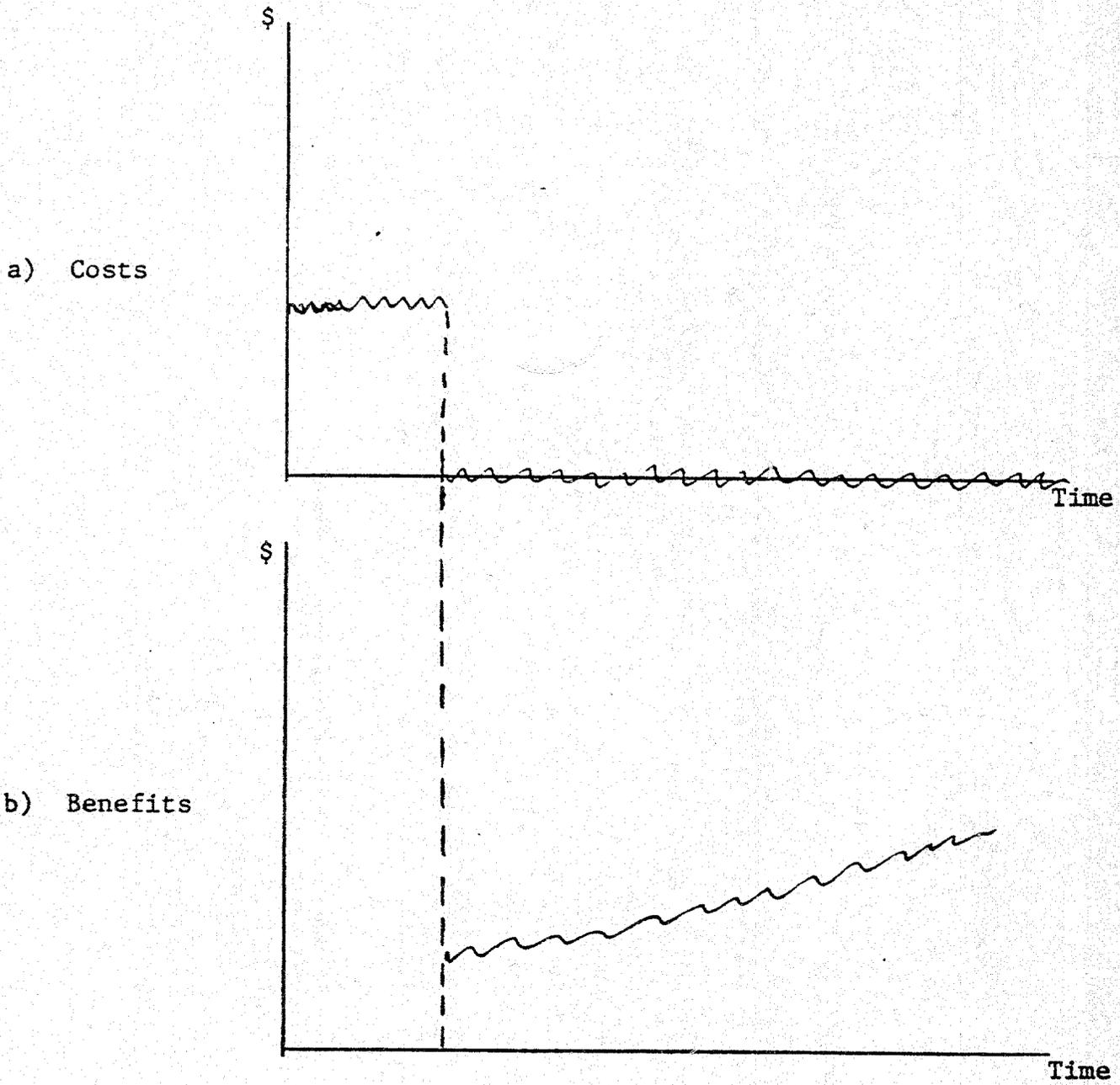
Likewise, the present value of benefits is:

$$(4) \text{ PV}_{\text{benefits}} = B_0 + \frac{B_1}{1+r} + \frac{B_2}{(1+r)^2} + \dots + \frac{B_T}{(1+r)^T}$$

<sup>1</sup>The market rate of interest is the correct criterion when capital markets are perfect. When they are not, or when interest rates are artificially low,

FIGURE 1.

TIMING OF COSTS AND BENEFITS OF EDUCATION



The present value decision rule is:

Rule 1. Invest in a project if its present value is positive; do not invest otherwise.

Note that this decision rule is general enough so that any and all presumed social benefits and social costs of education can be factored into the equation.

C. The Social-Rate-of-Return Method

The other method for social cost-benefit analysis is to calculate a social rate of return. This too relies on the notion of time discounting. However, it is done differently. Instead of using a specified interest rate  $r$ , the rate of return method finds that discount rate for which the present value of costs equals the present value of benefits. This is known as the "internal rate of return," or "rate of return" for short. So in the preceding example, if I could invest \$100 today and receive \$110 a year from now, I could calculate (using equation (1)) that the rate of return on my investment is 10%. In this example, in which we have only a one year lag between the time of investment and the payoff date, the rate of return is given implicitly by equation (1) and explicitly by:

$$(5) \text{ Rate of return on investement} = \frac{\text{Income Next Year}}{\text{Income This Year}} - 1.$$

To evaluate education projects, which involve many periods, the idea is the same, but the arithmetic is a bit more difficult. Use the same principle, i.e., equate the present value of costs to the present value of benefits; by equations (3) and (4), this is

$$(6) C_0 + \frac{C_1}{1+r^*} + \frac{C_2}{(1+r^*)^2} + \dots + \frac{C_T}{(1+r^*)^T} = B_0 + \frac{B_1}{1+r^*} + \frac{B_2}{(1+r^*)^2} + \dots + \frac{B_T}{(1+r^*)^T}$$

The internal rate of return is that particular value of  $r$ , denoted here by  $r^*$ , which makes the left hand side of (6) equal the right hand side. Having found  $r^*$ , use the following internal rate of return decision rule:

Rule 2. If the internal rate of return  $r^*$  is greater than the market rate of interest  $i$ , then the project under evaluation is worthwhile; otherwise not.

#### D. Equivalence of the Two Methods

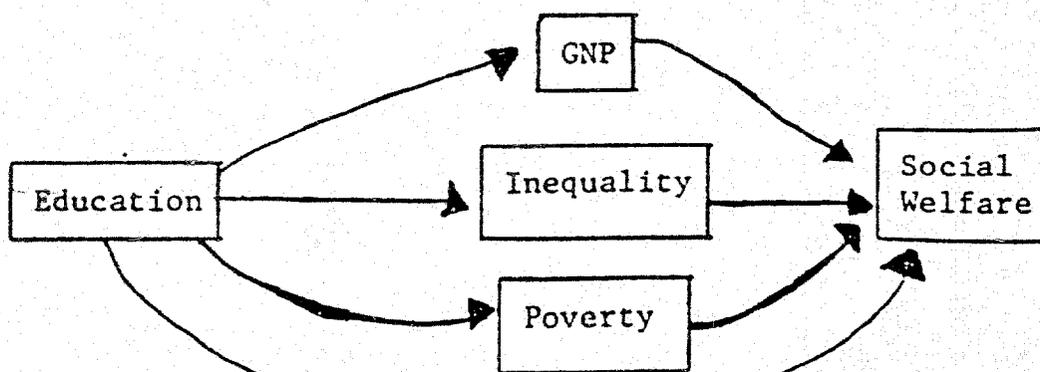
Now let us recollect from above the theorem stating that Rule 1 (the present value decision rule) and Rule 2 (the internal rate of return decision rule) are equivalent under the conditions that apply to most education investments. That is, we can talk about present value analysis as being equivalent to rate of return analysis. In view of this equivalence, throughout the balance of this paper, I will use the terms "social returns to education" and "social cost-benefit analysis" interchangeably.

## II. THREE APPROACHES TO EDUCATIONAL PLANNING

Any comprehensive approach to educational planning should take account of the welfare gains and losses resulting from the provision of education. The first step in doing this is to specify what factors enter into one's judgments about social welfare and how education might affect those factors. Education has at least four such effects:

1. Education affects GNP, which affects social welfare;
2. Education affects inequality, which affects social welfare;
3. Education affects poverty, which affects social welfare;
4. Education itself affects social welfare.

This is summed up in the following flow chart:



Appendix I presents a formal model of these effects. The key result is that the information requirements are many and include such data as the types of jobs available to graduates, the impact of their employment on job opportunities for persons with less education, etc. But if perfect competition in labor markets is taken as a working assumption, many of these information requirements are unnecessary, because the answers are assumed in the competitive framework. This may explain why the competitive framework is so popular in educational planning models: the data requirements are much less severe.

The balance of this section reviews three approaches to educational planning in the light of the social welfare approach developed in the appendix.

#### A. The Manpower Requirements Approach

Insofar as educational planning is done with an eye on costs and benefits, a frequent starting point is an analysis of manpower requirements. The "needs" of the economy for educated personnel are estimated, either by projecting employment patterns in various occupations or industries into the future, by asking employers how many persons of a given type they need, by consulting employment services and advertisements, or some combination of these. The outcome is a set of "requirements": e.g., 500 engineers, 100 doctors, 0 economists, etc. The educational system in total and its specific faculties are then enlarged or contracted according to the dictates of the manpower forecast.

This way of planning education has been severely criticized. One complaint is that the method is excessively rigid; it does not allow for substitutability among educational or occupational groups. For example, school might be taught by untrained teachers, by teachers with secondary-level teacher training, or by graduates of university colleges of education, but substitution of one category for another is not permitted in such manpower forecasts. Another

criticism of the manpower requirements approach is that past forecasts have proven to be notoriously inaccurate. There is no reason to believe that future projections would be any better.

These and other criticisms are relatively minor as compared with a fundamental conceptual flaw: the manpower requirements approach takes no account of costs. When employers state their manpower "requirements," they typically do so without regard to the costs of educating the engineers, lawyers, economists, or teachers they are hiring. Would employers still want to hire the same number if they had to pay the costs of their education? The likely answer is no. In economic analyses of education, all the benefits and costs of educated manpower must be considered. Since the manpower requirements criterion neglects costs entirely and looks only at private benefits, it is basically flawed as a method for educational planning.

In sum, the manpower requirements approach starts with a good question: what jobs will there be for the graduates of the educational system? However, the manpower requirements approach does not ask enough questions. What it leaves out is: to get these benefits, what costs have to be paid? For rational educational planning, the manpower requirements approach is a useful starting point, but we must go further.

#### B. The Social-Demand-for-Education Approach

The social-demand-for-education approach is popular among educationists, less so among economists. What this approach does is to quantify the "social demand for education," by which is meant the number of people want to attend school (or parents who want to send their children to school). If the number desiring education is greater than the number of spaces, adherents of this approach would argue that more education should be provided. After

all, so this line of reasoning goes, who would know more about the value of education than the people themselves?

This approach also is conceptually flawed. When people decide whether to send their children to school, they do so on the basis of the private costs of education in relation to the private benefits. The private costs are what the individual or family must pay for education. The private benefits are what the individual or family receives. The private costs and benefits may diverge systematically from the social costs and benefits. On the cost side, educational systems in developing countries are typically heavily subsidized. The school fees charged to students and their parents cover only a fraction of the total resource cost. Because the difference must be paid by taxpayers in the society, the social cost of education may be presumed to exceed the private cost.

On the benefit side of the equation, only by happenstance would the social benefits of education exactly equal the private benefits. There are two possibilities:

- (i) It may be that the individual who is educated benefits more from education than does society. This is likely to arise when wages do not fulfill a market-clearing function; more will be said about this later in this report. What is important for us now is that in this case the private benefits to education are apt to exceed the social benefits. Alternatively:
- (ii) It may be that society benefits more from education than does the individual who is educated. Society may receive a whole host of benefits, some of which are alluded to on the top of page 3. Some of these benefits accrue to persons other than the individual who is educated. Economists call these benefits that accrue to others "externalities." When external benefits are large relative

to private benefits, the possibility arises that the private benefits of education will be less than the social benefits.

In case (i), we have:

- (7) (A) The private cost of education is less than (<) the social cost of education.
- (B) The private benefit of education is greater than (>) the social benefit of education.
- (C) The private cost-benefit ratio is greater than the social cost-benefit ratio.

Condition (7.C) implies that the private rate of return to education will be larger than the social rate.

Consider now what would happen if resources were to be allocated to education on the basis of the "social demand," i.e., on the basis of the private return. If both the private and the social rates of return surpass the market rate of interest i.e., if

- (8) Private rate of return > Social rate of return > Market rate of interest,

we will reach the socially correct decision---namely, to expand the educational system---but we will have done so using the wrong decision rule. This is because we would have based the decision on the private rate of return when the logic of social cost-benefit analysis leads us to view the social rate of return as the appropriate decision criterion.

Suppose, however, that the market rate of interest were in between the private and social rates of return:

- (9) Private rate of return > Market rate of interest > Social rate of return .

The appendix gives an example of this. In such a case, by using the private rate of return criterion, the socially incorrect decision would be reached.

Too much education would be supplied, and it would be appropriate not to expand the educational system

Alternatively, consider case (ii), in which society benefits more from education than does the individual who is educated. In this case, we have:

- (10) (A) The private cost of education is less than the social cost of education.
- (B) The private benefit of education is less than the social benefit of education.
- (C) The private cost-benefit ratio may be greater than, less than, or equal to the social cost-benefit ratio.

It follows from condition (10.C) that the private rate of return to education may be greater than, less than, or equal to the social rate of return. As in case (i), allocating resources to education on the basis of the "social demand" would entail the wrong decision rule; but unlike case (i), the way in which the decision deviates from the social optimum (i.e., whether we end up with too much education being provided or too little) cannot be determined a priori. Once again, the "social demand" for education is a fallacious guide to public policy.

Actually, the very term "social demand" is a misnomer. It does not reflect the desires to taxpayers and other members of society who have to pay the costs of education or who may receive external benefits. It reflects only the perceptions by potential pupils and their parents of the private costs and private benefits of education. Consequently, economists typically refer to the number wanting education not as the "social demand" but rather as the "private demand for education," thereby emphasizing that the basis for this demand is a comparison of the private costs with the private benefits.

In sum, the social-demand-for-education approach improves upon the manpower forecasting approach by including the costs of education as well as the benefits. However, the social-demand-for-education approach remains deficient, because those costs and benefits that are included are private

costs, whereas social decisions should be made on the basis of social costs and benefits. It is this which social rate of return analysis attempts to do.

C. The Social Rate of Return Approach

The social-rate-of-return approach endeavors to compare the social benefits of education with the social costs. Sometimes, social rates of return are calculated; other times, present values. Here is a brief outline of how it's done in practice. (The following two paragraphs are adapted from an article by one of the leading figures in the field, Dr. George Psacharopoulos.)<sup>1</sup>

Estimates of the rate of return to a given level of education are calculated by comparing the discounted benefits over the lifetime of an educational investment "project" to the costs of such project. Thus, for the calculation of the social rate of return to four years of university education, benefits are estimated by taking the difference between existing statistics on the mean pre-tax earnings of university graduates by age and those of a sample group of secondary school graduates. The earnings of the latter also represents the opportunity cost of staying in school. Direct costs should include the full amount of resources committed per student of higher education, rather than the usually smaller part of expenditure borne by the student. Given these data, the rate of return to investment in a college degree compared with a secondary school qualification is the rate of interest that reduces to zero the net present value of the discounted difference between the costs and benefits.

A simple equation for the social rate of return is:

$$(11) \text{ Social rate or return} = \frac{\left( \text{Mean annual pre-tax earnings of university graduates} \right) - \left( \text{Mean annual pre-tax earnings of secondary school graduates} \right)}{\left( \text{Four years study} \right) \times \left( \text{Mean annual pre-tax earnings of secondary school graduates} \right) + \left( \text{Mean annual social direct cost of study} \right)}$$

Note that this formula can be interpreted as the yield of a permanent constant stream of benefits (the difference in earnings appearing in the numerator) over a lump sum cost of projected earnings plus direct outlays (appearing in the denominator). Neither the permanent benefits assumption nor the lumping together of costs are critical in the calculation, since the latter occur within four years and the former extend over several decades.

A private rate of return to college education could be calculated in the same way, although earnings should be post-tax (as the individual does not receive the earnings that are taxed) and the direct costs are obtained from statistics on a student's out-of-pocket expenditures that are strictly due to the costs of college attendance.

Social-return-to-education analysis seeks to weigh the social benefits of additional education against the social costs. In so doing, it asks the right questions. This is a major advantage compared to the manpower requirements and social demand for education approaches. For this reason, I restrict my attention to the social returns to education approach in what follows.

III. EVALUATING THE SOCIAL RATE-OF-RETURN APPROACH FROM A CENTRAL PLANNING PERSPECTIVE

As we saw in Section II, social-return-to-education analysis asks the right questions. How good a job does this method do of answering them? The answer depends on four criteria:

1. Are all costs included?
2. Are all costs valued properly?
3. Are all benefits included?
4. Are all benefits valued properly?

In this section and in the accompanying appendix, I evaluate social cost-benefit analysis according to these criteria. I conclude that social rates of return to education in developing countries as conventionally calculated have two serious problems:

1. Much of what should be included is missing, and
  2. Much of what is included is not valued properly.
- A. Are All the Relevant Costs Included?

Yes. The relevant costs include such direct outlays as costs of buildings, teachers' salaries, and educational materials, plus the indirect cost due to foregone output while the children are in school. Nothing important is left out in the social rate-of-return calculations.

- B. Are the Included Costs Valued Properly?

It depends. In computing social rates of return, the direct outlays are valued according to their dollar cost. This is appropriate if it does not matter who pays the costs. But if public policy is concerned with alleviating poverty and inequality and reaching the poor majority, the incidence of costs matters. This is where the progressivity or regressivity of the tax structure and the size of the overall budget surplus or deficit enter in. In many LDCs,

taxpayers as whole, including many poor families, help subsidize the education of the few, drawn disproportionately from the upper and middle classes.

The indirect costs (i.e., foregone output) in social return analysis are measured by the average earnings of persons without the educational level in question. Implicitly, this assumes that society loses that output, because the jobs the students would have filled had they not been in school remain vacant. This assumption may or may not be correct; it depends on the characteristics of the economy in question.

C. Are All the Relevant Benefits Included?

No. Social-rate-of-return analysis deals explicitly only with the extra output that the economy is presumed to gain by educating more people. In a poor country, this probably is the most important benefit of education. But other benefits, such as those listed at the beginning of Section I, are important too. Some of these are indirect (e.g., the effect of education on improved child-rearing practices) and others are non-quantifiable (e.g., a well-informed populace able to enjoy the arts, literature, and the good things of life). The omission of these indirect and non-quantifiable benefits from social cost-benefit calculations is not particularly troublesome. It can be justified in the following way: We know these other benefits exist. If investing in education is cost-effective when only the output gains are considered, then education is all the more worthwhile when these other benefits are added in. But suppose the measured social benefits are smaller than the social costs, say by \$1,000. We then have an explicit standard against which to gauge the miscellaneous gains from education: are the unmeasured benefits worth \$1,000? Though the economist can pose this question, he cannot answer it---that must be left to educationists, planners, and the people themselves.

Less aggregatively, conventional social cost-benefit analysis ignores such micro development objectives as reducing poverty and inequality and

raising employment. When these concerns are relevant, besides looking just at the number of beneficiaries, it is of interest as well to examine the beneficiaries in terms of their socio-economic status. It should be shown that the beneficiaries will be drawn in large numbers from the target group; fears that educational expansion will cater exclusively or primarily to the elites should be allayed.

D. Are the Included Benefits Valued Properly?

It depends. If the labor market is competitive, yes; if not, no. The included benefit is the extra output that would be produced by a better-educated labor force. As indicated earlier, this extra output is approximated by the difference in annual earnings of persons with the educational level in question as compared to persons without. How appropriate is this procedure?

On the positive side, this methodology is well-warranted in the theory of competitive labor markets. In that theory, the last worker hired is paid according to what he produces---the value of his marginal product. Furthermore, in competitive markets, wages adjust so that the supply and demand for different labor categories are in balance. If educated workers are paid more than less-educated workers competitive theory says it is because the educated workers are more productive than the less educated. The extra output due to education is the value of marginal product of an educated worker minus the value of marginal product of a less-educated worker. Under the competitive assumption, the difference in their value of marginal products is identical to the difference in their earnings. And it is this difference in earnings that is taken as the measure of social benefits from education in social cost-benefit analysis.

The standard methodology has been questioned on several grounds. One is that some part of the earnings differential between educated and less-educated persons is not due to education. The most important factor is differential

ability. Secondary schools, colleges, and universities try to admit the most able students. These individuals probably would earn more than the average even if they didn't have the education. So some part of the earnings differential reflects ability, not education per se. In some studies, an adjustment factor (usually called "alpha") is introduced to deal with this problem; but alpha is selected arbitrarily rather than on the basis of scientific measurement.

Another difficulty with the standard methodology is the failure to distinguish between average and marginal returns to education. The average return to education is what is conventionally used. It is the difference in mean annual earnings. But economic theory tells us that decisions should be based on marginal costs and benefits. The implicit assumption in the conventional literature is that that marginal benefit equals the average benefits. This is a very strong assumption which may not be correct. To determine the marginal benefits from a proposed educational program, projections are needed on what the newly-educated persons will do. What type of work will they find when they leave school in the future and how much will they earn from it? How much more productive will they be in that work with education than without it? Are others with less education likely to be displaced, and if so, what will they do instead? All these questions require a forward-looking approach. This is where educational planners and manpower planners need to work hand-in-hand.

But the most important difficulty with the standard methodology as applied to developing countries is the heavy reliance on an implicit conception of how these countries' labor markets work. Earlier we saw how the standard approach is warranted in terms of competitive labor market theory. But what if the labor market is not competitive? Suppose, instead, that wages

are set institutionally above the market-clearing level, and hence the quantity of labor supplied exceeds the quantity demanded at the institutionally-determined wage. Then, as I show in the appendix, the conventional method of calculating social benefits overstates the output gains from additional education. The basic reason is that in non-competitive labor markets the newly-educated workers may not find jobs comparable to what previously-educated workers had been able to find. If the newly-educated workers are unemployed, then the marginal benefit to education (at least in output terms) is zero. Alternatively, if the newly-educated workers take jobs that previously had been filled by less-educated workers, then the relevant question is: how much more productive are well-educated workers in those jobs than less-educated workers? There is no reason to think that they are several times more productive, which is what would be assumed if the productivity gain is approximated by the mean difference in earnings between educational groups.

#### E. Overall Evaluation

Summarizing the preceding discussion, I conclude that conventional social cost-benefit analysis pays little attention to who pays the costs of education and who receives the benefits. Therefore, the contribution of education to lessening poverty, reducing inequality, and raising employment is virtually ignored. But even if we consider social returns to education strictly in terms of aggregate output, there still are problems. Whether the included costs and benefits are evaluated properly by the conventional methods depends on the structure of labor markets in the country in question. If the labor market is close to competitive, then the standard methods are appropriate. But if the labor market is not competitive, use of the standard methods is problematical. The marginal social benefits of education are overstated by conventional methods. The marginal social costs may also be. The benefits

are probably overstated by more than the costs. If so, the social rate of return to education which is conventionally calculated (the average return) will be too large, and may be of a completely different magnitude from, the true (marginal) social rate of return.

How serious a problem is this? Few developing countries have labor markets that could reasonably be characterized as approximately competitive. Thus, in the majority of cases, conventional social rates of return may mislead rather than inform. See the appendices for further details of these arguments.

#### IV. HOW WOULD LOCAL PLANNING DIFFER FROM CENTRAL PLANNING?

##### A. The Question Under Investigation

Central governments in developing countries play a much larger role in deciding the sizes of their educational systems and methods of financing than does the federal government in the United States. One important policy issue under discussion in the education field is: what would be the effects of increased local decision-making? This section presents an analytical framework for answering two questions: (i) whether a shift to planning by a local authority such as a village chief or local school board would be likely to result in more or less education being provided than under central planning, and (ii) whether a shift to local planning would result in a better allocation of resources.

I shall consider three possible decision-making regimes:

REGIME I. The central government is the decision-maker. It makes its decisions on the basis of the true social costs of education and the true social benefits.

REGIME II. The central government is the decision-maker. It makes its decisions on the basis of true social costs of education, but unlike REGIME I, it measures social benefits in conventional ways.

REGIME III. The locality is the decision-making unit. The local education authority makes decisions on the basis of local costs of education and local benefits.<sup>1</sup>

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<sup>1</sup>It makes a difference how broadly the locality is defined. In this report, I define the locality as being the set of individuals who live within specified boundaries at any point in time. By this conception, when individuals move away, they cease to be counted as local residents. An alternative definition---one not pursued here---is to regard the locality as being comprised of those individuals who resided in a particular place at some base date. By this broader definition, benefits from education that accrue to outmigrants are regarded as benefits to the locality in question, whereas under the narrower definition, benefits accrue to the original locality only insofar as the outmigrants send remittances back from their desinations. I work with the narrower definition of "locality" in what follows.

The various decision-making regimes are illustrated in Figure 2. Motivations for each appear in subsection B below.

In each regime, decisions are posited to be made on the basis of the decision-makers' perceptions of the costs and benefits. They differ in specifying which costs and benefits are to be included. Consequently, they differ also in the quantities of education (as represented by enrollment ratios) that would result. Below, I analyze differences in the probable outcomes emerging from the three decision-making regimes.

The evaluative questions used for assessing and comparing the three regimes are:

- (1) What is optimal?
- (2) How does the amount of education supplied under each regime compare with the optimum?
- (3) How do the amounts of education supplied under each regime compare with one another?

To answer these questions, we need to develop an appropriate analytical framework and a criterion for optimality. These are the subjects of subsections B and C respectively.

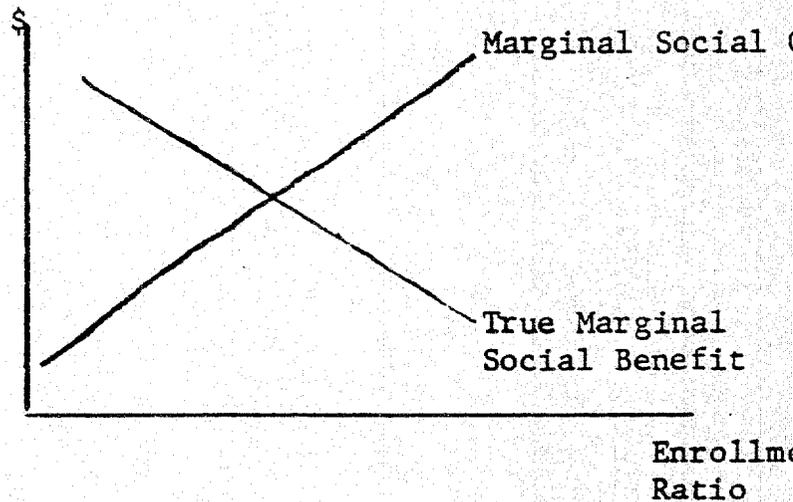
#### B. The Analytical Framework

To compare local planning of education with central planning, we must begin by specifying how each unit might behave if it were responsible for education decisions.

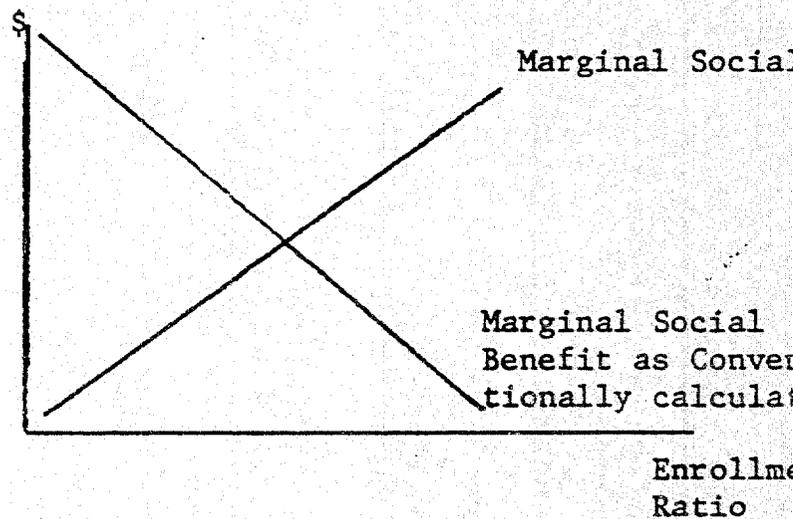
Start with the central government. Suppose that when it is the education decision-making unit, its decisions are made on the basis of perceived social costs and benefits. This is a favorable characterization, not necessarily

Figure 2: Three Decision-Making Regimes

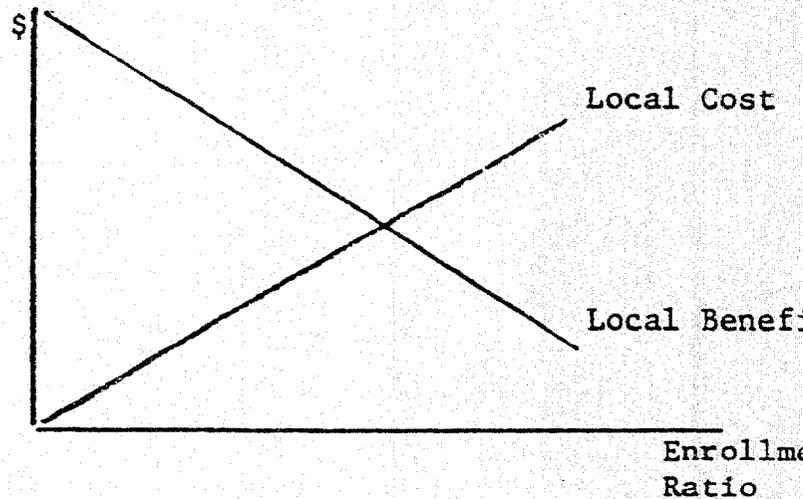
REGIME I: The central government is the decision-maker. It makes its decisions on the basis of the true social costs of education and the true social benefits.



REGIME II: The central government is the decision-maker. It makes its decisions on the basis of true social costs of education, but it measures social benefits in conventional ways.



REGIME III: The locality is the decision-making unit. The local education authority makes decisions on the basis of local costs of education and local benefits.



correct in all places and circumstances. Still, let us stick to the assumption that perceived social costs and benefits are used as the basis for educational decisions under central planning.

How would social costs and benefits be perceived by the central government? Either the true social costs and benefits are perceived accurately, or perceptions deviate systematically from actuality. (A third possibility is that perceptions differ from reality but in no systematic way; this case is uninteresting analytically.) In what follows, we shall work with the first two of these characterizations and assume either:

- a) the central authorities know what the true social costs and benefits are and act on the basis of them, or
- b) the central authorities act on the basis of social costs and benefits obtained from conventional social rate of return calculations.

As we saw in Section III and Appendix II, whether the conventional calculations yield appropriate answers or not depends on conditions in the labor market. If the labor market is competitive, then the social costs and benefits of education as conventionally calculated correspond to true social costs and benefits, at least insofar as narrow economic costs and benefits are concerned. But as we also saw, if the labor market is not competitive, the conventional methods systematically overstate the output gains from education, because the additional educated workers will be unemployed or underemployed. The standard analysis is appropriate if the underlying assumption of a competitive labor market is valid in a particular empirical setting. If the assumption is inappropriate, the standard calculations are appropriate too.

Up to now, we've looked at central decision-making. How would local

decision-making differ? It is reasonable to posit that the local education authority would respond to local costs and local benefits. For example, when they consider building a school, they weigh the costs to the community of building materials, construction labor, classroom supplies, and teachers' salaries. Those costs that are paid by other bodies (say, by an outside donor, a central Ministry of Education, or state aid) may, in the first instance, be ignored by the local authorities. Likewise, they may be presumed to concern themselves only with benefits that accrue to the locality. There is, of course, no reason for local education officials to heed non-local costs and benefits. In fact, to the extent that they do, they might be charged with failing to represent the interests of their constituents.

How do local costs compare with total costs? Even when the schools are locally-run, -operated, and -financed, some (perhaps sizable) share of the cost typically is born by the central government. Thus, local costs ordinarily would be less than total social cost for any given quantity of education, as shown in Figure 3. (Both marginal cost curves are drawn as upward sloping for the usual reasons.)

Now, what about benefits? Whether local benefits are greater or less than social benefits in the society as a whole depends on the workings of labor markets. Once again, the issue is whether or not labor markets are competitive. Now, let us consider how the local benefit is apt to compare with the social benefit in typical situations.

If the labor market is competitive, the local benefit will probably be less than the true social benefit. This is because some of the benefits of education will accrue outside the local area. There are two main reasons for this. One is that education ~~is~~ one community may have positive externalities on an adjacent community. For example, educated farmers in one

Figure 3.  
Costs

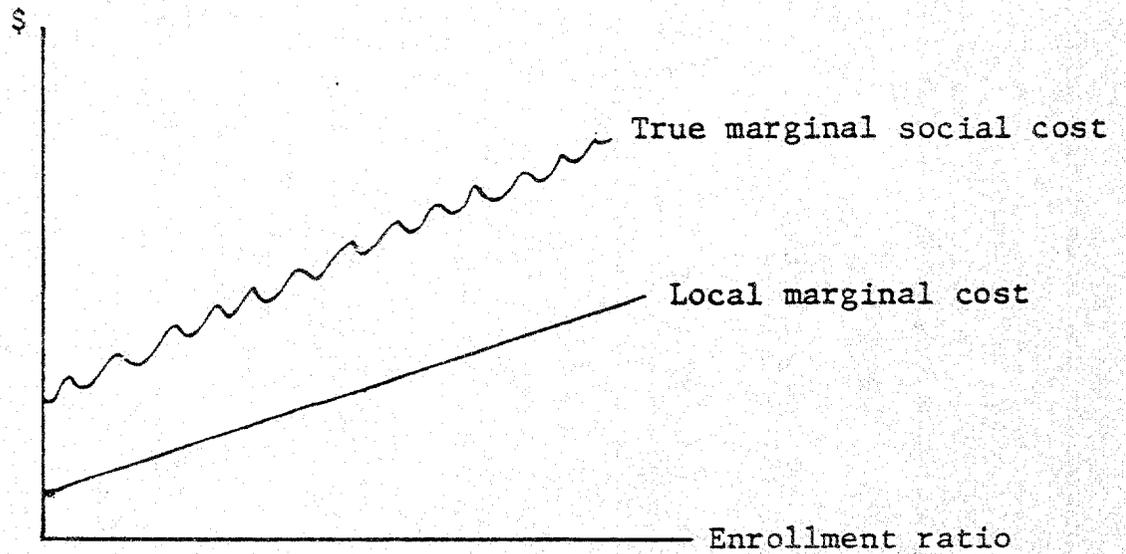


Figure 4.  
Benefits in Competitive Labor  
Market

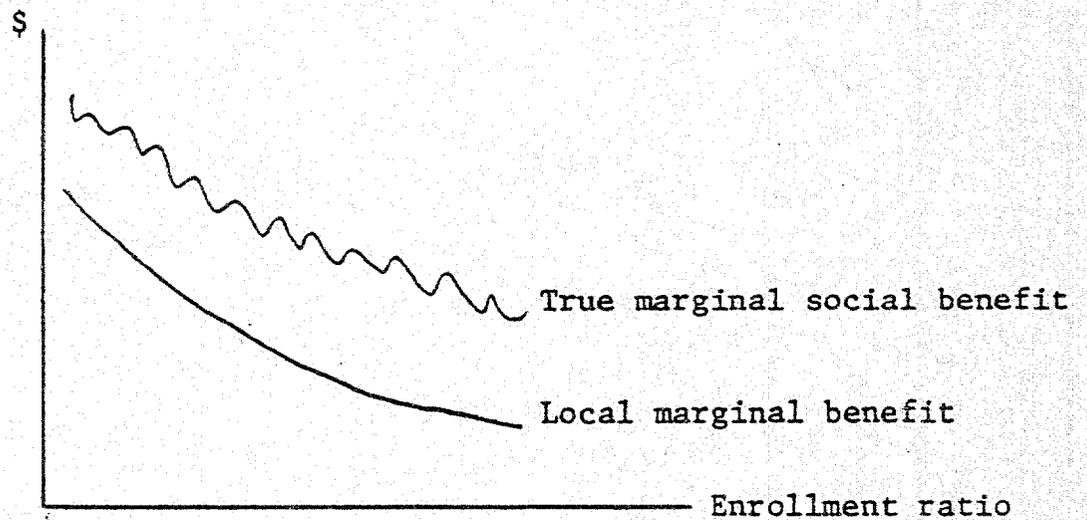
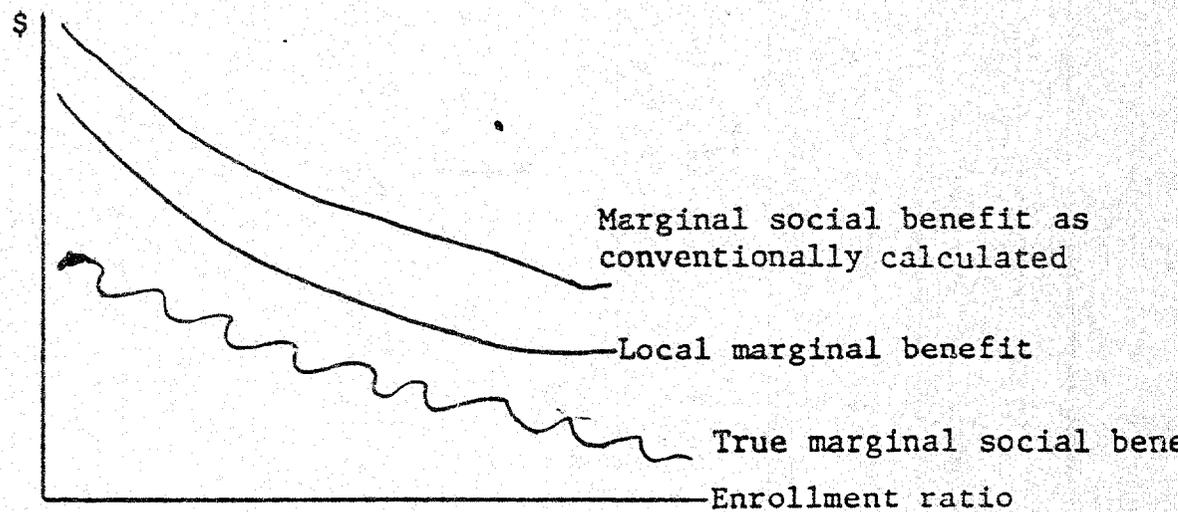


Figure 5.  
Benefits in Non-Competitive  
Labor Market



[Note: True costs and benefits appear as wavy lines.]

locality may fertilize or irrigate their crops differently, and this may result in demonstration effects for nearby farmers who hadn't been to school themselves. The other reason the local benefit of education would probably be less than the benefit to society as a whole relates to emigration. Very often, educated individuals leave the rural communities and work in the cities of their own countries or abroad. The local community benefits economically from this activity only to the extent that the out-migrants remit substantial sums to their home communities. To repeat, when labor markets are competitive, the local benefit of education is likely to be smaller than the true social benefit.

Figure 4 shows the probable shape of the true marginal social benefit curve and the local marginal benefit curve in the case of a competitive labor market. Both are shown as decreasing functions of the enrollment ratios, in recognition of diminishing returns to education. The local marginal benefit curve is shown as lying everywhere below the true marginal social benefit curve; this reflects the fact that some of the benefits accrue outside the locality.

If labor markets are not competitive, the situation will be different. In this case, the perceived local benefit is likely to be greater than the true social benefit but less than the social benefit as conventionally perceived and calculated. The reason the local benefit is less than the conventional social benefit is the same as in the preceding paragraph: some of the benefits of education accrue to persons living outside the local area. On the other hand, both the local and non-local benefits are private benefits and, as in the example in Appendix II, these private benefits may not have counterparts in social benefits. Consequently, though the true social benefit may be zero or close to it, the local benefit (i.e., the private benefits accruing to members of the local community) may well be positive.

Figure 5 illustrates the benefits of education in the case of a non-competitive labor market. Now, in contrast to the competitive case, the probable position of the true marginal social benefit curve is below the local marginal benefit curve. This is because society benefits from increased education only to the extent that educated workers are more productive than uneducated ones, whereas local workers benefit a great deal from education if their education causes them to be hired preferentially, even if they are only marginally more productive. The marginal social benefit as conventionally calculated is drawn to lie above the local marginal benefit curve, again because part of the apparent benefit is realized outside the locality.

In sum, the probable relationships are:

1. The marginal social cost curve is apt to lie everywhere above the local cost curve.
2. In the case of a competitive labor market, the social benefit as conventionally calculated coincides with the true marginal social benefit curve, and both are apt to lie above the local benefit curve.
3. In the case of a non-competitive labor market, the local benefit curve is apt to lie above the true marginal social benefit curve but below the marginal social benefit curve as conventionally calculated.

### C. What is Optimal?

At the beginning of this section, we raised three decision-making regimes for consideration:

<u>Regime #</u>	<u>Decision-Maker</u>	<u>Basis for Decision</u>
I	Central government	True social costs, true social benefits
II	Central government	True social costs, social benefits as conventionally measured
III	Local authorities	Local costs, local benefits

Which of these three regimes is optimal? Before we can answer this question, we need to establish a criterion for optimality.

It might be argued that optimality is properly defined in terms of the decision-making process. Those who favor local decision-making per se more or less irrespective of the actual decisions made would prefer Regime III.

Others would argue that optimality is properly defined in terms of the outcome of the decision. Those who seek the highest benefit from education net of costs more or less irrespective of the level of decision-making would favor Regime I.

In what follows, I use the outcome criterion for optimality.

#### D. Comparing the Three Regimes

Figures 6 and 7 depict the outcomes of each decision-making regime in the cases of competitive labor markets and non-competitive labor markets respectively. The results that emerge as being most probable are:

##### 1. In the case of competitive labor markets:

A. Central decision-making according to conventional social cost-benefit calculations (Regime II) will result in a socially optimal allocation of resources. This is because in the competitive case, the conventional social cost and benefit curves coincide with the true ones.

B. Decision-making by a local education authority (Regime III) will result in a socially non-optimal allocation of resources. This is because the true social costs and social benefits are not taken account of.

C. Whether the local decision process entails too much going to education or too little is indeterminate. This indeterminacy arises because, although the local benefits are less than the social benefits, the local costs also are lower, and the effect of these deviations on the size of the educational system depends on which gap (i.e., the benefit gap or the cost gap) is larger.

##### 2. In the case of non-competitive labor markets:

A. If the central government allocates resources to education on the basis of conventional social cost-benefits calculations (Regime II), the resultant educational system will be too large relative to the social optimum. This is because in Regime II social benefits are overstated relative to their true values.

Figure 6.  
Cost and Benefits  
in the Competitive  
Case

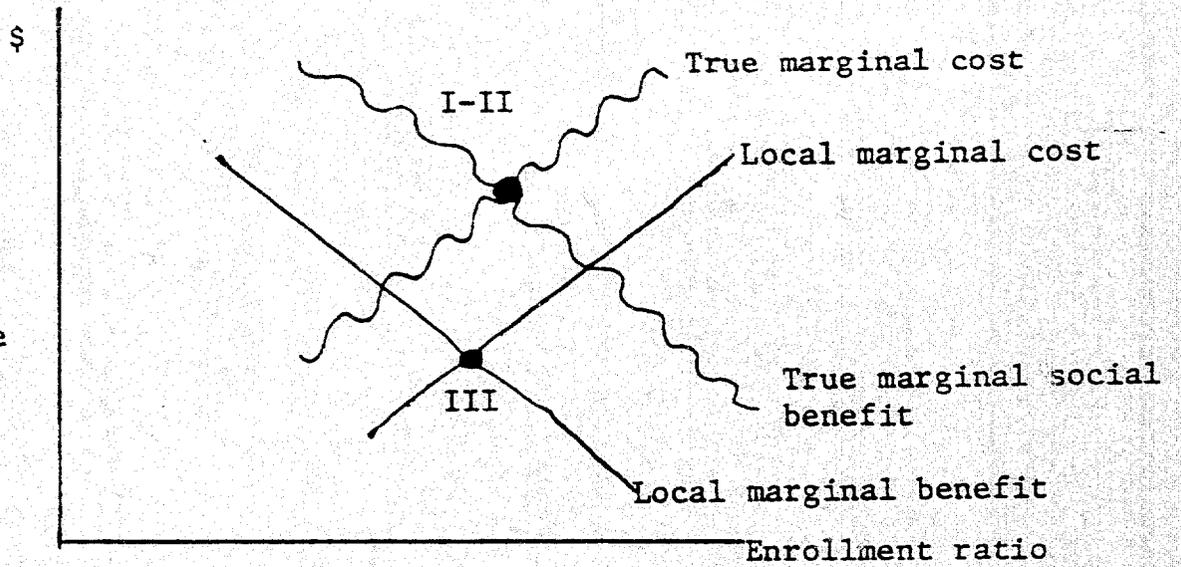
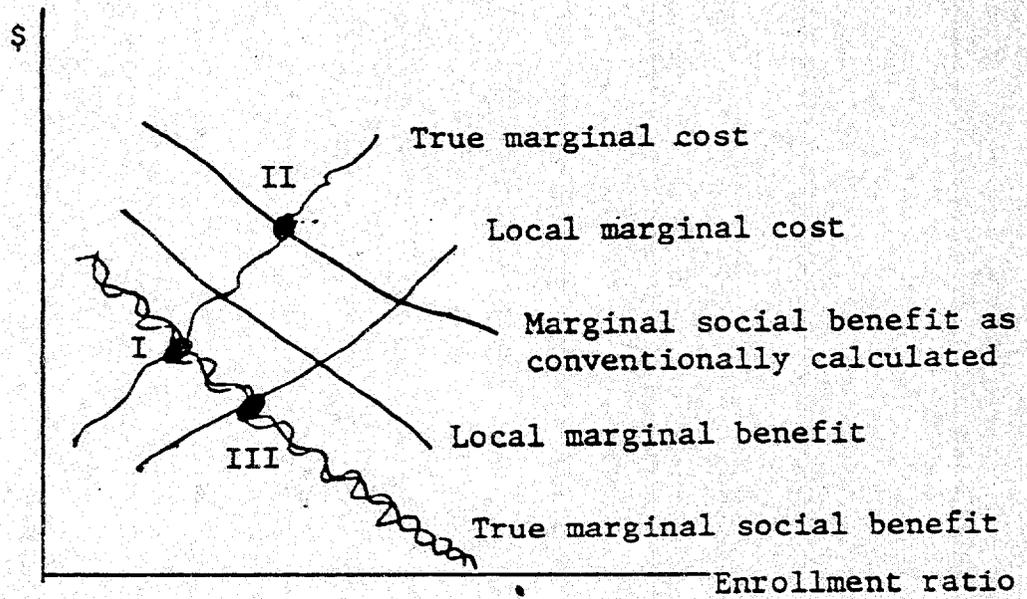


Figure 7.  
Costs and Benefits  
in the Non-Compe-  
titive Case



B. If resources are allocated to education by a local education authority on the basis of local costs and local benefits (Regime III), the resultant education system will be too large relative to the social optimum. This is because the local cost is less than the true social cost and the local benefits are greater than the true social benefits.

C. Whether the allocation by the central government according to conventional social cost-benefit calculations (Regime II) results in a larger or smaller deviation from optimality than if the resources are allocated by a local education authority (Regime III) cannot be determined a priori. The ambiguity is for the same reason as in the competitive case: both the local benefits and the local costs are lower than the social benefits and costs, so the outcome depends on the relative gaps.

#### E. Summary of Results

Defining an optimal decision-making regime as one in which consideration of true social costs and true social benefits leads to an educational system of optimal size, the results of this section can be summed up in a single sentence: The optimum will never be attained under resource allocation by a local education authority and will be attained using conventional social cost-benefit methods under central decision-making only when labor markets are competitive.

## V. CONCLUSIONS

Why conduct economic analysis of education? The most fundamental reason is that the resources expended on education could be put to alternative uses. The marginal social benefits of education must be estimated and evaluated in light of these opportunity costs.

The costs and benefits of education may be compared by calculating either a net present value or a social rate of return. These two methods give the same answers in educational projects, and so may be used interchangeably.

Various approaches are available for educational planning. The "manpower requirements approach" is deficient, both because it neglects costs and because manpower projections have not proven very accurate. The "social demand approach" also is deficient. Despite its name, it examines private costs and benefits; but social decisions should be based on social costs and benefits, not private ones. The "social cost-benefit approach" endeavors to quantify these social costs and social benefits. In so doing, it embodies important aspects of both the manpower forecasting and the social demand approaches.

How useful are the results from conventional social cost-benefit calculations? The answer depends on the circumstances in a particular country---specifically, on the competitiveness of its labor markets. If the labor market is approximately competitive, then conventional social cost-benefit calculations are useful; otherwise not. Intuitively, the reason is that the conventional methods present average rates of return; the appropriate criterion for allocating resources is the marginal rate of return; and the average and the marginal can be presumed equal only when labor markets are competitive. In the majority of less developed countries labor markets are thought to be very far from competitive. Only in relatively unusual instances,

Therefore, can conventional social rate of return calculations in developing countries be justified. This is not to say that social cost-benefit analysis should be dismissed. Rather, it should be done in more sophisticated ways.

How do local decision-making and central decision-making differ? In a competitive labor market, central government consideration of social rates of return can reasonably be expected to result in an educational system of optimal size. However, in the case of a non-competitive labor market, central government decision-making on the basis of a conventional social rate of return calculation would produce distortions. Decision-making by a local education authority, in contrast, would never be expected to produce the optimal outcome. Under labor market competition, the direction in which local decision-making deviates from the optimum is indeterminate. When labor markets are not competitive in the ways described in this report, decision-making by the central government or by a local education authority would be expected to result in an educational system that is too large relative to the social optimum. In a non-competitive environment, it cannot be determined a priori which regime (central planning or local planning) yields an outcome closer to the social optimum.

The available methods for assessing the social returns to education have their strengths and weaknesses. On the positive side, they ask important questions about what social benefits would be expected from additional education and what costs have to be paid. They are quite appropriate under conditions of labor market competitiveness. But on the negative side, some important benefits and costs of education are left out of the conventional calculations. Furthermore, the benefits and costs that are considered are not evaluated properly when labor markets are not competitive.

Looking ahead, the social rate of return approach can and should be refined. One refinement would be to include some of the things that are

poverty, looking both on the beneficiary side and on the cost side of the ledger. Another refinement would be to devise a methodology for assessing marginal social costs and benefits in the non-competitive labor market. The kinds of questions that planners should ask economists to answer are: What kinds of jobs will the newly-educated workers get? How much more productive will they be in those jobs than less-educated workers? How many less-educated workers will be displaced? Where will they go and how productive will they be elsewhere, if in fact they are employed at all? These are not easy questions to answer empirically; a great deal of new information is needed to compute a marginal social rate of return to education. Unless planners have this information, how wise can their education decisions be?

PLANNING EDUCATION'S CONTRIBUTION TO SOCIAL WELFARE:A FORMAL MODEL

Assume an economy has a social welfare function  $W$ , the arguments of which are Gross National Product ( $Y$ ), income inequality ( $I$ ), absolute poverty ( $P$ ), and education itself ( $ED$ ), with partial derivatives as specified:

$$(A.1) \quad W = W(Y, I, P, ED),$$

$$W_1 > 0,$$

$$W_2 < 0,$$

$$W_3 < 0,$$

$$W_4 > 0.$$

Then when more persons in the economy are educated:

$$(A.2) \quad \frac{dW}{dED} = \frac{\partial W}{\partial Y} \frac{\partial Y}{\partial ED} + \frac{\partial W}{\partial I} \frac{\partial I}{\partial ED} + \frac{\partial W}{\partial P} \frac{\partial P}{\partial ED} + \frac{\partial W}{\partial ED} \cdot 1$$

This tells us that the effect of education on social welfare depends on a) the marginal contribution of each component to social welfare, and b) the change in each component as education increases.

Standard educational planning approaches pay no attention to inequality, poverty, and education per se. They thus offer at best a partial accounting of the relevant social benefits and costs of education. But they do try to offer a reasonable estimate of the GNP effects of education.

How successful are the standard methods at taking account of GNP effects? First, let us see what should be considered. Write gross output as  $Q$  and the aggregate production function as

$$(A.3) \quad Q = f(E_1, E_0, K), \quad f_1, f_2, f_3 > 0,$$

where  $E_1$  is employment of type-1 (educated) labor,  $E_0$  is employment of type-0 (uneducated) labor, and  $K$  is the economy's capital stock. Education requires

---

<sup>1</sup>The time dimension must be such that future benefits are taken account

the expenditure of resources to build and operate the schools; write the cost-of-education function as:

$$(A.4) \quad C = C(ED), \quad C' > 0.$$

GNP net of educational costs is then

$$(A.5) \quad Y = f(E_1, E_0, K) - C(ED).$$

If the economy is non-homogeneous and different sectors (e.g., modern and traditional) co-exist, (A.5) becomes

$$(A.6) \quad Y = \sum_{i=1}^N [f^i(E_1^i, E_0^i, K^i) - C(ED)],$$

where there are  $N$  sectors, indexed by  $i$ .

The effect of additional education on net GNP is found by totally differentiating  $Y$  with respect to  $ED$ :

$$(A.7) \quad \frac{dY}{dED} = \sum_{i=1}^N \left( \frac{\partial f^i}{\partial E_1^i} \frac{\partial E_1^i}{\partial ED} \right) + \sum_{i=1}^N \left( \frac{\partial f^i}{\partial E_0^i} \frac{\partial E_0^i}{\partial ED} \right) + \sum_{i=1}^N \left( \frac{\partial f^i}{\partial K^i} \frac{\partial K^i}{\partial ED} \right) - \frac{\partial C}{\partial ED}.$$

This tells us that the output effects of education depend upon seven sets of factors, the first six of which have as many terms as there are sectors in the economy:

1. The terms  $\partial f^i / \partial E_1^i$ , which tell if an additional educated worker is employed in sector  $i$ , how much he contributes to that sector's output.
2. The terms  $\partial E_1^i / \partial ED$ , which tell if more workers are educated, how many of them will be employed in sector  $i$ .

3. The terms  $\partial f^i / \partial E_0^i$ , which tell if an additional uneducated worker is employed in sector  $i$ , how much he contributes to that sector's output.
4. The terms  $\partial E_0^i / \partial ED$ , which tell if more workers are educated, how many more or fewer uneducated workers will be employed in sector  $i$ .
5. The terms  $\partial f^i / \partial K^i$ , which tell if additional capital is employed in sector  $i$ , how much it contributes to that sector's output.
6. The terms  $\partial K^i / \partial ED$ , which tell if more workers are educated, how much more or less capital will be employed in sector  $i$ .
7. The term  $\partial C / \partial ED$ , which is the social cost of education.

Either factor markets are competitive or they are not. The reason this matters for educational planning is discussed in Section III and Appendix II.

In the case of competitive factor markets, we can readily find  $6N + 1$  equations to go along with the  $6N + 1$  unknowns on the right hand side of (A.7). First of all, by virtue of competition, the marginal products of each factor are equalized across alternative uses. Thus, if each factor is used in each sector:

$$(A.8.a) \quad \partial f^i / \partial E_1^i = \partial f^j / \partial E_1^j = W_1 \text{ for all } i, j;$$

$$(A.8.b) \quad \partial f^i / \partial E_0^i = \partial f^j / \partial E_0^j = W_0 \text{ for all } i, j;$$

$$(A.8.c) \quad \partial f^i / \partial K^i = \partial f^j / \partial K^j = r \text{ for all } i, j.$$

( $W_1$  and  $W_0$  denote the wages of well-educated and less-educated labor respectively)

Second, competition assures the full employment of all factors, and hence:

$$(A.8.d) \quad \sum_{i=1}^N \partial E_1^i / \partial ED = 1,$$

$$(A.8.e) \quad \sum_{i=1}^N \partial E_0^i / \partial ED = -1,$$

$$(A.8.f) \quad \sum_{i=1}^N \partial K^i / \partial ED = 0,$$

the latter assuming a fixed, fully-employed endowment of capital in the aggregate economy. Equations (A.8.-f), along with equation (A.4), provide the requisite  $6N + 1$  terms. By substitution, (A.7) becomes:

$$(A.9) \quad \frac{dY}{dED} = W_1 - W_0 - C';$$

that is, the gain in net GNP is the wage of an educated worker, minus the wage of an uneducated worker, minus the cost of education---exactly what is included in conventional social cost-benefit analysis.

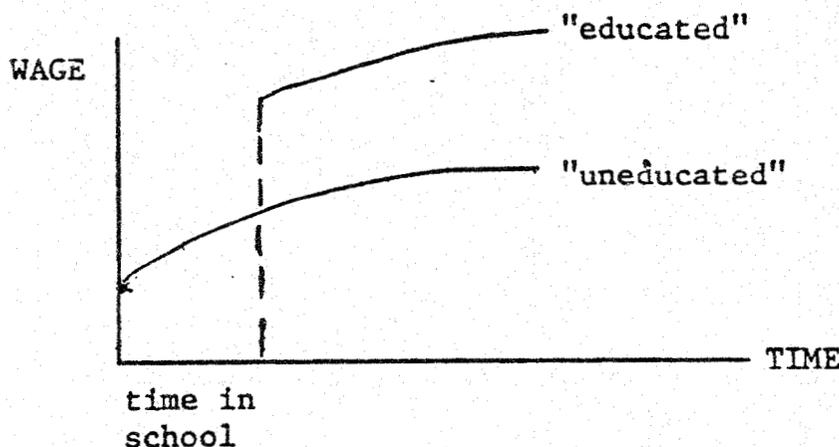
When labor markets are not competitive, as indeed they are not in many developing economies, equations (A.8.a-f) do not hold. But equation (A.9) is derived from equations (A.8.a-f), so when they do not hold, equation (A.9) does not either. Thus, in the non-competitive case, there is no warrant for using the wage differential between educated and uneducated workers to approximate the social benefits of education.

What should be used? What is needed is information on the seven sets of factors that enter into equation (A.7). It would be interesting to set up various models of labor markets, capital markets, and education and work through the necessary calculations. Appendix II presents one such model. Further research in building other models of interrelationships among education and factor markets would be worthwhile.

SOCIAL COST-BENEFIT ANALYSIS AND LABOR MARKET COMPETITIVENESSA. The Basic Issue

Having examined the conventional procedures for computing social returns to education, we found that incomplete enumeration of social benefits may lead to an underestimate of the actual returns to education. My concern in this appendix is to show that when labor markets are not competitive, the usual way of evaluating social benefits 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 such a case, we must look carefully at the role of labor market competitiveness in validating established methods.

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 would typically look like this:



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

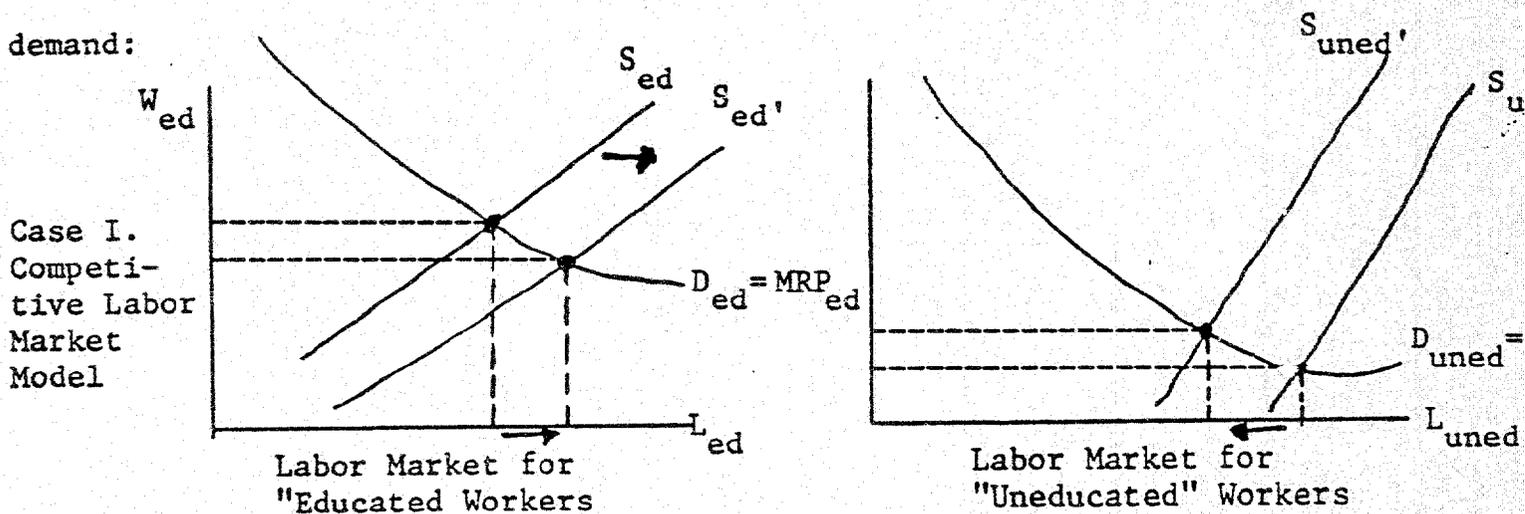
As always in economics, for policy purposes, the interest is in the marginal

<sup>1</sup>This appendix is drawn from Gary S. Fields, "Assessing Educational Progress and Commitment," Report prepared for the U.S. Agency for International Development, October, 1978, revised version published under the title "Educational Progress and Economic Development" in Lascelles Anderson and Douglas Windham, eds.,

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 average return is a good guide if and only if it equals the marginal return. And as I shall now show, this holds only when labor markets are competitive.

### B. The Case of Competitive Labor Markets

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:

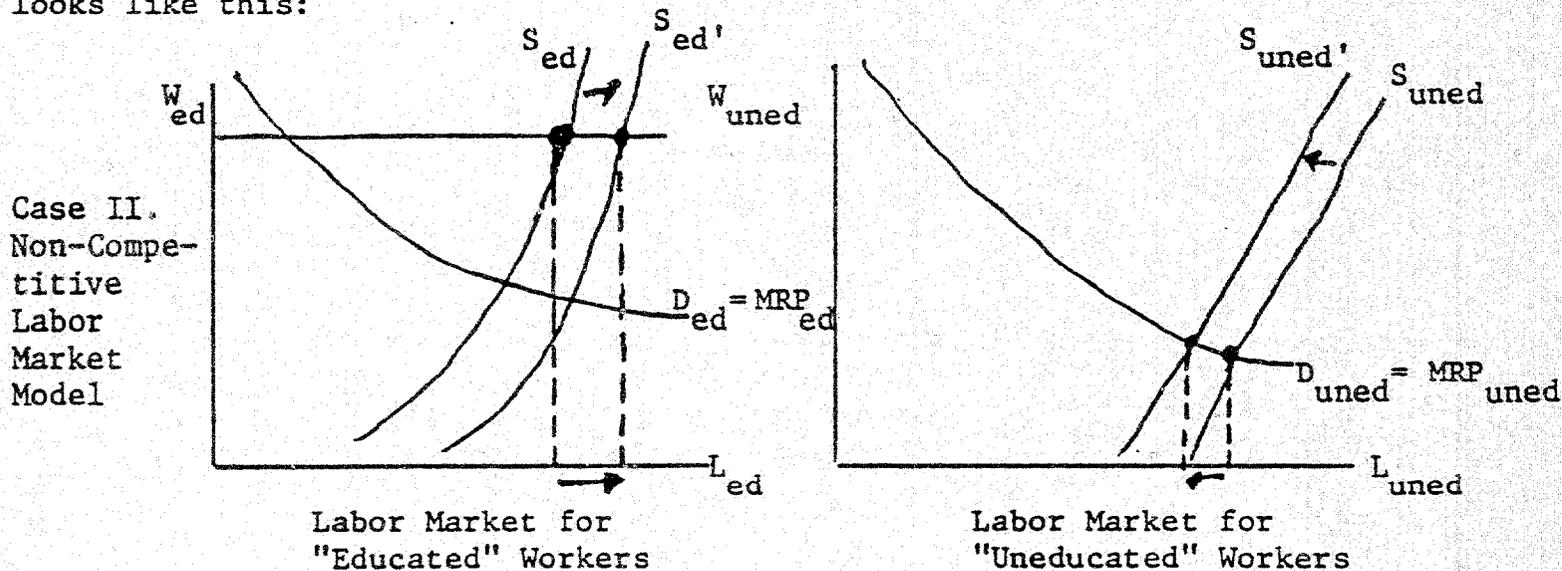


Educating an additional person shifts the supply of educated labor by one unit to the right and shifts the supply of uneducated labor by one unit to the left. The newly-educated worker is employed at the educated worker's wage ( $W_{ed}$ ), which is only slightly different from the wage received previously 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 the marginal worker. Hence, when wages are determined competitively, the social rate of return to education as conventionally calculated provides a good estimate of the output gains from additional education.

### C. The Non-Competitive Case

In many less developed countries, labor markets are not competitive. 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  $S_{ed}$  to  $S'_{ed}$ ). 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 cost) is negative, at least in familiar output terms. And, to repeat, it is the marginal social rate of return that is the proper criterion for assessing the economic value of educational investment.

Marginal rates of return are seldom calculated. What is conventionally calculated is an average rate of return. This is likely to differ greatly from the marginal rate of return in the non-competitive case. In particular:

Although the marginal social rate of return is expected to be negative in the non-competitive case, the average social rate of return as conventionally calculated is expected to be positive and very likely greater than the opportunity cost of funds.

The reason the conventional rate of return is probably positive is that the average social return about equals the expected private return. (They are not exactly equal because the private benefits are wages net of taxes and social benefits do not net out taxes, and because social costs exceed private costs by the amount of school subsidies.) And it may be presumed that the private rate of return is positive and at least equal to the opportunity cost of funds (because if it were not, parents would not be observed sending their children to school.)

#### D. An Example

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 set according to the job and 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. After all, 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, a measure of the educated-uneducated productivity differential, 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 work year) is expected to prevail throughout the individual's working life.

On the cost side, let us assume:

- (ii) 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

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

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, i.e., the average rate. 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

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

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 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 non-competitive wage setting in the labor surplus model under investigation).

To compute 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.<sup>1</sup> 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

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

the solution of which yields a marginal social rate of return of one-half of one percent.<sup>2</sup> Despite the earlier findings that the average private and

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<sup>1</sup>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 (by definition, the wage while employed multiplied by the probability of employment) are equal in the two alternative occupations. Indeed they are equal in the hypothetical data in this example. 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.

<sup>2</sup>It is mathematically impossible for the internal rate of return to be

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.

#### E. Conclusion

Whenever social rates of return to education are computed by conventional methods, the competitiveness of the labor market should be verified. For if labor markets are not competitive, the usual types of estimates of social rates of return to education may be 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 theoretically appropriate way. In a study of Greece, Psacharopoulos<sup>1</sup> 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.

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<sup>1</sup>George Psacharopoulos, "Estimating Shadow Rates of Return to Investment