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ABSTRACT

The use of educational cost-benefit analysis (CBA) is now widely accepted, not least in connection with the development of education systems in Third World countries. It has much to recommend it and is widely seen as preferable, both in theory and in practice, to the major alternative techniques, namely manpower planning and the social-demand approach. However, there is considerable unease over its use. This paper reviews the current state of thinking relating to educational cost-benefit analysis and suggests a number of possible modifications. It consists of 13 chapters: (1) "Introduction"; (2) "Definition"; (3) "Development"; (4) "Methodology"; (5) "An Alternative Approach to Rates-of-Return"; (6) "Other Techniques in Educational Planning"; (7) "Some Cost-Benefit Results"; (8) "CBA in Third World Countries: Earlier Findings"; (9) "CBA in Third World Countries: More Recent Studies"; (10) "Criticisms of CBA in Third World Countries"; (11) "The Educational Effectiveness Literature"; (12) "The Comparative Education Literature"; and (13) "Towards a New Approach to Cost-Benefit Analysis." Appendix 1 contains the project proposal provided by the Overseas Development Administration; Appendix 2 lists returns to investment in education by level and country; and Appendix 3 is the bibliography. (Contains 81 references.) (RT)

DFID Department for International Development

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EDUCATION RESEARCH

EDUCATIONAL COST-BENEFIT ANALYSIS

Serial No. 2

Professor J R Hough

Department For International Development

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EDUCATION RESEARCH

EDUCATIONAL COST-BENEFIT ANALYSIS

Professor J R Hough
Loughborough University

Serial No. 2
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Department For International Development

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P.72-73 CBA (i) can usefully be linked more closely to cost-effectiveness analysis, as a means of comparing alternative uses of resources, (ii) could be extended to relate alternative manpower forecasts and different patterns of manpower utilisation to the determinants of private demand, which would include students' perceptions of costs and benefits, and (iii) has been used to develop or justify new policies on financing education, i.e. a new approach to CBA is already in evidence in many developing count
ries.

P.74 Further research is needed.

1. INTRODUCTION

> "Of all the techniques of investment appraisal which in recent years have come to be applied to the public sector, none has attracted more attention than cost-benefit analysis" (Blaug, 1970).

This quotation, taken from one of the world's leading authorities in the field of the economics of education, may be taken to epitomise current thinking among academics, educational policy-makers and planners, regarding the usage of cost-benefit analysis as a methodological technique in education decision-making.

The use of educational cost-benefit analysis is now widely accepted, not least in connection with the development of education systems in Third World countries. It has much to commend it and is widely seen as preferable, both in theory and in practice, to the major alternative techniques, namely manpower planning and the social demand approach.

Yet there is, at the same time, considerable unease over its usage, especially regarding some of the restrictive assumptions that have to be made and regarding problems of data availability and the necessary adjustments that frequently have to be made to data. Some twenty years ago, Vaizey and Sheehan (1972) concluded "The usefulness of such studies is very limited" and more recently the Overseas Development Administration (1990) commented: "Recent studies have shown this method to be both fallacious
and limiting".

One of the major writers in this field observed: "the rate of return subject is still highly controversial in the literature" (Psacharopoulos, 1981).

This paper will review the current state of thinking relating to educational cost-benefit analysis and suggest a number of possible modifications, in accordance with the terms of the project proposal provided by the Overseas Development Administration and reproduced at Appendix A.

2. DEFINITION

A general definition of cost-benefit analysis states that it is:

> "A practical way of assessing the desirability of projects, where it is important to take a long view (in the sense of looking at repercussions in the further, as well as in the nearer, future) and a wide view (in the sense of allowing for side-effects of many kinds on many persons, industries, regions, etc.), i.e. it implies the enumeration and evaluation of all the relevant costs and benefits" (Prest and Turvey, 1965).

3. DEVELOPMENT

The methodology of cost-benefit analysis has been in existence since the turn of the century and was, for example, incorporated in the USA's River and Harbor Act of 1902. Its use mushroomed in the 1950s, again in the USA, in connection with attempts to rationalize the large-scale development of major river valleys.

Subsequently, applications were extended to virtually all areas of public sector investment, including in the nationalized industries, health expenditures, housing schemes, traffic networks, land-use and town planning problems, and regional development, and also in the private sector. The technique developed extensively in the USA, was then applied increasingly in the UK, and became commonly used throughout developed and developing countries (Prest and Turvey, 1965).

Well-known examples in the UK include the cost-benefit analyses relating to the original M1 motorway, the third London airport, London's Victoria Line underground, the Morecambe Bay Barrage project, and the re-siting of London's Covent Garden market (Button and Barker, 1975), and in the USA reservoir construction and disease control (MIshan, 1971).

By extension, as part of the developing interest in the economics of education, cost-benefit analysis was applied to investment in education, where it increasingly became known as "rate-of-return analysis". The term "Benefit-Cost Analysis" is also used, including in the most widely-read text on the economics of education in the USA (Cohn and Geske, 1990).

> Regarding the resulting cost-benefit measures,
> "There are three ways of presenting this information in a convenient form, firstly by means of a benefit-cost ratio, secondly by a calculation of the present net value of the project, and thirdly by calculating the internal rate of return of the investment. A benefit-cost ratio, as the name implies, simply measures the ratio of discounted future benefits to discounted costs, at a particular rate of interest, and the present net value of a project is the value of discounted benefits minus discounted costs. Both these measures of investment yield have been used to carry out cost-benefit analysis of education, but they are less frequently used to evaluate education than the third technique, rate-of-return analysis....The virtue of using the rate of return as a means of measuring the yield of educational investment is that the choice of an alternative rate of return is not built into the calculation as it is in the case of benefit cost ratios" (Woodhall, 1970).

The many theoretical problems relating to cost-benefit analysis received extended treatment (Layard, 1972; Mishan, 1971; Peters, 1973).

The founding date of the economics of education as a subject area is usually taken to be the seminal lecture given by Professor Theodore Schultz to the annual meeting of the American Economic Association in 1960, in which he advocated the concept of human capital - investment in people could be as important, and as expensive, as investment in physical capital - and appealed to his fellow economists to take seriously this neglected branch of study (Hough, 1991). Previous references can also be found in the writings of earlier economists, dating back to Adam Smith.

Once human beings had come to be seen as a form of capital, akin to items of industrial machinery, it was inevitable that economists would endeavour to apply to them the same kinds of calculations of investment criteria, profitability, and rates-of-return as had previously been familiar in the worlds of public sector investment or industrial economics. Therefore, calculations of rates-of-return to investment in education soon followed, among the earliest being those by Professor Hansen relating to USA males, published in 1963.

Subsequently there has developed a large literature, seeking to answer such questions as: "Should investment in education be increased (or decreased)?", "Would we do better to concentrate more resources at the primary school end of the process rather than on higher education?", or "How does the performance of one country in this respect compare with those of other countries?".

Perhaps the peak of official acceptance of the value of the results of cost-benefit studies in the UK was their inclusion in the White Paper on Higher Education issued by the Department of Education and Science in 1985 (Cmnd. 9524) and their use in the 1988 White Paper on Top-Up Loans for Students: in the latter the fact that private rates of return exceeded social rates of return was used to justify the introduction of student loans.

4. METHODOLOGY

Whereas the early cost-benefit studies used relatively simple research methods, today quite complex and sophisticated statistical and other techniques have been developed. However, the underlying concepts and problems have, for the most part, remained the same. The methodology used in cost-benefit analysis outside the world of education essentially applies in its entirety to educational cost-benefit studies but, in addition, the latter give rise to complex conceptual and computational problems of their own.

It is important that the various problems indicated in this section are seen in context and are not taken to invalidate what is still a widely-used and very useful technique.

According to the traditional method of calculating rates-of-return to investment in education from a detailed cost-benefit analysis (we shall refer later to a revised technique that has attracted considerable attention in recent years), the analysis must commence with a tabulation of all the costs and all the benefits of the expenditure in question.

The computation of educational costs is not a simple matter; it is possible to arrive at a number of different definitions of costs, which may result in contrasting figures (Hough, 1981). Nevertheless, the principles involved in calculating costs in education are not essentially different from those involved in calculating costs elsewhere.

To determine the benefits from education is much more difficult and involves philosophical issues relating to the purposes of education and how to assess whether these are being achieved. Economists have tended to concentrate on the relatively hard evidence that exists in most countries that those people with higher levels of education on average receive higher incomes throughout their working lives than people with lower levels of education. These differences, as measured by data known as age-earnings profiles, appear to be relatively stable and consistent over time. It has therefore seemed reasonable to regard the income-stream differentials, or some proportion of them, as attributable to the education received and it has become conventional to use them to measure the benefits from education. Clearly, to do so is not without problems and leaves a number of questions unanswered but efforts to find alternatives have met with difficulties. One of the most interesting alternatives was the attempt to measure the contribution of education directly by comparing the physical output of educated and less educated workers (Jamison and Lau, 1982).

At the outset it is necessary to decide whether to use the Present Value method or the Internal rate-of-return method. This is a rather technical distinction between the former, which deducts the present value (arrived at via discounting) of costs from the present value of benefits to arrive at a net figure, and the latter, which arrives at the rate of discount which equates the total benefits with the total costs. With the former, the rule is:

> Select all projects where the present value of benefits exceed the present value of costs",

whereas with the latter the rule is:

> "Select all projects where the internal rate of return exceeds the chosen rate of discount"
> (Prest and Turvey, 1965).

The latter, the Internal rate-of-return method, avoids the difficult problem of which rate of discount to employ in the calculation, and is commonly used.

In many cases the two approaches will give equivalent answers, although this need not necessarily be the case (Cohn and Geske, 1990).

The principal conceptual and other problems that arise in educational cost-benefit computations are as follows:

(i) Which type of cost-benefit analysis is required? There are four possibilities, as under:

	From perspective of the individual	From perspective of society as a whole
Average over all education received	Average private rate-of-return	Average social rate-of-return
Incremental part of education	Marginal private rate-of-return	Marginal social rate-of-return

The social calculus relates the whole of the costs to society to gross (before deduction of income tax) incomes. The private calculus relates those costs borne by the students and/or their families to net (post-tax) incomes.

Which of these is required will depend on the reasons for carrying out the analysis. The social rate-of-return should be important for educational planning since it gives the returns to society as a whole but the private rate-of return shows the basis on which individual students make their investment decisions. Many studies include more than one type. It is also true that, in a sense, all rate of return calculations can be regarded as "marginal", in that they measure the costs and benefits of a marginal increase in investment in education.

(ii) In principle, all costs (opportunity costs, not just money expenditure) and all benefits should be included but in practice this may not be possible and it may be necessary to settle for some degree of approximation; an example would be the need to give an approximate apportionment of capital depreciation.

iii) Do workers' earnings differentials accurately reflect differences in their marginal productivities? This point has been termed "the Achilles Heel of rate-of-return analysis" (Blaug, 1970). If they do not, there will be a problem in using them as a proxy for benefits in social rate-of-return calculations. They may, for example, reflect:

> "traditional hiring practices and a variety of social conventions about the relative worth of different kinds of labour, not to mention the restrictive practices of trade unions and professional associations"
> (Blaug, 1970).

This point may also be important in connection with public sector employees, who in many Third World countries comprise large percentages, often 50% or more, of the more highly educated people. Cost-benefit calculations rarely include corrections for market imperfections. Similarly, in connection with private rate-of-return calculations, how to allow for "the non-pecuniary attractions of certain occupations that are accessible only to the highly educated" (Blaug, 1970)? No ready method has been found.

Subsequently, there has developed the "screening hypothesis" which suggests that education does not directly affect productivity at all but simply enables employers to identify workers with different levels of ability, one consequence being that an increase in the supply of educated workers leads to "credentialism" as employers demand higher and higher levels of education.

(iv) In using age-earnings profiles as a proxy for educational benefits, as indicated above, it has become conventional to include an "alpha-coefficient" (sometimes called an "ability adjustment") - although it would seem more appropriate to call it an "education coefficient" (Hough, 1967) - adjustment for the proportion of differences in incomes to be attributed to factors other than education, such as innate ability, personality, favourable home background and social class. Following the work of Denison (1964), in many studies the alpha-coefficient is taken to be two-thirds (i.e., this is the proportion of the income differences attributed to education). However, this may be a considerable approximation: Denison's findings related to the USA, to males only, solely to high-school and college levels of education and accepted the validity of IQ test scores (which have been much disputed elsewhere). Denison's findings

have been challenged by other writers - Blaug, for example, suggests that for some groups, including university graduates, the figure of 0.66 may be too low but that for secondary-school leavers in the UK the alpha-coefficient may well be less than 0.66. It would indeed be surprising if the same figure applied to all groups of people in all societies:

> "The estimates made of the effect of education alone are based on slender evidence, ignoring major studies, and the standard error of the estimates is likely to be large even if the position is accepted" (Vaizey, 1972).

Psacharopoulos (1975) suggests that for developed countries a figure of 0.7 or 0.8 may be more appropriate but rather little is known regarding an appropriate value of the alpha-coefficient for developing countries.

(v) Available income statistics almost always exclude the value of fringe benefits, which may be important in some occupations. Examples would be the provision of subsidised meals, medical care, or transport to and from work.

(vi) Age-earnings profiles should be based on time-series statistical data, i.e. data collected over the whole of the working life, a period of forty years or more. For obvious reasons, these rarely exist and it is necessary instead to rely on cross-section data, i.e. snapshot evidence of cross-sections of society at one moment in time. Such cross-section data may be unduly affected by short-run cyclical changes in the economy, they ignore future changes in the demand and supply of educated manpower and they fail to capture the effects of trends over time, the major one of which in most countries is the incidence of economic growth. Regarding the latter, Becker (1974) in the USA suggested adding the annual expected increase in real income per head and Ziderman (1977) in the UK "conservatively" added 2 per cent per annum to all incomes, as did Blaug, Layard and Woodhall (1969) for India. The effect of such an adjustment on the final computation is considerable; further, to add a fixed percentage adjustment in this way assumes that income differentials will remain constant over a period of some forty years, which seems very unlikely (Hough, 1987). On the other hand, an advantage with using cross-section data is that it is not necessary to correct for the changing effects of inflation over time. Some time-series data has recently started to become available and Psacharopoulos (1985) found evidence that over time the rate of return to education declined slightly in developing countries but remained relatively stable in developed countries.

(vii) How to translate into monetary terms some elements which it may be difficult to quantify, one example being the benefits from university research, some of which may accrue as a spin-off from the teaching process? Again, some degree of approximation or estimation may be necessary.

(viii) The timing of any costs or benefits, especially the latter, where some of the benefits may accrue many years hence. The principle of Discounted Cash Flow is that benefits in the immediate or near future should figure much more prominently in the final calculation than benefits much further away (the problem is usually less acute on the costs side). Therefore, values need to be discounted over time in order to be expressed in today's value. However, the choice of discount rate may not be easy and has a significant effect on the calculation (although this problem is avoided where the choice of discount rate is not built into the calculation as in the case of cost-benefit ratios).

(ix) The principle of opportunity costs, notably in connection with how to value the input of time by the student into the learning process, commonly valued via income foregone (following Blaug, 1970, although Vaizey, 1972, disagreed with this approach). But if the process of education is pleasureable, as one must hope that it is for most students most of the time, then are we justified in regarding the time so spent as a cost? A significant point in developing countries is that the student's family will often suffer the loss of his/her income, either monetary income or in terms of practical work done, and that primary school children, particularly girls, are often withdrawn from school because their parents need their services at home. The importance of allowing for income foregone may be seen when it is realised that, when it is included, it frequently exceeds the whole of the direct cost of the education in question.

(x) How to allow for the probability of unemployment, which would affect both the calculation of future income streams and also the opportunity cost of the student's time? In many countries, unemployment statistics show little consistency over time and may in any event be inaccurate; therefore, predictions of future unemployment may be subject to considerable error.

(xi) Problems of data availability: the statistical data required may not be available and it may be necessary to make use of some alternative, which may or may not be a good substitute and may involve some degree of approximation. An example would be when Ziderman (1977) needed data relating to income streams for people educated to GCE A level: the nearest substitute he could find was the salary scale for the Executive class in the Civil Service, for which GCE A-level was the normal entry requirement.

This obviously begs the question of whether people with the same level of education but in other jobs would have had higher or lower incomes.

(xii) "Externalities" or spill-over benefits to persons other than those having received the education in question, notably increased incomes to other people brought about by the higher productivity of the educated person. Attempts to quantify spill-over benefits have proved extremely difficult but Becker (1964) estimates that to include them could lead to the original benefits, and thus the ensuing rates-of-return, being doubled.

(xiii) Woodhall (1973) showed that there are reasons for thinking that the rates-of-return to educating women may be considerably higher, perhaps by two percentage points, than the standard computations would show, on account of such factors as the higher probability that more highly educated women will return to work after child-bearing, that more highly-educated women may face less market discrimination than uneducated or less-educated women, that women's non-market work has positive economic value, and that women arguably enjoy increased psychic income as compared to men educated to similar levels. These factors, together with the fact that women tend to be concentrated in public sector employment, such as teaching or nursing, where the value of earnings as a measure of marginal product was more than usually suspect, combined to suggest that rate-of-return studies typically understated the returns to investment in the education of women. It is noticeable that many cost-benefit analyses use data relating to males only.

(xiv) Various other adjustments may be found necessary in particular cost-benefit calculations, depending on the circumstances. An example would be the cost-benefit analysis by Birch and Calvert (1974) relating to the profitability of becoming a teacher in the UK: they found it necessary to adjust teachers' income streams upwards by one-twelfth (= one-month's extra salary) to allow for the "perk" of extra-long holidays.

(xv) No way has been found to isolate the effects of investment in education from other forms of investment in manpower, such as associated medical care, on-the-job training, and even migration. In the absence of any evidence to the contrary, we have to assume that the return to investment in education does not differ significantly from the return to such other forms of investment in human capital (Blaug, 1970).

(xvi) Rate-of-return analysis tells us whether to invest more or less in a particular direction. But how much more or less? This is a question that rate-of-return analysis can not answer, other than:

> "to answer 'a little bit more or less' after which yields will have to be recalculated
> (Blaug, 1970)

And since the effects of any education investment decision may not be felt for some years hence, to undertake such a recalculation in the short term may be impossible.

Rate of return calculations may be biased upwards or downwards, depending on which of various extraneous points have been allowed for. Professor Blaug gave a "Check List of Biases in Rates of Return", as follows:

	Downward Bias (too low)	Upward Bias (too high)
Private Rates of return	1. Lower rates of return to other types of human capital formation (training, health, etc.) 2. Future consumption benefits(?). 3. Non-pecuniary occupational preference of educated people. 4. Improved quality of education. 5. Earnings differentials include first-round spill-overs.	1.Higher rates of return to other types of human capital formation. 2. Present consumption benefits(?).
Social Rates of Return	1. As 1 above 2. Future consumption benefits (?). 3. Non-pecuniary occupational benefits taking the form of fringe-benefits. 4. As 4 above 5. Earnings below marginal private product(?). 6. Excess demand for labour 7. Externalities (first-round and second-round spill-overs).	1. As 1 above 5. Earnings above marginal private product (?). 6. Over-staffing in public sector

This section has reviewed a formidable list of conceptual and computational problems and adjustments. The effects of at least some of them might be very substantial, for example, the inclusion of spill-over benefits might double benefits whilst the inclusion of earnings foregone might double costs; rather fortunately, perhaps, these might cancel each other out. However, in practice, most rate of return studies do include earnings forgone but exclude externalties. The effects of other possible adjustments should be less. It is, of course, true that at least some of these points also apply in the case of other approaches to educational planning, notably the manpower planning approach, which, for example, also

largely ignores spill-over effects. This needs to be borne in mind when the advantages and disadvantages of cost-benefit analysis are being weighed against those of other approaches.

It is also true that other types of investment (e.g. investment in health care, agricultural development projects) also generate "spill-overs" which are often ignored. There may also be spill-over costs as well as benefits. Recent attempts to estimate the environmental impact of investment projects are one way of attempting to measure spill-over costs of investment projects. The "environmental impact" of education may be both positive (e.g. educating children in environmental awareness) and negativ
e (e.g. if emphasis on academic education generates distaste for technical/vocational programmes and occupations).

5. AN ALTERNATIVE APPROACH TO RATES-OF-RETURN

In recent years, considerable attention has been given to a method of calculating rates-of-return to education that was developed in the USA by Mincer (1974) and which makes use of what has become known as a Mincerian equation. This approach does not include any specific reference to direct educational costs, although it does incorporate earnings forgone which are a high proportion of total costs.

Mincer suggested setting up a multiple regression equation of the form:

$$\ln Y = a + bS + cX1 + dX2 + eX3 + ...$$

where the dependent variable = the natural logarithm (ln) of individual earnings (Y) [where a variable increases by progressively larger proportions, using the natural logarithm is simply a device for being able to translate these increases into equal, or nearly equal, steps]. The independent variables are:

S = years of schooling
X1 = training
X2 = experience
X3 = weeks worked etc.

Such an equation can be presented in a number of different forms, including the parabolic where additional terms are included for one or more independent variables squared. The equation can relate to a group of workers for a particular time period, for example, Mincer's original formulation related to 1959 annual earnings of white, nonfarm, men in the USA.

The partial coefficient (b) of years of schooling (S) gives an estimate of the average rate of return to schooling. In the simplest form of the equation, the coefficient gives this return directly (Psacharopoulos and Alam, 1991). In more complex forms, it is arrived at via a mathematical adjustment - e.g. Tannen (1991) took "the antilog of the schooling coefficient minus one". Other writers often do not explain the mathematical adjustment they have made (e.g. Al-Qudsi, 1989).

This approach to calculating rates-of-return to education may be contrasted with the full cost-benefit approach outlined previously which is sometimes termed the "elaborate" method; a third approach is the "short-cut" method which "amounts to doing in an explicit way what the earnings function method is doing explicitly, i.e. the returns to education are estimated on the basis of a simple formula" (Psacharopoulos, 1981).
Depending on data availability, the Mincer approach may be relatively quick and easy to compute, with the regression equation being readily produced by a standard computer software package. The equation picks out the effect of S (years of schooling) on Y (incomes) but does not include costs at all and therefore can not be termed a cost-benefit analysis as such. Nevertheless, when researchers have used both the "elaborate" and "short-cut" methods to estimate rates-of-return and compared the results, these are often remarkably close (e.g. Tan and Paqueo, 1989).

The obvious advantage of the Mincer approach is that it is quick and easy to use, assuming only that a suitable computer programme is available. The major disadvantage is that this approach is applied to data for broad aggregates, often for the whole of education, and thus does not provide results that are readily implementable at the micro level.

6. OTHER TECHNIQUES IN EDUCATIONAL PLANNING

Cost-benefit analysis is not the only technique used in connection with educational planning. The two principal alternatives that have been used in many countries are manpower planning and the social demand approach, each of which has been the subject of a great deal of criticism. Whilst these approaches can not be discussed in detail here, the relevant main points from each need to be outlined.

Manpower planning, which has been used in some form or other in the majority of UNESCO member countries (Blaug, 1970), is based on the attempt to forecast the future demand for educated manpower. Given the length of time taken to produce educated professional people, such forecasts may have to be made for some years hence, perhaps fifteen years in the case of scientists, engineers, or medical doctors. This is one of the major problems inherent in the manpower planning approach, since in the meantime economic or labour market conditions may have changed significantly.

There have been a number of different approaches to manpower planning. Each entails producing detailed forecasts of the number of workers, in each skill and at each level of education, that will be required in each industry by the time of the future target year. Professor Parnes suggested that to be able to specify these precisely, implies:

(i) a degree of rigidity in the occupational composition of the workforce that is unrealistic,
(ii) having data relating to withdrawals from each occupation that is rarely available,
(iii) having data relating to patterns of occupational mobility that is never available,
(iv) one unique relationship between educational background and occupational affiliation, whereas in practice the position is often more flexible,
(v) concentrating on the formal educational structure, whereas in practice much vocational preparation takes place outside that structure,
(vi) clear differentiation of jobs, whereas in practice there is usually much transferability of jobs as far as educational qualification is concerned.

In summary, manpower planning methods:

> "involve numerous dangers, not the least of which is that they provide no basis for evaluating the realism of the specific forecast in light of the total structure of employment" (Parnes, 1962).

Professor Blaug's conclusion was even more pessimistic:

> "There seems to be little point in continuing to waste resources on long-term single-valued forecasts whose results are suspected even by the forecasters themselves (Blaug, 1970).

More recently, Little (1986) was critical of manpower planning in developing countries for largely ignoring rural and village needs, the very areas where the greater part of the population are likely to live.

A recent World Bank publication has come to conclusions expressed in equally adverse terms. It argued that manpower planning had clearly failed, for a number of reasons: the technique has largely been applied at the level of persons with higher education and has tended to ignore those with lower levels of education, i.e. the great majority of workers; limits itself to headcounts and ignores the effects of movements in wages and other prices; largely makes use of employment data relating to the public sector and/or to large private firms, whereas in developing countries the majority of workers are liable to be in small firms and/or in the informal sector; is based on the historical relationship between output and labour, which is then extrapolated forward decades ahead; assumes a one-to-one correspondence between, for example, a mechanical engineer and a graduate of the mechanical engineering faculty of the university, which is unrealistic; ignores that middle-level technician engineers may come from a variety of backgrounds, including on-the-job training; ignores the problem of how to plan for executive and administrative workers, who may have diverse educational qualifications; ignores cost implications; tacitly assumes that relative wages are fixed; typically recommends, due to the nature of the exercise, increasing the supply of labour with vocational/technical qualifications, whereas general training may often be more cost-effective; ignores that skills may be produced outside the formal school system, such as in specialised training or private institutions; typically adopts a long horizon, whereas to forecast for a shorter time-span may be more realistic; and is typically "lumpsum, jumpy and discontinuous" (Psacharopoulos, 1991).

It should be recalled that even in those countries where manpower planning has been most criticised, it is still in use in some form or another. The numbers of newly trained teachers to be produced by teacher training courses, for example, is planned in some sense in all countries; it is difficult to see how it could not be, given that, in all countries, most or all of the supply and the greater part of the demand for newly trained teachers are in the hands of the public authorities and depend on public funding. Similarly, to plan and build a new medical school requires some view regarding the number of new medical doctors that will be required at the date when the new school's first output of new doctors become qualified, which will probably be in around 15 years time. Again, most medical schools in most countries are within the public sector. Therefore, whether explicitly or implicitly, some element of manpower planning seems inescapable.

The social demand approach, by contrast, essentially focuses on forecasts of future student choices to determine the level of education provision, without any apparent direct reference to national economic or social needs. Given that much of the cost of the education is borne by the state, it can be argued that there is a presumption of some hidden or underlying mechanism whereby students and their families arrive at their educational decisions in the light of market signals or mechanisms which correspond to those that would be used with other approaches. If not, the social demand approach sounds like a free-for-all.

The social demand approach has been particularly used in connection with the planning of higher education, a good example being that in the UK in the post-Robbins era. The Robbins Report (Cmnd 2154, 1963), in its much-publicised conclusion, urged that:

> "all young persons qualified by ability and attainment to pursue a full-time course in higher education should have the opportunity to do so".

The subsequent expansion of higher education in the UK has largely followed from that recommendation.

Another, much less-publicised, recommendation in Robbins was that there should be some degree of shift in higher education towards the study of the physical sciences, which was in the event largely ignored. Much of the remainder of the Robbins Report was devoted to how to estimate, and how to stimulate, future demand for places. The committee had no doubt that:

> "fears that expansion would lead to a lowering of the average ability of students have proved unfounded".
>
> The post-Robbins years were to prove extremely difficult to plan, largely due to uncertainty as to what would be the rate of expansion in student numbers and what were the factors leading potential students and their families to make such decisions (Layard and King, 1968).

Subsequently, Williams showed that various economic factors, especially implied prices, may well have played an important part, in which case the outcome of concentrating on social demand, by young people and their families, might not be so very different from that from rate-of-return analysis:

> "It is not of course being claimed that they do estimate rates of return, merely that a statistical estimate of rates of return is quite a good summary of many of the factors, some of which have been discussed in this article, that make higher education seem worthwhile to young people deciding what they are going to try to do with their lives" (Williams, 1974).

Layard and King (1968) had reached essentially the same conclusion.

Currently, in 1991, higher education in the UK is again undergoing rapid expansion of student numbers, at a time when the DES had forecast a decline. This expansion is seen by the government as being well suited to the country's needs for future educated manpower. In this instance at least, it seems likely that all three approaches, manpower planning, social demand, and rate-of-return, although they would start from contrasting assumptions and methodologies, would point to broadly similar conclusions.

7. SOME COST-BENEFIT RESULTS

There have now been a large number of studies of rates-of-return to education and their results vary widely. In this section it is obviously not possible to cover them all; rather, the intention is convey the broad direction in which the field has developed over a period of nearly thirty years, with particular reference to studies in the UK and the USA. Studies of rates-of-return in Third World countries, which have developed more recently, will be dealt with in a later section.

Studies in the UK have concentrated on post-school education, and especially on that in universities. The two most widely quoted are those by Ziderman (1973) and Morris (1973). Ziderman found average private rates-of-return on degree education from age 15, using 1966-67 data, to be:

	No "ability" adjustment	"Ability" adjusted
Males		
First degree	15.0	12.5
Master's degree	15.5	12.5
Doctorate	16.0	13.0
Females		
First degree	20.5	18.0

To arrive at these results, Ziderman used earnings survey data published by the Department of Education and Science which, after adjustments, gave him a sample of some 2,000 and he then adjusted for long-term economic growth and for the probabilities of unemployment and mortality. The right-hand column assumes an alpha-coefficient of 0.66, the left-hand column makes no such correction. No results are given for females above first degree level, as there were so few such females in the sample. The rates-of-return results are generally high, especially so in the case of females (for GCE A Level only, due primarily to the low career earnings of females with only lower levels of education).

Marginal private rates-of-return, i.e. returns on an additional or incremental slice of education, were given as:

	No 'ability' adjustment	'Ability' adjusted	Drop-out Adjusted
GCE A-level			
(from no qualification)	10.0	8.5	Negative
First degree	22.5	20.0	16.5
(from GCE A-level)	(23.5)	(21.5)	(18.5)
Master's degree	20.0	16.5	Negative
(from first degree)	(19.0)	(16.0)	(Negative)
Doctorate	19.5	16.0	2.5
(from first degree)	(14.5)	(11.0)	(Negative)

These results are for males only, due to the difficulty in obtaining adequate earnings data for females. The additional third column on the right allows for the possibility of students not completing their courses. The separate figures given in brackets gives the results for when schoolteachers are excluded (to see whether this adjustment would have a significant effect). Although the results are again generally high, the appearance of some negative results in the right-hand column is particularly interesting.

Morris was able to calculate social rates-of-return to different subject disciplines studied at various

post-school levels. For university degrees, returns were mostly higher in the case of arts and social science subjects than for engineering and science, due mainly to the higher costs of the latter. Part-time courses, such as for ONC (Ordinary National Certificate) and HNC (Higher National Certificate) had much higher returns (often around 20%) than full-time courses, due to the former having no income foregone. After alpha-coefficient (0.66) adjustment, marginal social returns to first degrees were around 10%. Returns to postgraduate-level education were generally low and sometimes negative. Returns to society from educating women were several percentage points lower than for educating their male counterparts.

Birch and Calvert (1974) found high rates-of-return to training to become a teacher, very high in the case of females (around 30%) because of the poor alternatives available to females who were not so well qualified. In the case of males, the higher returns, around 12-14%, only showed up in the case of graduates and especially those graduates teaching in secondary schools. Whether it was worthwhile for teachers to study in their spare time to obtain an Open University degree depended crucially on their economic valuation of the time they would have to spend doing so. If there were no such cost, i.e. if they found such studying enjoyable, then the returns could be 50% or even 60% or more but once such cost figures were included the returns fell steeply and in the case of primary teachers could become negative.

In the USA, there have been so many rate-of-return studies that it would be impossible to mention them all.

One feature is that more work has been done at the level of returns to secondary schooling, for which Cohn and Geske give the following table of internal rates-of-return:

Reference	Sample year	Private	Social
Hansen (1963)	1950	14.5	11.4
Becker (1964)	1940	16.0	
	1950	20.0	
	1956	25.0	
	1958	28.0	
Hanoch (1967) (a)	1960	16.1	
Hines at al.(1970) (b)	1960	19.5	14.0
Mincer (1974)	1960	13.0	
Carnoy & Marenbach (1975)	1940	49.1	18.2
	1950	22.7	14.2
	1960	14.6	10.1
	1970	18.9	10.7

(a) Northern whites only

(b) Male whites only; rates for other race-sex groups vary substantially.

Returns to higher education in the USA were generally between 10% and 20%, with private returns always being greater than social. McMahon and Wagner (1982) examined the historical record of monetary rates-of-return to higher education and found these to have remained relatively stable at around 13-14%, i.e. significantly higher than the returns available on financial assets. However, Cohn and Hughes (1988) found evidence of a secular decline to returns from investment in college education.

All of the above studies, in both the UK and the USA, used the traditional method. Murphy and Welch (1989) used the Mincerian approach and found returns of 13.5% for the early 1980s, i.e., very similar to the evidence in the McMahon and Wagner survey.

As in the UK, private returns to postgraduate-level study were found, by a series of researchers, to be lower, and were sometimes negative (Cohn and Geske, 1990). However, Tomaske (1974) suggested that most other studies had failed to take full account of students' summer and outside earnings and that when these were included the returns rose to around 10%.

8. CBA IN THIRD WORLD COUNTRIES: EARLIER FINDINGS

A large number of rate-of-return studies have now been carried out in relation to Third World countries. Psacharopoulos (1985) tabulated the results from such studies, as given in the table reproduced in Appendix 2 (Earlier comparative reviews had been given in Psacharopoulos (1973) and Psacharopoulos (1981) and a review of returns to higher education was given in Psacharopoulos (1982)).

Those rates-of-return vary considerably, from extremes of 66.0 to 4.0 (social) and 99.0 to 6.5 (private). However, given that they cover the different levels of education, as indicated by the column headings, and encompass the differing circumstances found in the many countries listed, and date from very different periods (some estimates relating to the 1950s when education was much less widespread in developing countries than to-day), the variations are perhaps no more than might have been expected.

Indeed, once the findings are summarised by level of education and region/country type (including also intermediate and advanced countries, giving a total of 61 countries in all), as below, relatively clear patterns emerge:

Region/ Country Type	Social			Private		
	Prim.	Sec.	Higher	Prim.	Sec.	Higher
Africa	26	17	13	45	26	32
Asia	27	15	13	31	15	18
Latin America	26	18	16	32	23	23
Intermediate	13	10	8	17	13	13
Advanced	NA	11	9	NA	12	12

Source: Psacharopoulos (1985)

Thus:

(i) private rates-of-return are always higher than social,

(ii) rates-of-return are always highest at the lowest, primary, level of education,

(iii) social rates-of-return to higher education are always lower than those to secondary education, but this is not always the case with private returns,

(iv) all the private returns, and the great majority of the social ones, show education to be very profitable, with almost all the figures above the notional 10% cut-off level which is often used for comparative purposes (and thus there is clear evidence of underinvestment in education),

(v) private rates-of-return to primary education in African countries are quite exceptionally high, averaging 45%.

(vi) public subsidies (i.e. the differences between private and social rates-of-return) are particularly high in the case of higher education, leading to a case for the reallocation of such funds (Psacharopoulos, 1985).

(vii) where time series data on earnings exist, there appears to be a decline in rates of return over time.

Psacharopoulos also notes that returns are higher for general curricula rather than for vocational education (due to the latter's higher unit cost), for the education of women (due to the latter's low alternative earnings) rather than men and highest in those countries with the lowest per capita income. The differences between private and social rates-of-return, i.e. the extent of public sudsidization of education, are greatest in the poorest countries and at the higher levels of education.

To compare the results of rate-of-return studies in this way across countries and across levels of education is not an easy matter. Some of the studies, especially the older ones, use the traditional method, some, especially more recent ones, the Mincer method. Psacharopoulos comments that researchers do not always state explicitly the nature of the sample used (for example, urban, rural, national) or the methodology according to which the estimates are made (especially what adjustments have been made on the benefits side).

Further, more recent studies have increasingly been based on the earnings of those employed in the competitive sector of the economy where the benefits of education should better reflect the worker's productivity: where returns have been given differentiated by economic sector, the returns in the competitive setting exceed those in the noncompetitive sector by three percentage points. This means that previous estimates based on the earnings of workers in all sectors have underestimated the returns to education. On the other hand, the proportion of workers employed in the modern, competitive, sector in many developing countries is low, so that a rate of return based only on earnings in this may overstate the average returns.

Despite all the above caveats, to undertake such cross-country comparisons does seem valid. Overall, it would seem that any corrections required would not significantly alter the principal conclusions outlined above; it is at least plausible, in the absence of any evidence to the contrary, that any resulting pluses and minuses would approximately offset each other.

9. CBA IN THIRD WORLD COUNTRIES: MORE RECENT STUDIES

The previous section referred to the evidence available to 1985. Whatever the validity of doubts about such attempts at international comparisons, these do seem to have stimulated considerable interest in cost-benefit studies in Third World countries, and a significant number of new studies have appeared subsequently. These more recent studies will be discussed in greater detail.

Home studies appeared at about the same time as the Psacharopoulos (1985) review but too late for inclusion in it. Heyneman (1984) used the traditional method to estimate the returns to investment in Malawi's Certificate of Education, taken at the end of upper secondary schooling, and found these to be high, of the order of 20% for the social rate-of-return and 50% for the private rate-of-return; the calculations allowed for income foregone, assumed an alpha-coefficient as high as 90%, and assumed u nemployment at a constant level. The results were for males only; returns could not be calculated for females because from the available sample in the base year (1976) no females chose to enter the labour market.

Guisinger et al (1984) using a Mincerian function and data for males only found low rates-of-return to schooling in Pakistan, for all schooling 3.4% for employees and 7.6% for the self-employed. Returns were particularly low in the Rawalpindi area, due apparently to many of the sample working in the

government sector whilst the government had a policy of compressing pay-scale differentials. In contrast to many findings elsewhere, returns were higher at higher levels of education.

The analysis by Marar and Fraser (1986) of the Harijan Education Programme operated at the pre-degree and degree levels by the Kerala State Government in India found the net present value of the programme and its redistribution benefits in favour of the Harijans (ex-untouchables or ex-outcasts) to be negative. These results followed from the facts that nearly 90% of Harijans were unable to complete their courses successfully and that their preferential inclusion in the limited number of places available entailed restrictions on the admission of Christian and higher-caste Hindu students. The researchers suggest, however, that other less quantifiable benefits may follow in the longer run and may help to reduce the effects of caste origins and untouchability and reduce discrimination and illiteracy.

For college education in Mali, Hough (1987), in a simplified calculation as part of a World Bank consultancy report, found a low social rate-of-return of 2%, high private rate-of-return of 59%; this extreme disparity followed from a combination of the high student grants and the high subsequent rate of graduate unemployment (90%). The social rate-of-return to primary education was very low, around 3%, due to the high cost of examination failures and repetitions.

Psacharopoulos and Steier (1988) used a Mincerian function in their study of returns to education in Venezuela and found an overall return of 11.2% for 1984 data, down from the previous finding of 13.7% for 1975, lending support to the view that returns to education decline over time. Separate calculations relating solely to those workers in the competitive sector of the economy gave results that were of the same order of magnitude.

Al-Qudsi (1989) also used the Mincer approach in connection with education in Kuwait and found returns to education to be relatively low but to be significantly higher for those in the private sector (overall, 8.15% against 4.52%). A complicating factor was ethnic origin since the majority of workers were non-Kuwaiti nationals and these were paid significantly less than Kuwaitis, especially in the public sector. 88% of public sector workers were nationals but returns were highest, at 9.36%, for those Kuwaiti nationals who were in the private sector.

Tan and Paqueo (1989), using a Mincerian function, found returns to education in the Philippines which were described as lower than the average for developing countries. Social rates-of-return averaged around 12.7% and were comparable among the three levels of education but private returns were significantly higher for primary than for higher levels of education: the former was calculated at 18.2% but dropped to 12.2% when primary pupils' income foregone was assumed to equal one-tenth of the average earnings of 19-year-olds. Where pupils failed to complete a cycle (e.g., primary, secondary), the returns were much lower. A Mincerian function approach gave a private return (average over all education) of only 8.1%

Gomez-Castellanos and Psacharopoulos (1990), using a Mincerian approach, found social returns to education in Ecuador to average around 12% for primary and university education and 9% for secondary education; the former was more equity-enhancing on account of pronounced sex discrimination in the case of forms of employment associated with higher education. Returns were higher for private sector workers than for those in the public sector.

Grootaert (1990) applied Mincer-type functions to data for the Ivory Coast and found that secondary vocational and technical education (VTE) yielded a high private return of 15.84% but a social return of only 3.86%, with a similar contrast for VTE at the post-secondary level (private 21.2% against social 4.4%). Since all the social returns were below the social opportunity cost of capital,

> "to justify the investment in VTE thus requires the invocation of non-quantifiable benefits, such as general externalities from having a pool of vocational and technically trained manpower available".

Alongside formal VTE, which predominantly led on to becoming an employee, informal apprenticeships led on to informal labour markets and yielded broadly similar returns.

Hinchliffe (1990) found high social returns to education in Botswana: 20% for the three years of junior secondary schooling, 35% for the two years of senior secondary, and very large earnings increments following vocational training. For those with no schooling, those who had completed primary, those with junior secondary, and those with senior secondary, respectively, returns were calculated at 51%, 82%, 52%, and 30%. There were problems in calculating returns for education separately from training and in arriving at a single operational definition of training; nevertheless, it was clear that vocational training was socially very profitable.

Knight and Sabot (1990) found average social rates of return in Kenya and Tanzania to be around 13% but, since educational expansion over time compressed the educational structure of wages, marginal rates of

return could be significantly less than average.

Riveros (1990) calculated internal rates-of-return to education in Chile both via a standard approach and via a Mincerian function. The former gave returns for 1985 of:

	private	social
primary	27.6	12.4
secondary	11.0	9.2
university	10.3	6.9

whereas the Mincer function gave an average to all schooling of 11.2%. Returns showed a relatively clear trend of declining over time. The author referred to the ability-adjustment problem but does not seem to have allowed for any corresponding alpha-coefficient in his calculations. He viewed the Mincer approach as unsatisfactory since it failed to correct for the fact that his income-related data excluded the unemployed, who were predominantly those with less education: an overestimation of the returns to education was therefore probable.

McGavin (1991) presented updated rates-of-return to education in Papua New Guinea, ranging from (private) 37% primary to 23% university and (social) 13% primary to 8% university. Important local factors were that, for both males and females, wage employment did not begin much before 19 years and that the average life span did not much exceed 50. Many pupils did not complete secondary schooling; where they could be brought to do so, the returns were high. For unskilled and lesser-skilled workers, the reporting of earnings data was probably incomplete, leading to some over-estimation of returns to lower level education. All findings were significantly higher than those quoted in an earlier report which had found some social returns approaching zero.

For Brazil, Tannen (1991) used a Mincerian-function approach and data for working males only and found average private rates-of-return averaging around 12%-13%. These were substantially lower than previous estimates. Correction for the probability of unemployment might reduce the findings by one or two percentage points. Regional data enabled the calculation of geographical variations but these were not substantial. The incorporation in the Mincer framework of estimates of subsidies enabled social returns to be calculated but these involved some "guesstimates" relating to public expenditure figures. Vocational training in industrial skills was observed to yield sizeable private and social returns over an academic curriculum at the primary school level. The only notable difference in the returns to education between private and federal government employees occurred for persons who had attended high school; they fared substantially less well in the federal sector.

Psacharopoulos and Alam (1991) found the return to education in Venezuela, from a Mincerian function approach, to average 10.7% (10.0% for males, 13.1% for females). Returns were higher for workers in urban areas; returns had not fallen significantly over time, despite the education explosion in Venezuela. Calculations via the "elaborate method" found somewhat higher figures, up to 16.2% in the case of the private primary return, with some evidence of rates falling over the previous decade.

Two separate studies reviewed recent evidence relating to rates-of-return. Psacharopoulos (1989) assembled data relating to 23 countries studied by the "elaborate method" and 16 by the Mincer function, to examine whether returns to education were falling over time: overall, they were in the majority of countries but the trend was quite mild. Returns to education continued to be quite high in developing countries, usually above a reasonable measure of the opportunity cost of capital such as 10%. Jain (1991) also found only weak support for the declining rate-of-return hypothesis, especially when temporary, cyclical, variations in local economies were taken into account; also, over time it would be necessary to drop a number of assumptions such as constant technology. The author concluded by emphasising the diversity of cross-country experience.

The latter point may perhaps serve as a useful concluding comment for this section. As the dates of the above publications show, there has been recently and there is currently much interest in studies of educational rates-of-return in Third World countries. A summary reading of their findings, however, shows:

(i) the variety of approaches used by the various researchers,
(ii) the varying data bases with which they had to work, and
(iii) the wide variety in their results and in the conclusions that they were able to draw from these.

It can not be doubted that there are currently in progress many other rate-of-return studies, the results of which will be published in due course.

10. CRITICISMS OF CBA IN THIRD WORLD COUNTRIES

As the preceding sections indicate, a large number of academics and others have been and are sufficiently in favour of educational cost-benefit analysis in Third World countries to devote a great deal of time, energy, and expense to undertaking such studies. Equally, other writers have been critical of various aspects of such work. Some of these criticisms have referred to a number of the problems set out in section 4 above,

whilst others have raised questions particular to the circumstances in developing countries.

Such criticisms are not new. An early paper by Handa and Skolnik (1975) was very pessimistic regarding the contribution that rate-of-return analysis, which was termed inadequate and misleading, could make to educational policy decision-making. The authors referred to a number of the points outlined above in section 4, were particularly critical that distributional effects on different groups in society were usually ignored, and concluded "it is time the energy of researchers was directed to other allocation models". At about the same time, Griffin (1976) had found alpha-coefficient corrections to be unsatisfactory; his work showed that separate adjustments were necessary in respect of different groups, notably men differently from women, blacks differently from whites.

Perhaps the most comprehensive critique was given by Leslie (1990), who argued that rate-of-return studies were essentially flawed and were inappropriate policy devices for educational aims. He was particularly critical of the fact that calculated benefits almost always failed to take account of the consumption value of education and that calculations of costs failed to correct for the subsistence expenditure that the student would have incurred elsewhere.

Leslie argued that other private investment benefits should, but rarely do, include greater fringe benefits and superior working conditions (including paid vacations and holidays), better ability to select advantageous forms of savings, better health and longer life, lower unemployment and lower disability rates, fewer unwanted children and better health for offspring, more informed purchases, better, education-related, child-rearing practices leading to greater likelihood of future college attendance, and selection of spouse with higher earnings potential. Hence the findings by Becker, 1975, and Haveman and Wolfe, 1984, that true private rates-of-return are essentially double conventionally-calculated rates if nonmonetary benefits are included. "The reliability of social rates-of-return is even less" (Douglas, in Bowen, 1977). Calculations of costs, for example, have routinely failed to disaggregate different instructional costs for students at different levels and have neglected the incidence of cost subsidies from which particular groups of students may benefit. Wider social benefits than those encompassed by the students' future earnings are usually ignored: an example would be the future benefits to society from certain forms of research, such as into improved forms of agriculture.

The writer saw it as particularly important that in many Third World countries the ingredients that determine rates-of-return are impacted by quite different government policies, especially relating to government pay scales; as a consequence, it is likely that there is overproduction of graduates in social sciences and humanities alongside real shortages of technicians and engineers. Due to the effects of discounting, rates-of-return are far more sensitive to cost than to benefits differences, so that "such studies primarily are cost studies not benefit studies" (Leslie, 1990).

In summary, Leslie argues, the effects of all such adjustments would greatly increase the rates-of-return to education and thus there emerges a much strengthened case for increasing allocations to education but "generally rates-of-return do a poor job of identifying unmet and saturated manpower needs".

An important line of criticism of the standard cost-benefit approach has been developed by Behrman and Birdsall (1983, 1985, 1987) who argue that the cost-benefit model is seriously in default in concentrating on the quantity of education and neglecting the factor of educational quality. Quantity of education is almost always included via data for number of years of schooling but few rate-of-return studies have included any indicators of quality of schooling. Using data for Brazil, Behrman and Birdsall found that the standard approach may cause biases in the estimated returns to years of schooling, probably in the upward direction; that the standard approach tends to overstate regional and urban-rural differentials in the impact of schooling; and that most of the apparent differential returns to schooling in the standard estimates for migrants vs. nonmigrants, often attributed to migrant selectivity on personal characteristics, are due to variations in school quality.

The researchers conclude that rates-of-return have typically been overstated, perhaps by a factor of three and that once quality is taken into account the results:

> "indicate that 'deepening' schooling by increasing quality has a higher social rate of return than 'broadening' schooling by increasing quantity" (Behrman and Birdsall, 1983).

The same writers subsequently commented that their conclusions point to a productivity/equity trade-off, since greater productivity gains would be possible if years of schooling and schooling quality were concentrated among fewer individuals rather than being spread broadly (Behrman and Birdsall, 1987). Behrman (1987), separately, produced detailed computations to support the above findings.

The above emphasis on quality of schooling is closely reflected in the development of the literature relating to educational effectiveness, which is referred to in section 11 below.

A study by Knight and Sabot (1987) was particularly

concerned with the fact that the labour market may operate imperfectly and thus the marginal product of labour may not be accurately measured by the average wage, data for which tend to be more readily available than data for marginal wages. Using data for Kenya and Tanzania, the researchers found the marginal rate-of-return to secondary education to be lower - by between one and three percentage points - than the average return, thus suggesting a potential source of bias in standard returns calculations. They also suggest that over time such bias could become increasingly important as secondary school-leavers filter down into unskilled wage- or self-employment occupations in which their education has less value.

Tsang (1988) found five major methodological problems relating to rates-of-return studies. First, the results are based on past conditions and may not be reliable predictors of the future; second, most studies use cross-sectional data instead of longitudinal data; third, most studies use data for quantity of schooling and ignore educational quality; fourth, most studies ignore significant noneconomic benefits of education; fifth, the assumption that the labour market is perfectly competitive is unlikely to be true in developing countries where governments are major employers.

Tsang also points out that a number of previous writers have questioned the basic assumption underlying cost-benefit studies, namely that education raises future productivity; if it does not, if, e.g., education is merely a screening device or productivity is determined primarily by job structure or labour market characteristics such as segmentation, or if there is underutilization of education in production (leading, perhaps to lower work effort and lower productivity), then cost-benefit analysis loses its validity. Finally, Tsang notes that Bowles & Gintis (1976) found the focus on the productivity and earnings benefits of education too narrow, given their thesis that the central function of education is to reproduce the social relations of production in a capitalist economy.

McMahon (1988) found cost-benefit studies of vocational and technical education to be often unsatisfactory, partly because the "vocational" course content may not be up-to-date, and partly because there may be an imbalance between vocational and general curricula. In some circumstances, corrected rates-of-return would be negative.

Most recently of all, Bourguignon (1991) commented that during the recent period of major education transition, the very rapid development of education may lead to:

> "a drastic change in the educational structure of the labour-supply, which in turn may induce changes in the structure of earnings by educational levels, and therefore changes in the observed returns to education".

Depending on a number of factors, this may mean that the standard "static" rate-of-return results may be over- or under-estimated. Also, externalities relating to educational development - following, for example, significantly increased education levels among urban workers - may be overlooked. Bourguignon also stressed the potential importance of externalities typically excluded from cost-benefit calculations, notably the reduced fertility of more educated women, the ability to adapt quickly to a changing environment and make technical innovations, or the enhanced national cohesion and democratic sense of a more educated population.

Overall, these criticisms are so comprehensive that it may seem a matter of some surprise that so many researchers are still engaged in producing educational rate-of-return studies for Third World countries. The explanation must relate partly to the desire to constantly improve and refine the technique, partly to the fact that alternative techniques, such as manpower planning, are beset by at least as many problems.
Perhaps at times too much is expected of cost-benefit analysis. One recent study concludes with a salutary caution:

> "Rates of return estimates are not precise results. Their policy purpose is to indicate desirable directions of policy changes. The composition of social or government investment should be shifted in directions where returns are highest" (McGavin, 1991).

11. THE EDUCATIONAL EFFECTIVENESS LITERATURE

Parallel to the above-mentioned work on rates-of-return, there developed a considerable, and quite separate, literature relating to school effectiveness (although the latter can and has affect cost-benefit studies, for example regarding comparison of alternative use of resources and to identify the most cost-effective). This is referred to here only in so far as it affects the work on cost-benefit analysis. The rate-of-return literature, as reviewed above, contents itself with measuring schooling by number of years of attendance; by contrast, the educational effectiveness literature attempts to disaggregate the school experience and to examine the variety of inputs going into schools during any one school year and their differing effects on educational outcomes.

The review of this field by Schiefelbein and Simmons (1981) found that the principal findings relating to variables studied were:

(i) Number of students per class: was related to student achievement in 9 out of 14 studies.

(ii) Higher expenditure per student: associated with higher student achievement in only 3 out of 8 studies.
(iii) Availability of textbooks: positively related to learning in 7 out of 10 studies.
(iv) Setting of homework: led to higher achievement in 6 out of 8 studies.
(v) Teacher certification: in 19 out of 32 studies, the students of non-certificated teachers fared as well in tests as the students of certificated teachers.
(vi) Teachers' years of experience: a significant determinant of achievement in only 7 out of 19 studies.
(vii) Additional years of teacher training: was not related to higher student achievement in 5 out of 6 studies.
(viii) Socioeconomic status of students' parents: a significant predictor in 10 out of 13 observations (and often the single most important determinant of school outcomes).
(ix) Malnutrition, body weight and health: significant predictors of test scores in 8 out of 11 cases - which "provides strong support for experiments to raise health levels as a form of educational investment".
(x) Repetition: the more repeating a student did, the lower the test score, in 7 observations out of 8.

Overall, therefore, these studies provide evidence towards investing in certain directions, notably in text-books for example, but whilst some of the evidence is strong, it is never conclusive: for each of the variables cited above, there is some measure of disagreement as to the effects. Further, a practical problem is that this approach can not say how much more investment should be made in any one direction. Later reviews by Fuller (1987) and Fuller and Heyneman (1989) largely confirmed the above conclusions, as evidenced by the following summary table:

School factor	Number of Studies	Number Confirming Achievement Effect
Highly effective		
Textbooks and instructional materials	24	16
Years of teacher training	31	22
School library activity	18	15
Length of instructional programs	14	12
Pupil feeding programs	6	5
Less effective		
Reducing class size	21	5
Science laboratories	11	4
Teacher salaries	14	5
Pupil repetition of grades	5	1

Fuller (1987) notes that the great majority of such studies do not control for prior achievement levels, thus this is not genuine longitudinal research.

Space does not permit discussion here of the large number of individual country studies but we should not leave this topic without quoting from the findings of Lockheed and Hanushek (1988) who incorporate similar school variables in a cost-effectiveness approach. Among the points they make are that in Brazil, textbooks are more than twice as cost-effective as primary teacher training, four times as cost-effective as inservice teacher training, and seven times as cost-effective as secondary teacher training. In Nicaragua, radio is half again as cost-effective as textbooks. In Thailand, textbooks are nearly five times as cost-effective as each semester of postsecondary education for teachers.

All of the above leads one to suggest that, in view of the availability of such evidence relating to school input and output variables, to assess the effects of education by simply taking the number of years of schooling, as is conventionally done in rate-of-return analysis, seems quite inadequate.

Considerable evidence is now available, including from writers who are World Bank staff members, regarding the World Bank's wide experience over 30 years of financing educational development, with the aim of promoting economic and social development, throughout Third World countries. Psacharopoulos (1988) summarised what the World Bank had apparently learnt from such experience. Whilst conditions and requirements varied in different individual countries, the following list of policy priorities had emerged and might be applicable to a large number of countries:

(i) Emphasis on primary education
(ii) Emphasis on general skills at the secondary level
(iii) Emphasis on employment-based vocational training
(iv) Emphasis on cost recovery in higher education
(v) Emphasis on school quality
(vi) De-emphasis on planning models
(vii) Emphasis on analytical work specific to countries.

For vocational education and training, Middleton (1988) showed how the Bank had shifted emphasis away from schools and towards non-formal training systems. Maglen (1990) noted that if the priority strategies listed by Psacharopoulos had been applied to Australia's educational aid to Pacific Island countries it would have caused a drastic realignment in aid programmes (Maglen, 1990).

Hawkridge (1988), writing in connection with distance

education, showed that World Bank investments were most profitable in those instances where the Bank and the recipients were able to agree on the educational objectives, and were most effective when they were sharply focussed on improving the quality of the teaching available. In practice, there is some evidence to show that aid priorities frequently reflect the geopolitical interests of the donors rather than any ideal priorities in the recipient countries (Bujazan et al., 1987).

Given that the World Bank is the world's major provider of funds for educational aid to developing countries, it would seem apparent that it should be possible to draw on the results of its wide experience, as summarised above, in connection with any future aid projects.

It is also worth noting the influence that rate of return studies have had on World Bank policies, e.g. World Bank, Financing Education in Developing Countries (1986) and Education in Sub-Saharan Africa (1988) both draw crucial conclusions about investment and financing policies from the fact that (a) private returns exceed social returns (b) primary is more profitable than secondary, secondary is more profitable than higher.

12. THE COMPARATIVE EDUCATION LITERATURE

The Comparative Education literature, also, will only be referred to here in so far as is necessary for the purposes of the present work on cost-benefit analysis. Within the comparative literature, there has in recent years been increased emphasis on the problems of drawing meaningful comparisons between countries which are often in very different situations. A major trend in recent years has been that comparative studies have:

> "moved in practice increasingly away from a descriptive, historical, even philosophical function to one that is interpretative, aetiological and lays claim even to be predictive"
> (Halls, 1990).

The various approaches to comparative education differ widely but they have increasingly come to recognise the validity of the differing local cultures and social and economic circumstances within which education systems have to subsist; thus, the search for one convergent educational mould into which education systems everywhere had to fit has had to be abandoned as futile.

Specific to developing countries, comparativists have drawn heavily on modernization theory and dependency theory and, more recently, on human capital theory, to all of which they have tried to relate many local ethnographic studies. A variety of different approaches are in use by scholars in different parts of the world, including, increasingly, many that are essentially practical and policy orientated (Thomas, 1990).

At the same time, the comparative literature has had to recognise that financial constraint and retrenchment are now universal and thus financial and economic criteria have come to play an increasing role in questions relating to the allocation of scarce educational resources. Thus it is that cross-references to cost-benefit analysis and cost-effectiveness analysis have come to feature ever more prominently in the comparative literature.

Bishop (1989) quotes a comment from an authority in Uganda as pinpointing what he sees as perhaps the most glaring defect of education in developing countries:

> "The most serious limitation of school in developing countries is that it can only reach a small proportion of the school population...and the result is often a small, powerful elite on the one hand and an uneducated impotent majority on the other...two nations, with one rich, educated, African in appearance but mentally foreign, and the other, the majority of the population, poor and illiterate".

If so, difficult resource allocation decisions will need to be taken on the basis of analysis which should be as scientific and rigorous as possible. Hence there would seem to be little doubt that cost-benefit analysis, in its present or in some future refined form, will increasingly play a major role in the educational decision-making process.

The cross-country reviews of cost-benefit analysis by Psacharopoulos (1973, 1981, 1982, 1985) and by Jain (1991) were evidently comparative in nature but few if any cost-benefit studies have been carried out on a comparative country basis.

13. TOWARDS A NEW APPROACH TO COST-BENEFIT ANALYSIS

From the foregoing sections in this report, it is clear that:

(i) Educational cost-benefit analysis is currently, and has been for some years, a widely-accepted technique, used to assess the profitability of investment in education. Educational rate-of-return studies have been carried out in most developed countries and in many developing countries. In the great majority of cases, the results are in favour of additional investment in education, which the studies show to be profitable both from the point of view of the national economy and from that of the individual student. In general, the studies particularly favour additional investment at the level of primary education.

(ii) There are serious doubts regarding a number of

aspects of the methodology used in rate-of-return studies. It is not difficult to show that the underlying assumptions may be invalid, the data may be faulty, or there may be inherent sources of bias in the results and that some of these may be very large, possibly so large as to invalidate the findings. Some writers see the application of cost-benefit techniques to education as being essentially flawed.

Educational cost-benefit analysis will undoubtedly continue. But the above criticisms point towards the desirability of a revision of this approach, possibly in the direction of incorporating elements of the two principal alternative approaches, namely manpower planning and social demand. Such a possibility was in fact envisaged by Professor Blaug over twenty years ago, when he wrote:

> "Faced with the difficulties of manpower forecasting, difficulties that seem to increase at a progressive rate the longer the time period over which we are forecasting, the remedy is to begin modestly with short-term forecasts which are then extrapolated with a compounding margin of error. As we accumulate more experience, we begin to adjust the margin of error, gradually producing more and more reliable medium-term and eventually long-term forecasts. As a check on such forecasts of demand, we ought to make continuous year-by-year projections of the future supply of educated people. Indeed, the forecasts of demand ought to be of the type that provides a range of alternative estimates, given different projections of the projected supply. If the demand for educational inputs depends in any way on their prices, and this will necessarily be so if there is any substitutability between educated people, changes in supply are just as capable of altering prices as changes in demand and, therefore, the quantity demanded of educational inputs is not independent of its supply. It follows that manpower forecasts must always be combined with projections of the demand-for-places. As we combine forecasts of demand for manpower with projections of the supply of manpower, we start thinking quite naturally of earnings associated with education as possible indicators of impending shortages and surpluses; and since the costs of training various types of specialized manpower differ considerably, we shall be led to consider variations in earnings in relation to variations in the costs of education. This is rate-of-return analysis, whether we call it that or not. If earnings are inflexible and fail to reveal shortages and surpluses of manpower, the remedy lies in imputing "shadow prices" to labour of different skills and calculating the critical rates of return that lead to definite investment priorities in education. By making such calculations on a year-to-year basis, we keep a continual check on labour markets for highly qualified manpower and gradually develop insights into the ways in which education interacts with economic growth. Rates of return as such can never provide more than an ex post check on the efficiency of investment already embodied in different kinds of educational facilities and, of course, a signal for a possible direction of change in the pattern of educational investment. By supplementing rates of return with exante estimates of the likely changes in the demand and supply of skills over the planning period, however, we convert them into tests of the validity of predictions of demand and supply. If we get different answers from rate-of-return calculations than from manpower forecasts, it may be that (a) earnings are divorced from the marginal productivity of labour, (b) the costs of education are artificially inflated, (c) future rates of return will diverge from present rates or (d) the manpower forecasts are wrong. Which of these four factors or which combination of them is responsible for the difference in answers cannot be settled on a priori grounds. What we have been trying to do is to build up a framework in which such factors can be systematically considered. The message of this framework is that the manpower requirements approach, the "social demand" approach and rate-of-return analysis are reconcilable and, in fact, complementary techniques of educational planning, but not as these approaches are presently practised around the world." (Blaug, 1970, underlining added)

Professor Blaug was particularly critical of attempts to make use wholesale of elements of the different approaches in their present form, as happened with higher education in the UK in the post-Robbins era: higher education places were expanded to meet the increasing demand (the social demand approach) but the government attempted to maintain the principle from previous manpower planning exercises that two-thirds of the additional places outside medicine and agriculture should be in science and technology. Given the different assumptions embodied in each approach, Blaug concluded that "this really combines the worst of both worlds".

Subsequently, there has been considerable interest in developing educational planning models which combine elements of all three approaches (cost-benefit analysis, manpower planning and social demand), or at least combine cost-benefit analysis and manpower planning. Such approaches became known as "synthetic" educational planning models. Synthetic models:"purport to offer a compromise between the polarized assumptions of the manpower requirements approach and the cost-benefit model" (Psacharapoulos, 1985b).

Such models may proceed in a number of stages, for example:

1. From: Base year labour structure via: Manpower forecasting
2. to: Target year labour structure, 1st approximation.
3. Using: Linear programming
   incorporate: Shadow wages of target year labour structure.
4. CBA: To give shadow rates of return, corresponding to above labour structure.
5. This enables: rate of return comparison between each other and the social discount rate.
6. This gives: Optimal target year labour structure

(Source: Psacharopoulos, 1985b).

This approach can either commence from a quantity solution, i.e. estimation of quantities of labour skills required in the target year (via manpower planning), and subsequently add in relative prices, or commence with a set of relative prices of skills, or rates of return (via cost-benefit analysis) and then proceed to find corresponding quantities, thus giving "a cost-benefit evaluation of manpower planning" (Psacharopoulos, 1985).

Such synthetic models are also sometimes referred to, incorrectly, as linear programming models: linear programming is simply a mathematical technique for arriving at a solution to a set problem and has nothing to do with educational planning as such.

In adopting a synthetic planning model, it has to be remembered that the cost-benefit and manpower planning approaches, which are both being used here, embody quite different, indeed opposing, assumptions. The most important of these assumptions may be represented as follows:

	cost-benefit analysis	manpower planning
elasticity of substitution between different skills	infinite	zero
elasticity of demand for skills	infinite	zero

Thus, in including both approaches, we must necessarily, in each case, be assuming some elasticity around mid-point between zero and infinity. To do so may well be reasonable and realistic but may also undermine some of the findings. Thus in the manpower planning part of the exercise, if there are some genuine elasticities, both of substitution between skills and of demand for skills, then the forecast quantity figures will be partially invalidated. Similarly, if in the cost-benefit part either or both of these elasticities are "sticky", then price signals will not have the effects anticipated and, again, the expected outcome will be partially invalidated.

This is a fundamental problem with any attempt to combine cost-benefit analysis with manpower planning, since the two approaches are based on quite different assumptions, indeed on contrasting views of the economic world to which they apply. These were outlined in some detail by Blaug (1970) in what he termed "Two Views of the World"; he went on to recommend an "active manpower policy" which would consist partly of attempts to move the real world in the direction of the rate-of-return end of the continuum, e.g. reductions in specialization and greater flexibility.

The above account of the development of synthetic approaches is at the conceptual or model-building level. There seem to have been very few attempts to apply such an approach in practice.

Dougherty (1971) showed that when the standard cost-benefit approach is modified to allow for relative wage levels to change over time, it is possible to incorporate the effects of the growth of the education system on the growth of each category of labour and thence on future wage rates. This clearly incorporates elements of manpower planning. Dougherty tested this approach for data relating to Colombia and calculated rates of return to primary, secondary and higher education for successive years, allowing for the effects of changing wage rates. For 1985, he found returns of 19.8%, 17.8%, 0.9%, respectively.

One of the rare attempts known to attempt to embody the principles of both rate-of-return analysis and manpower planning has taken place in Cyprus. The Director of the Department of Statistics of the Ministry of Finance, Government of Cyprus, has given outline details of the way his government has developed an "eclectic" approach which uses both manpower forecasts and cost-benefit studies and which: "focuses much more on particular forms of education and particular occupational and industrial employment categories, rather than combining all relevant factors into a single model" (Demetriades, 1989).

There has been little other progress in the direction of empirical studies incorporating both the cost-benefit and manpower planning approaches, and it is not difficult to see why. Quite apart from the differing assumptions underlying each and the fact that, as indicated previously, each of the manpower planning and social demand approaches has been the subject of at least as much criticism as has cost-benefit analysis, research studies would become not only more complex but also much more costly.

Also, there have been very few attempts to relate cost-benefit results to questions of school "quality" (as argued by Behrman & Birdsall - see section 10 above) or educational "effectiveness" (see section 11 above), instead of merely taking number of years of schooling as the adequate school variable as is conventionally the case with rate-of-return studies.

In conclusion, three further points, all of which have been referred to earlier in this report, require emphasis here. Firstly, the link with cost-effectiveness: cost-benefit analysis may be used as a means of comparing alternative uses of resources in order to identify the most cost-effective. Psacharopoulos and Woodhall gave examples of this, including general versus vocational education in Colombia and Tanzania, on-the-job training versus formal training in Israel and formal schooling in Brazil, and the effectiveness of a new school building programme compared with a school repair programme in El Salvador.

Secondly, there could be a more extended treatment of the use of sensitivity analysis to compare alternative manpower forecasts and different patterns of manpower utilisation, and of cost-benefit analysis to study the determinants of private demand, which is a way of linking up the three approaches; the determinants of demand would include students' perceptions of costs and benefits, i.e. the private rate of return, and their forecasts of future job prospects, i.e. crude manpower forecasts. Government may then seek to shift costs from taxpayers to students, as the British Government has done recently. Compare with, e.g. the massive expansion of higher education in Kenya and transfers of costs to students.

Thirdly, cost-benefit analysis has been used in several countries to develop or at least justify new policies on financing education, see e.g. the World Bank recommendations on financing education, which draw heavily on rate of return studies. This represents the main way in which governments in both developed and developing countries are currently using cost-benefit analysis to guide and formulate policy. To quote Maureen Woodhall again:

> "To sum up, a new approach to cost-benefit analysis is already in evidence in many developing countries, which are changing traditional patterns of financing higher education in the light of evidence of high private rates of return and are switching emphasis to primary education, just as cost-benefit analysis recommended.
>
> The crucial need in the next decade is to monitor the effects of these changes within a cost-benefit framework".

Finally, as we have seen, educational cost-benefit analysis, as currently practised, has been the subject of much criticism, and yet the principal alternative, the manpower planning approach, has been the subject of even more. Given that both are currently is use in different ways or for different sectors in many different countries, from the point of view of this report it does seem regrettable that there seem to have been so few attempts to combine the two in empirically-based studies.

Further research on these lines would be welcome even though it would be both costly and time-consuming. This might take the form of studying recent cohorts emerging from the education system and charting their subsequent employment progress, including vis the use of such competitive labour market signals as are available. Such research should enhance the validity of educational cost-benefit studies and should lead to increased confidence in the effectiveness of educational planning.

Any such future studies should be carried out in conjunction with local staff from the country in question, perhaps suitably-qualified staff from the Ministry of Education or possibly from a local university, with a view to developing local capacity to undertake independent cost-benefit studies.

PROJECT TITLE: EDUCATIONAL COST-BENEFIT ANALYSIS

The use of conventional economic cost-benefit analysis in an educational context is being increasingly questioned as a reliable guide to optimal resource allocation. There is doubt as to whether conventional means of determining the private and social costs and benefits of education are sufficiently reliable or comprehensive. If a means of determining costs and benefits of elements of education provision could be constructed that were more consistent with educational philosophy yet capable of being simply and rapidly determined, then cost-benefit analysis could serve as a more useful tool in educational planning and evaluation.

The purpose of the study is to:

1. identify current procedures for identifying educational costs and benefits;

2. provide a critique of those procedures from a comprehensive educational viewpoint that includes, but is not restricted to, manpower planning and social demand;

3. make proposals, to the extent that this is possible, for refining these procedures to become more valid from an educational viewpoint.

This would involve a literature survey on the construction, use and criticism of cost-benefit analysis in education (and, where relevant, other economic sectors); a survey of comparative education literature and other relevant literature sufficient to clarify (a) principal expressions of educational goals and objectives, (b) key internal and external elements of the educational process, and (c) key internal and external factors and variables determining the achievement or otherwise of these goals; reasoned refinement or reconstruction of conventional cost-benefit procedures in the light of these surveys; demonstration of the advantages and limitation of the new procedures through case studies.

APPENDIX 2
RETURNS TO INVESTMENT IN EDUCATION BY LEVEL AND COUNTRY

Country	Year	Social Prim.	Social Sec.	Social Higher	Private Prim.	Private Sec.	Private Higher
AFRICA							
Botswana	1983	42.0	41.0	15.0	99.0	76.0	38.0
Ethiopia	1972	20.3	18.7	9.7	35.0	22.8	27.4
Ghana	1967	18.0	13.0	16.5	24.5	17.0	37.0
Kenya	1971	21.7	19.2	8.8	28.0	33.0	31.0
	1980		13.0			14.5	
Lesotho	1980	10.7	18.6	10.2	15.5	26.7	36.5
Liberia	1983	41.0	17.0	8.0	99.0	30.5	17.0
Malawi	1978		15.1				
	1982	14.7	15.2	11.5	15.7	16.8	46.6
Morocco	1970	50.5	10.0	13.0			
Nigeria	1966	23.0	12.8	17.0	30.0	14.0	34.0
Rhodesia	1960	12.4					
Sierra Leone	1971	20.0	22.0	9.5			
Somalia	1983	20.6	10.4	19.9	59.9	13.0	33.2
Sudan	1974	8.0	4.0	13.0	15.0		
Tanzania	1982		5.0				
Uganda	1965	66.0	28.6	12.0			
Upper Volta	1970	25.9	60.6				
	1975	27.7	30.1	22.0			
	1982	20.1	14.9	21.3			
ASIA							
Hong Kong	1976		15.0	12.4		18.5	25.2
India	1965	13.4	15.5	10.3	17.3	18.8	16.2
	1978	29.3	13.7	10.8	33.4	19.8	13.2
Indonesia	1977				25.5	15.6	
	1978	21.9	16.2	14.8			
Malaysia	1978					32.6	34.5
Pakistan	1975	13.0	9.0	8.0	20.0	11.0	27.0
	1979				14.6	6.7	9.4
Philippines	1971	7.0	6.5	8.5	9.0	6.5	9.5
	1977		8.5				16.0
Singapore	1966	6.6	17.6	14.1		20.0	25.4
South Korea	1967		9.0	5.0			
	1969		11.0	9.5			
	1971		14.6	9.3		16.1	16.2
	1973		12.2	8.8			
	1980		8.1	11.7			
Taiwan	1970	26.5	15.0			17.6	18.4
	1972	27.0	12.3	17.7	50.0	12.7	15.8
Thailand	1970	30.5	13.0	11.0	56.0	14.5	14.0
	1972	63.2	30.9	18.4			
LATIN AMERICA							
Bahamas	1970		20.6			26.1	
Brazil	1970	23.5	13.1			24.7	13.9
Chile	1959	24.0	16.9	12.2			
Colombia	1973				15.1	15.4	20.7
	1976			18.4			24.9
	1981		9.6				
Costa Rica	1974				13.1	8.7	25.7
Mexico	1963	25.0	17.0	23.0	32.0	23.0	29.0
Paraguay	1982	14.0	11.0	13.0			
Peru	1972	46.9	19.8	16.3			
	1974	34.3	9.0	15.0			
	1980	41.4	3.3	16.1			
Puerto Rico	1959	24.0	34.1	15.5	68.2	52.1	29.0
Venezuela	1957	82.0	17.0	23.0		18.0	27.0
	1984				32.5	11.7	20.6
INTERMEDIATE							
Cyprus-1	1975				15.0	11.2	14.8
	1979				8.6	8.1	14.1
Cyprus-2	1975		10.5	9.7		11.6	8.6
	1979	7.7	6.8	7.6	15.4	7.0	5.6
Greece	1962		6.3	13.7		7.2	14.0
	1977	16.5	5.5	4.5	20.0	6.0	5.5
Iran	1972	34.0	11.5	15.0			
	1976	15.2	17.6	13.6		21.2	18.5
Iran-2	1975				10.6	15.3	19.3
Israel	1958	16.5	6.9	6.6	27.0	6.9	8.0
Spain	1971	17.2	8.6	12.8	31.6	10.2	15.5
Turkey	1968			8.5		24.0	26.0
Yugoslavia	1969	9.3	15.4	2.8	7.6	15.3	2.6

Note: Private rates to primary education in excess of 100% have been given as 99%.

Source: Psacharopoulos (1985)

(The original table also lists data for 37 studies in 15 advanced countries).

APPENDIX 3

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