

Cost-benefit analysis in educational planning

Fourth edition

Maureen Woodhall

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Fundamentals of educational planning

The booklets in this series are written primarily for two types of clientele: those engaged in educational planning and administration, in developing as well as developed countries; and others, less specialized, such as senior government officials and policy-makers who seek a more general understanding of educational planning and of how it is related to overall national development. They are intended to be of use either for private study or in formal training programmes.

Since this series was launched in 1967 practices and concepts of educational planning have undergone substantial change. Many of the assumptions which underlay earlier attempts to rationalize the process of educational development have been criticized or abandoned. Even if rigid mandatory centralized planning has now clearly proven to be inappropriate, this does not mean that all forms of planning have been dispensed with. On the contrary, the need for collecting data, evaluating the efficiency of existing programmes, undertaking a wide range of studies, exploring the future and fostering broad debate on these bases to guide educational policy and decision-making has become even more acute than before. One cannot make sensible policy choices without assessing the present situation, specifying the goals to be reached, marshalling the means to attain them and monitoring what has been accomplished. Hence planning is also a way to organize learning: by mapping, targeting, acting and correcting.

The scope of educational planning has been broadened. In addition to the formal system of education, it is now applied to all other important educational efforts in non-formal settings. Attention to the growth and expansion of education systems is being complemented and sometimes even replaced by a growing concern for the quality of the entire educational process and for the control of its results. Finally, planners and administrators have become more and more aware of the importance of implementation strategies and of the role of different regulatory mechanisms in this respect: the choice of financing methods, the examination and certification procedures or various other regulation

and incentive structures. The concern of planners is twofold: to reach a better understanding of the validity of education in its own empirically observed specific dimensions and to help in defining appropriate strategies for change.

The purpose of these booklets includes monitoring the evolution and change in educational policies and their effect upon educational planning requirements; highlighting current issues of educational planning and analyzing them in the context of their historical and societal setting; and disseminating methodologies of planning which can be applied in the context of both the developed and the developing countries.

For policy-making and planning, vicarious experience is a potent source of learning: the problems others face, the objectives they seek, the routes they try, the results they arrive at and the unintended results they produce are worth analysis.

In order to help the Institute identify the real up-to-date issues in educational planning and policy-making in different parts of the world, an Editorial Board has been appointed, composed of two general editors and associate editors from different regions, all professionals of high repute in their own field. At the first meeting of this new Editorial Board in January 1990, its members identified key topics to be covered in the coming issues under the following headings:

1. Education and development.
2. Equity considerations.
3. Quality of education.
4. Structure, administration and management of education.
5. Curriculum.
6. Cost and financing of education.
7. Planning techniques and approaches.
8. Information systems, monitoring and evaluation.

Each heading is covered by one or two associate editors.

The series has been carefully planned but no attempt has been made to avoid differences or even contradictions in the views expressed by the authors. The Institute itself does not wish to impose any official doctrine. Thus, while the views are the responsibility of the authors and may not always be shared by UNESCO or the IIEP, they warrant attention in the international forum of ideas. Indeed, one of the purposes of this series is to reflect a diversity of experience and opinions by giving different authors from a wide range of backgrounds and disciplines the opportunity of expressing their views on changing theories and practices in educational planning.

This booklet on *Cost-benefit analysis in educational planning* was first published in 1970. The practice of educational planning has changed a great deal since then yet the need to make sound decisions based on an analysis of costs and benefit remains. The tense debate surrounding the validity of this method has appeased as it is now widely recognized that cost-benefit analysis and rates of return are not the only criteria to take into consideration when planning education and making policy decisions. However this criterion is important and the booklet is in very high demand among planners. The Editorial Board felt that prior to issuing a fourth edition of this booklet it was necessary to ask Maureen Woodhall to revise it thoroughly, taking into account the latest developments in cost-benefit analysis. We are very grateful to her for having accepted to do so, drawing on her very vast experience and over 40 years worth of publications on the subject of economics of education. As an emeritus reader in the Institute of Education at the University of London and a consultant with many international agencies she is the most appropriate person to write such a booklet, which is a classic in our collection.

Gudmund Hernes
Director, IIEP

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Preface

In the mass of writing on educational planning over the past decade, no topic has incurred the suspicion of teachers and administrators more than cost-benefit analysis. To be sure, these latter accepted gladly enough the economists' conclusion that education is a good investment – they were already convinced of that without the benefit of mathematical models – but they shied away from the corollary that, in the competition for limited funds, the effectiveness of education might be compared with that of new roads, fertilizers or factories and vehemently insisted that the most important products of education must continue to slip through any economic net, however cunningly woven. The economists did little to allay their fears: They were so busy arguing about the subject amongst themselves that they had little time to explain what it was all about in language intelligible to the teacher.

This booklet attempts to bring the practising educationist into the picture, although some economists will also read it with interest. It begins with almost deceptive simplicity but goes on to discuss some of the difficult problems that have worried the economists themselves – without recourse to jargon. Whatever lingering suspicions educationists may have of Maureen Woodhall *qua* economist, after reading this essay they cannot fail to admire her as a teacher; Indeed we were fortunate in getting her to explain one profession to the other. She makes no exaggerated claims for the techniques she expounds. Rather, she insists that cost-benefit analysis “cannot be the sole criterion for educational planning but that such an analysis should be an important element in decision making ... All planning consists of a choice between alternatives. If cost-benefit analysis does no more than serve as a reminder of this truth, it will have practical significance”. Any educational administrator who ignores this truth in the future will be asking for trouble. Particularly in developing countries, the allocation for education over recent years has absorbed an increasing proportion of the national budget and ministers of finance are the last people to

Preface

forget that there are attractive alternative ways of spending the nation's money and that the economists have offered them a tool, however rough, that is said to measure the effectiveness of different forms of expenditure. Thus the administrators who press for increased financing of schools must be prepared to support their case with arguments more sophisticated – both economically and socially – than many of us have employed in the past. Knowing the sweeping assumptions that lie behind some numerical statements of both costs and benefits in education, administrators may on occasion suspect the arithmetic by which conclusions are reached, however the reasoning behind the formulae is not so open to question and as they are likely to meet it increasingly frequently in official life, the sooner they try to master it the better. This booklet may be of help to them.

Extract from the preface by C.E. Beeby
to the 1970 edition

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List of abbreviations

HE	Higher education
HECS	Higher Education Contribution Scheme
OECD	Organisation for Economic Co-operation and Development
OED	Operations Evaluation Department
PURE	Public funding and private returns to education
SAR	Staff Appraisal Report
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WEI	World Education Indicators

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Introduction to the fourth edition

The first edition of this booklet was published by IIEP in 1970, when the economics of education was in its infancy and cost-benefit analysis of education was a relatively new and controversial technique. When the booklet was first written in 1969, fierce battles were still being conducted in the literature on the economics of education and educational planning between advocates and critics of cost-benefit analysis. The introduction recognized that “cost-benefit analysis of education, as currently practised throughout the world, can be criticized” and the booklet examined theoretical objections to the approach as well as providing a simple introduction to the technique and a discussion of examples of cost-benefit analysis in both developed and developing countries. A second edition, with slight revisions, was published in 1980 and a third edition in 1992.

The revisions in the second and third editions were quite minor, consisting mainly of brief references to more recent theoretical and empirical research including criticisms of cost-benefit techniques such as the ‘screening hypothesis’ and the continuing controversy on the relative effects of education and ability on earnings as well as new examples of cost-benefit analysis of education and estimates of rates of return. The main conclusion remained unchanged: that cost-benefit analysis can be a useful tool for educational planners which provides a conceptual framework for evaluating alternative proposals or projects and generates investment signals in the form of rough estimates of the profitability of different types of education or different patterns of resource allocation. However, no grandiose claims were made. Rather than as a stand-alone guide to investment decisions, cost-benefit analysis was presented as one useful technique in the educational planner’s toolbox to be used in conjunction with other techniques such as cost-effectiveness analysis and analysis of the labour market for educated workers. Indeed, the conclusion states quite clearly: “Cost-benefit analysis does not offer an automatic solution to problems of resource allocation” and “numerical calculations of rates of return

may be helpful, but it is more important to attempt some sort of systematic comparison of the costs and benefits of a project, and the balance between them, than to make precise estimates of rates of return (Third edition, 63, 71)”.

Thirty-five years after writing the first edition, the author stands by these conclusions but recognizes that the practice of educational planning and cost-benefit analysis have both changed significantly. In the intervening years, increasingly vehement claims and counter-claims have been made about the value and reliability of rates of return on investment in education. There have been periods when the approach has fallen out of favour. However there have also been periods when cost-benefit analysis has been extremely influential both in individual ministries of education and in funding agencies. Recently, the idea of the ‘knowledge economy’ has caused a reawakening of interest in the concept of human capital and in estimates and applications of cost-benefit analysis. Researchers have been highly active, particularly in the last decade. When the first edition of the booklet was published, estimates of the rate of return to education were available for about 30 countries. The third edition refers to a summary of rate-of-return studies in more than 60 countries (Psacharopoulos, 1985) and the most recent ‘update’ summarized in this fourth edition (Psacharopoulos and Patrinos, 2002) presents estimates for 98 countries. There have also been technical improvements both in the statistical data available in many countries and in the analytical techniques used by researchers. When the first edition was written, several rate-of-return estimates had relied on primitive calculators for analysis of data collected from small samples and had calculated the rate of return on a ‘trial and error’ basis. By 2000, not only had there been considerable improvement in data on the earnings of educated workers (an essential element of most rate-of-return calculations) with many rate-of-return studies able to draw on census data or on large representative national samples, but econometric techniques for multivariate analysis of the contribution of different factors to earnings differentials had also improved, researchers and planners had access to far more powerful computing capacity and the availability of information and research findings on the Internet had created exciting new possibilities for international comparative research and exchange of information.

Several agencies, including the OECD and the World Bank, have recently conducted international comparisons of human capital and rates of return.

It is obvious, in this changed environment, that not only the first and second but also the third edition of this booklet are out of date. Yet there is still a perceived need for a short booklet written in simple, non-technical language which explains both the underlying rationale for applying cost-benefit analysis to education and the mechanics of calculating rates of return, examines theoretical objections and criticisms of the technique as well as some of the practical difficulties of collecting and interpreting data and summarizes results of cost-benefit analysis with a focus on policy and practical issues rather than theoretical debate. The IIEP has therefore decided to publish a fourth edition rather than commissioning a completely new study. Similarly, the author decided to maintain the original structure and much of the content of the first edition, as the objectives remain unchanged, while at the same time adding new material and in some cases whole new sections or chapters to reflect recent research and policy issues.

Many new examples of cost-benefit analysis are discussed in *Chapter X*, including studies in both OECD and developing countries. Recent criticisms of the calculation, interpretation and use of rates of return are summarized in *Chapter VI*, together with some of the responses of researchers and practitioners. The chapter on interpretation of rates of return (*Chapter IX*) has been completely rewritten and there is a new chapter on using rates of return to guide policy (*Chapter XI*). There is also discussion in this fourth edition of issues such as gender differences in rates of return, which were hardly mentioned in the first edition as researchers had not really begun to explore them at that time. A first attempt by the author to compare rates of return to education for men and women (Woodhall, 1973) appeared three years after the publication of the first edition of this booklet and pointed out that the term 'human capital' had been almost exclusively applied to men. It quoted Schultz (1970): "If one were to judge from the work that is being done, the conclusion would be that human capital is the unique property of the male population ... despite all of the schooling of females and other expenditures on them, they

appear to be of no account in the accounting of human capital” (Schultz 1970: 302-3). Fortunately, that observation is no longer true. There has been considerable interest in estimating the economic benefits of female education in recent years and in analyzing female participation and the ‘gender gap’, reflecting changes in a society that at that time would make exclusive use of the terms ‘he’ and ‘him’ in relation to educational planners (as in the Foreword to the first edition), a practice that would be unthinkable today. Research on gender is discussed in *Chapters IX and X*.

New sections have been added in most other chapters. There is now greater use of subheadings than in the previous editions and references are presented at the end of the booklet rather than in footnotes. The suggestions for further reading have been expanded and now include other sources of information, including Internet sources and other study tools. It is hoped that these changes will increase the usefulness and relevance of the booklet and help to develop awareness in a new generation of educational planners and policy-makers of the uses and limitations of cost-benefit analysis of education.

Maureen Woodhall
January 2004

I. The purpose of cost-benefit analysis

Investment in human capital

Education is now universally recognized as a form of investment in human capital that yields economic benefits and contributes to a country's future wealth by increasing the productive capacity of its people. Thus expenditure on education can be partially justified in terms of the potential contribution of education to economic growth. However this immediately raises many questions. How does education compare with other forms of national investment? Which makes the greater contribution to future economic growth: investment in human capital or investment in physical capital? Are all forms of education equally productive? Is education a profitable form of investment for the individual as well as for society? And if so, do pupils and students, or their families, take this into account when making educational and occupational choices? All of these questions revolve round one basic issue: the relationship between the costs and the benefits of education, viewed as a form of social or private investment. This booklet is concerned with the theory and techniques of cost-benefit analysis as applied to education and with the relevance of cost-benefit analysis for educational planning.

It is written from the point of view of educational planners and administrators in developing countries and its emphasis is fundamentally practical. It is, of course, necessary to give a brief summary of the economic theory underlying the concepts and techniques of cost-benefit analysis and to examine some of the theoretical objections that have been made to applications of cost-benefit analysis to education. But theoretical reviews of cost-benefit analysis are available elsewhere. The purpose of this booklet is to examine the practical significance of cost-benefit analysis for educational planning and to provide a simple explanation of the technique for non-economists who are faced with economic problems of resource allocation. A major part of the booklet will be devoted to the practical problems of collecting and analyzing

the data necessary for a cost-benefit calculation. Real examples will be given of cost-benefit exercises in developing countries. The booklet concludes with a discussion of the policy implications of cost-benefit analysis of education.

The term ‘cost-benefit analysis’ implies a systematic comparison of the magnitude of the costs and benefits of a form of investment in order to assess its economic profitability. All forms of investment involve a sacrifice of present consumption in order to secure future benefits in the form of higher levels of output or income. Cost-benefit analysis (or rate-of-return analysis, which is the type of cost-benefit analysis most frequently applied to education) provides a means of appraising these future benefits in the light of the costs that must be incurred in the present. The purpose of the analysis is to provide a measure of the expected yield of the investment as a guide to rational allocation of resources. Thus any private businessman who is contemplating investing in physical machinery must make a cost-benefit calculation to assess the likely profitability of the investment. In recent years, economists have paid increasing attention to the application of cost-benefit analysis to public investment and sophisticated techniques have been developed for measuring the costs and benefits of, for example, water resource and transport projects. Such projects are clearly analogous to private investments in physical capital and it is not surprising that techniques that are useful to the businessman should also prove useful to governments in making investment decisions.

Since the 1960s, following influential work by economists such as Schultz (1961) and Becker (1964) described by another American economist as “The human investment revolution in economic thought” (Bowman, 1966), an extensive body of research has developed which applies cost-benefit analysis to the whole field of investment in human capital: education, on-the-job training and health expenditures, to give the most obvious examples. An immediate problem arises here. The future benefits from such investment include non-economic benefits and even the economic benefits are difficult to quantify. As cost-benefit analysis is an economist’s tool designed to provide an economic appraisal of an investment possibility, applications of cost-benefit analysis to education focus strongly on the economic benefits of

education. Consequently, some educationists have argued that cost-benefit analysis is inapplicable to education due to the multiplicity of educational objectives and the importance of non-economic benefits. However, once it is recognized that investment in education does produce significant economic benefits, the need to analyze the nature and magnitude of these benefits in relation to costs is inescapable in a world in which resources are scarce and investment choices must be made.

In view of the importance that planners in developing countries now attach to the goal of maximizing economic growth, it is extremely important to have some means of assessing the economic impact of education. It is now recognized, however, that this is only a part of the total picture. The concept of human capital that underlies the application of cost-benefit to education has been further developed since the 1960s. In the 1980s and 1990s, critics argued that the concept was too narrow. The economic benefits of education are important, however the social, political and cultural consequences of education must not be neglected. Sociologists such as Coleman (1988) have introduced the concept of social capital, which takes account of social relationships and networks as well as non-economic factors such as trust and co-operation. International agencies now emphasize that human capital and social capital may be equally important in contributing to development.¹

However, cost-benefit analysis in its present form does not provide an appropriate means of analyzing non-economic benefits of education. There are other techniques such as cost-effectiveness analysis that may be more appropriate for analysis of non-economic benefits.

Cost-benefit versus cost-effectiveness analysis

Both cost-benefit and cost-effectiveness analysis involve systematic comparisons between costs and outcomes, however there

1. A recent World Bank study on *Social capital: a multifaceted perspective* (Dasgupta and Serageldin, 2000) and an OECD study on *The well-being of nations: the role of human and social capital* (OECD, 2001) both emphasize that human and social capital may be mutually reinforcing.

is an important difference between the two techniques. Cost-benefit analysis relies on monetary measures of both costs and benefits. The following two chapters discuss problems of measuring ‘opportunity’ costs and the direct and indirect benefits of education. The most common way of measuring direct benefits of education is to compare the earnings of people with different levels or types of education, but *Chapter III* discusses other examples of monetary measures as well as attempting to estimate ‘spillover’ benefits and ‘externalities’. Where benefits or outcomes cannot be measured or even approximated in monetary terms, another technique must be used; namely cost-effectiveness analysis. This technique compares alternatives such as different types of school (for example general versus vocational schools), different combinations of inputs (teachers, books and other learning materials) or different educational programmes (for example different types of teacher training) in terms of their effectiveness, measured by variables such as examination results, test scores, retention or completion rates.²

Cost-effectiveness analysis consists of three steps: (a) The costs of the alternatives must be carefully measured, for example expenditure on teacher salaries, books and learning materials in each type of school; (b) the outcomes or educational effectiveness of the alternatives must be measured, for example by standardized test scores of pupils in each school; finally, (c) costs and effectiveness measures are combined to calculate a cost-effectiveness ratio, for example by dividing the effectiveness of each alternative by its cost to show the unit cost of achieving a particular objective, such as a 1 per cent improvement in pupil achievement. Such a ratio is described in one cost-effectiveness study as “the achievement gain per dollar spent” (Harbison and Hanushek, 1992: 140). The most cost-effective alternative can then be identified – for example the school that produces the greatest improvement in pupil achievement for a given cost or alternatively the school where pupils achieve the required examination results at least cost.

2. See Levin (1995*a* and 1995*b*) and Psacharopoulos and Woodhall (1985) for a discussion of the difference between cost-benefit and cost-effectiveness analysis and Harbison and Hanushek (1992) for an example of cost-effectiveness analysis that compares costs and measures of pupil achievement in different schools in Brazil.

Some practitioners believe that cost-effectiveness analysis has advantages over cost-benefit analysis, particularly in day-to-day educational planning. Levin, for example, argues that the measures of educational effectiveness can be those which a decision-maker would normally consider, such as improvements in students' test scores, and that cost-effectiveness evaluations generally require less time and other resources than cost-benefit analysis (Levin, 1983: 114). On the other hand, accurate measurement of effectiveness can be just as problematic as the measurement of benefits, as education has multiple objectives and there is no single measure that adequately quantifies effectiveness. This booklet does not explore cost-effectiveness analysis in depth and interested readers should consult relevant texts such as Levin, 1983, 1995*a* and 1995*b*. The two approaches are quite closely related and, in fact, are complementary rather than alternative choices. Recent research in the USA shows that the learning achievements of students, as measured by tests of cognitive skills, are related to subsequent earnings. A summary of this research by Hanushek concludes: "There is mounting evidence that quality measured by test scores is directly related to individual earnings, productivity, and economic growth" (Hanushek, 2003: 5). In other words, the economic benefits of effective schooling as measured by pupil achievement are much greater than the benefits of ineffective schooling. Ideally, therefore, cost-benefit analysis should try to take account of the quality of education (as measured by achievement test scores or other measures) and not just quantity (as measured by years of schooling). In fact, this is rarely attempted and most cost-benefit studies use years of schooling as a proxy for learning and knowledge acquired by students. This problem is discussed further in *Chapter VI*.

In the past, a few writers have discussed cost-benefit analysis of education as though it were a panacea for all problems of resource allocation in educational planning. Others have rejected the approach entirely, considering it as of no value whatsoever to educational planning. It is not the purpose of this booklet to present cost-benefit analysis of education as a superior alternative to other approaches to educational planning, such as manpower and labour market analysis or the social demand approach, or to other techniques such as cost-effectiveness analysis. Nor does the booklet suggest that cost-benefit

analysis alone can provide the answer to all problems of planning. Rather, its aim is to show that cost-benefit analysis can provide the educational planner with vital information about the links between education and the labour market and about the economic consequences of alternative educational policies.

Cost-benefit analysis of education, as currently practised throughout the world, has been frequently criticized. For example, the common neglect of indirect economic benefits as well as of non-economic benefits and the use of cross-section data that reflect present and past supply and demand conditions raise doubts about the usefulness of cost-benefit analysis as a guide to future policy decisions. Such objections will be examined in the booklet to determine whether they are fatal to the approach as a whole or can be overcome. At the same time, the booklet seeks to emphasize the strength of cost-benefit analysis of education: namely that it combines, in a convenient form, information about the costs of different kinds of education together with information about the balance between supply and demand for different categories of educated manpower. Cost-benefit analysis also serves to focus attention on certain key variables in a country's educational or economic system; namely relative costs of different types of education and relative earnings of different categories of manpower. Thus, although cost-benefit analysis may not always provide planners with unambiguous policy directives, it does provide them with information useful for making rational policy decisions. It is hoped that readers may judge its usefulness for themselves after reading this booklet.

II. Measurement of costs

The concept of opportunity cost

The words ‘cost of education’ are often loosely equated with ‘expenditure on education’. For the purposes of cost-benefit analysis of an investment, however, it is necessary to define costs in terms of the total *opportunity cost* of a project; that is, all real resources that are used by the project. These are called the ‘opportunity cost’ as each investment represents the sacrifice of alternative opportunities to use the resources, either for present consumption or for some other form of investment. Thus money expenditures are significant only because they represent the purchase of teachers’ labour, school buildings and equipment or other goods and services that have alternative uses. At the same time the education system uses up other resources with alternative uses, even though these are not reflected in normal expenditure on education. The most obvious example is the time of pupils and students themselves, who deprive the labour market of their services by choosing to continue their education. This represents a loss of productive capacity and thus a loss of current output for the economy as a whole as well as a loss of earnings for the individual. This opportunity of current output or income is foregone in the expectation that education will increase the productive capacity of students in the future and hence future output. However, this loss of present income must be counted as one of the opportunity costs of education as it does represent a sacrifice of real resources, even though the time of students is not reflected in actual expenditure and thus appears at first sight to be a ‘free’ good. Similarly, other apparently ‘free’ goods or services used in the educational process do, in fact, represent a sacrifice of alternative opportunities. In developing countries, for example, the land and even the buildings for a school may be donated by the local community. However, these buildings or land may have alternative uses and the decision to build a school may mean the sacrifice of an opportunity to build a hospital or community development centre. For budgetary purposes, donated land may be

ignored, but for purposes of a cost-benefit calculation, which attempts to evaluate the profitability of one particular form of investment in comparison with alternative investments, it is essential that the sacrifice of alternative opportunities to use land or buildings be counted as part of the real cost of the investment.

Thus, the measurement of the costs of education, for the purposes of cost-benefit analysis, involves more than a simple calculation of money expenditures. It also involves an attempt to estimate the total cost of investment in education in terms of alternative opportunities foregone either by society as a whole or by the private individual.

Social and private costs

If the purpose of the cost-benefit analysis is to evaluate education as a form of social investment, the relevant cost concept is the total resource cost of education to the economy (social costs). This includes the value of teachers' time, books, materials and other goods or services, the value of the use of buildings and capital equipment, and finally the value of students' time, measured in terms of alternative uses.

The simplest measure of the value of teachers' time is expenditure on salaries. If, however, for some reason teachers are paid less than the current market rate for their services, some attempt must be made to estimate the true opportunity cost of their time. For example, in some developing countries teachers give some of their free time to conducting adult literacy classes (without payment). If this time would otherwise be unoccupied, there is no opportunity cost to be measured; but if the time could otherwise be devoted to some form of community development work, then the time does have an alternative use and is not strictly a 'free' good. Similarly, if teachers are required by law to serve for a year at reduced rates of pay as a form of 'national service', the value of their time should be measured by market rates rather than by their actual salaries.

The value of books, stationery and writing materials can also be measured in terms of money expenditure. In some countries books are financed with public funds and provided to pupils free or at a

subsidized price. In this case the appropriate way to measure their cost is by public expenditure on books or materials. However, in other countries pupils and students are expected to buy their own books. In such cases, some estimate of private expenditure on books is needed as variations in methods of financing purchases make no difference to the true economic cost of the goods.

It is usually fairly easy to obtain estimates of annual current expenditure on salaries and purchase of materials. It is more difficult to estimate the annual value of buildings and equipment. If the buildings are rented, the annual rent can be used to represent the value of the capital resources used during the year. However, in most cases buildings are not rented and therefore some estimate is required of the annual value of the use of capital; that is to say an annual rent must be imputed for the buildings or equipment. The simplest method of allowing for the costs of capital services is to calculate the annual amortization of the building over its expected life. Amortization represents not only the annual depreciation of the building and equipment but also a notional payment to cover interest charges. It therefore provides a good measure of the imputed annual rent of a building. At first sight it might appear that a simple depreciation calculation would be sufficient. However, this would be to ignore both the fact that buildings are financed in a single year by investment funds while their services are enjoyed over a number of years and that the decision to build a school means a sacrifice of alternative opportunities to use the investment funds in order to earn interest. Once again, we are concerned with measuring the cost of using educational buildings in terms of the alternative opportunities foregone.

Finally, the opportunity cost of students' time must be measured in terms of the earnings foregone by students when they continue their education rather than entering the labour force. These foregone earnings represent a real cost to the individual and, in the case of social costs, are a proxy measure for the output foregone by society. Some readers may be puzzled by the fact that this definition of the cost of education includes both actual money expenditure such as teachers' salaries and notional items such as imputed rent for buildings and foregone earnings. In fact, all items are alike in being approximate measures of the opportunity cost of physical resources. Teachers'

salaries are no more a real cost than foregone earnings, as both are no more than a proxy measure of the value of teachers' or students' time in alternative use. This is what is meant by the statement that "in a fundamental sense all costs are opportunity costs" (Bowman in Robinson and Vaizey, 1966: 423).

There are, of course, considerable problems involved in measuring the opportunity cost of pupils' or students' time; it is necessary, for example, to take account of unemployment when measuring earnings foregone. It is sometimes assumed that the time of young children has no economic value and that the concept of earnings foregone applies only to secondary school or higher education students and not to those of primary school age. However studies of primary school retention rates have shown that the time of quite young children does have an economic value to their families. The problems of estimating earnings foregone of primary school pupils, most of whose work is unpaid, are discussed in the section entitled *Progress in analyzing opportunity costs*. However, the practical problems of measurement should not obscure the need to find some measure, however approximate, of the value of real resources. It is also worth emphasizing that estimates of opportunity costs make sense only within a given institutional framework. For example, if all universities were suddenly closed the resulting flood of students onto the labour market would lower the wages of all young workers. Similarly, the sudden need to find alternative uses for teachers, buildings and equipment would disrupt the entire wage and price structure of the economy. The concept of opportunity cost and the technique of cost-benefit analysis are not, however, applicable to situations where a total change in the entire educational or economic structure is contemplated. It will be emphasized below that cost-benefit analysis is essentially a technique of marginal analysis. Similarly, the concept of the opportunity cost of an investment is meaningful only if the project does not, in itself, transform the alternative uses to which the resources could be put.

If the purpose of a cost-benefit analysis is to evaluate education as a form of investment for the individual, the relevant costs are those borne by the student or his/her family (private costs). If fees are charged these must be included together with expenditure on books and other direct costs such as travel. Once again, indirect costs must

also be included in the form of earnings foregone. If students receive scholarships from public funds to cover fees or maintenance costs, the average value of such scholarships must be subtracted from the total estimate of private costs.

Table 2.1 summarizes the elements of the total social and private costs of education.

Table 2.1 Social and private costs of education

Social costs	Private costs
<i>Direct</i>	
<ul style="list-style-type: none"> • Teachers' salaries • Other current expenditure on goods and services • Expenditure on books, etc. • Imputed rent 	<ul style="list-style-type: none"> • Fees, minus average value of scholarships • Books, etc.
<i>Indirect</i>	
<ul style="list-style-type: none"> • Earnings foregone 	<ul style="list-style-type: none"> • Earnings foregone

These cost elements can easily be combined to give an estimate of the annual cost per student of each level or type of education. If there were no wastage or repetition, this would be sufficient for a cost-benefit calculation. But where wastage rates are high, an entirely false impression would be given by a calculation based simply on annual costs and the normal length of a course. Indeed, whether we are considering education as a social or a private investment, allowance must be made for the fact that some students do not complete a course while others repeat parts of the course in order to gain a qualification. Ideally, separate cost-benefit calculations should be made for dropouts, repeaters and those who complete a course in the minimum time. For despite the implications of the word 'wastage', it is likely that even an uncompleted course may yield some economic benefits that must be compared with the costs of one or two years' education. In fact, most countries do not have data that permit measurement of the benefits associated with part of a course. As a result, the simplest solution is to calculate the average length of courses, allowing for dropouts and repeaters, and to use this as the basis for

the calculation of total costs rather than the minimum or ‘normal’ length of courses. This will give the total cost that must be borne by society in order to produce a qualified student, or the average cost to the individual after allowance for average rates of repetition and wastage.

Progress in analyzing opportunity costs

Some examples of cost-benefit analysis of education assume that earnings foregone by primary school pupils are very low, or even nil, as opportunities for employment (and therefore earnings) are very limited. However, the cost-benefit study of education in India described in subsequent chapters of this booklet pointed out that “the earnings foregone of even six-year-olds have some significance; certainly they help to explain the high drop-out rates in the early years of primary school” (Blaug, Layard and Woodhall, 1969: 199). More recently, increasing emphasis on the target of achieving Education for All (EFA) has led to renewed efforts to estimate and analyze the opportunity cost of pupils’ time and its effects on primary school participation rates, particularly in the case of girls, who represent well over half of all out-of-school children (UNESCO, 2002). Studies such as Colclough with Lewin (1993) and Colclough, Al-Samarrai, Rose and Tembon (2003) confirm that the opportunity costs of school attendance are a significant barrier to primary school participation for many families, particularly the poorest households, as the value of earnings or domestic labour foregone is often much higher than the direct costs of schooling.

Recent studies of the opportunity costs of attending primary school in several African countries (reported in Colclough *et al.*, 2003) estimate the monetary value of children’s time not only in terms of foregone earnings, for example in petty trade, but also the loss of other forms of family income such as unpaid agricultural work and domestic labour, including domestic chores and child care. When all these are taken into account the opportunity cost of attending school is substantial and often higher for girls than boys, as the former are expected to spend time looking after younger children. Analysis of opportunity costs therefore helps to explain phenomena such as the gender gap in primary schooling and high rates of drop-out as well as being an essential part of cost-benefit analysis.

III. Measurement of benefits

Earnings as a measure of direct benefits

To evaluate education as an investment we need a measure of education's expected contribution to future levels of income or output. The obvious way in which education contributes to future income is by imparting skills and knowledge to educated manpower, thus improving the productivity of labour. If the productivity of educated workers is higher than that of the uneducated, this will be reflected in increased output and in higher earnings for the educated. We therefore need an estimate of the additional lifetime earnings of educated workers. Ideally, these data should be collected by comparing the earnings of educated and uneducated workers over their whole working lives. The total lifetime earnings differential would then provide an estimate of the higher productivity of the educated.

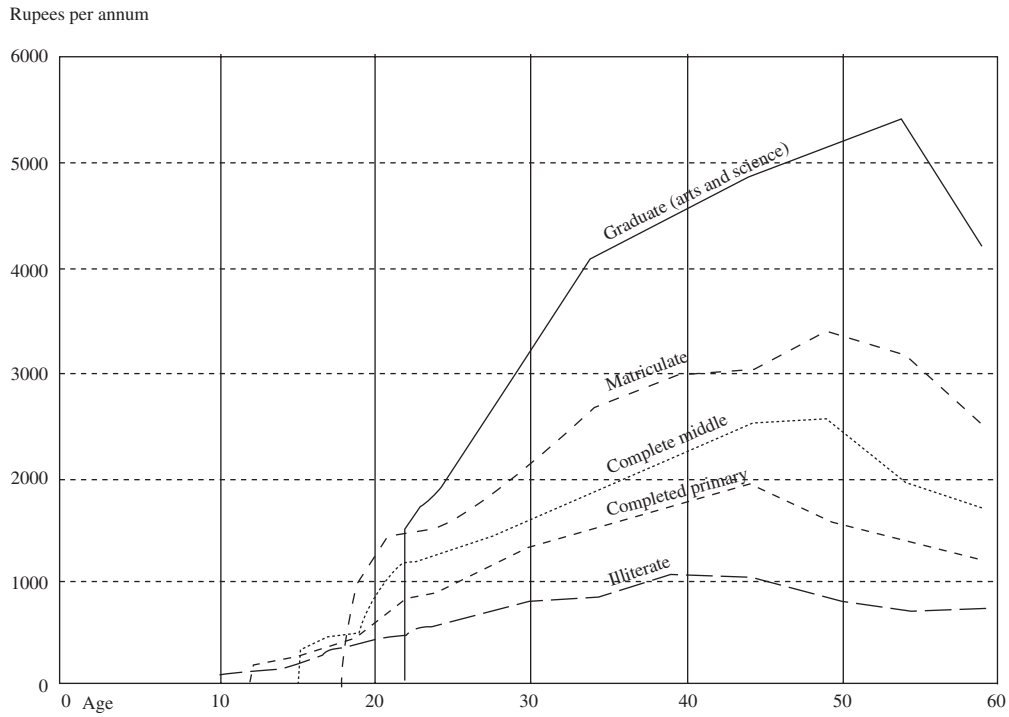
Unfortunately, few countries have time-series data on the earnings of samples of educated and less educated workers and the collection of such data would be difficult and time-consuming. The standard way of measuring benefits is therefore to use cross-section data to estimate average age-education-earnings profiles for workers with different levels of education. This means that instead of using data for a sample of workers collected over their whole working lives we use data for a sample of workers of different ages, collected at a single time. Whereas genuine time-series data would show the earnings of a sample of workers in each successive year and thus an age-earnings profile for the whole of a working life, the cross-section data show the current earnings of workers of successive ages and thus an average lifetime age-earnings profile. The assumption underlying this technique is that in the future the earnings of a worker at age 30 will bear the same relation to his earnings at age 20 as the relationship now observed between the current earnings of a 30-year-old and a 20-year-old worker.

Figure 3.1 shows the average age-earnings profiles of five groups of educated workers in India in 1960-1961. Such age-earnings profiles have now been constructed, on the basis of cross-section data, for nearly 100 developed and developing countries.³ This experience shows that typical age-earnings profiles have the following characteristics: (a) Earnings are highly correlated with education; at every age the highly educated earn more than workers with less education; (b) earnings increase with age up to a peak at middle age and then flatten, or even decline, up to the age of retirement; (c) The profiles of highly educated workers are steeper than those of the less educated; The peak earnings of an educated worker are higher, in relation to initial earnings, than the peak earnings of the less educated; (d) The age at which earnings reach their peak is later for highly educated than for less-educated workers; in a few cases the earnings of highly qualified manpower continue to rise until retirement.

If age-earnings profiles are available for two categories of workers, for example graduates and workers with no higher education, these can be used to calculate the lifetime earnings differential of the average graduate (in some recent studies, this is called the 'graduate premium'); that is, the total additional income received by a graduate throughout his/her working life. It is this lifetime earnings differential that is used as a measure of the direct economic benefit of education for cost-benefit calculations.

3. George Psacharopoulos, who first summarized the results of cost-benefit studies for 32 countries in 1973, has published regular 'updates' (including Psacharopoulos, 1985 and 1994). The most recent (Psacharopoulos and Patrinos, 2002) covers 98 countries. These summaries are discussed below in *Chapters IX* and *X*.

Figure 3.1 Age-earnings profiles: by level of education, urban India



Source: Blaug *et al.*, 1969: Figure 1.4.

If the purpose is to analyze education as a social benefit, the whole of this differential, measured before income tax, is the relevant measure. If, on the other hand, we wish to assess education as a form of private investment for the individual, then it is the benefit actually enjoyed by the individual that is relevant, namely the post-tax differential.

This brief summary of the now standard way of measuring the direct benefits of education using lifetime earnings as a proxy measure leaves many questions about the validity of the approach unanswered. Many of the objections that have been made to cost-benefit analysis of education centre on the measurement of benefits, and these will be examined in some detail in *Chapter VI*. First, however, the following sections consider problems of (a) how to measure the direct benefits of education projects where earnings are not an appropriate measure; and (b) how to measure the indirect benefits of education, which some researchers believe outweigh the direct benefits.

Other measures of direct benefits

When cost-benefit analysis is used to judge the profitability of investment in education as a sector, in comparison with other forms of investment or to compare different levels or types of education as a form of investment in human capital, the additional lifetime earnings of educated people provide a monetary measure of the direct private returns to individuals and a proxy measure of their extra productivity as a measure of the social returns. This approach may also be used to assess the profitability of a proposed education project such as building a vocational school, where the objective is to increase the supply of highly trained workers. If the project objective is to improve the quality of education but the outcome cannot be measured in monetary terms, cost-effectiveness analysis may be more appropriate, as explained in *Chapter I*. There are some education projects where it is possible to use cost-benefit analysis to assess profitability but where earnings are not a suitable measure of direct benefits. An example might be a proposal to restructure schools or universities and merge two institutions on the grounds that this will increase internal efficiency and reduce unit costs through economies of scale. In this case, future savings in

recurrent expenditure would provide a monetary measure of direct benefits that could be compared with the costs of the merger, such as the capital costs of building a new school to replace several smaller units. Examples of this type of cost-benefit analysis are discussed in *Chapter X*.

Indirect benefits and externalities

The measures described in this chapter relate only to the direct economic benefits of investment in education. It was argued in *Chapter I* that education also has indirect and non-economic benefits, including social and cultural benefits. There are non-economic benefits to the individual, for example personal enjoyment of education, known collectively as the consumption value of education, to distinguish it from the investment aspects. There are also non-economic public benefits, which are usually termed external benefits, externalities or 'spillover' benefits (as they spill over to other members of society, apart from the educated themselves). Many of the earliest examples of cost-benefit analysis referred briefly to these indirect benefits but left them out of their calculations on the grounds that they could not be measured. This was one of the main objections to cost-benefit analysis put forward by critics in the 1960s and is examined below in *Chapter VI*. Recently, however, there has been renewed interest in the indirect benefits of education, including non-economic benefits and externalities, and techniques have been developed to estimate the monetary value of indirect benefits of education such as better health, reduced fertility rates among females with primary schooling and higher educational achievement among the children of educated mothers. In some cases, researchers simply identified such indirect benefits or calculated correlations between level of education and health indicators or size of family to demonstrate the indirect benefits of education in terms of health or fertility. Recent research goes further and attempts to measure indirect social benefits in monetary terms, for example by using the cost of 'purchasing' such benefits by alternative means (OECD, 2001: 33). McMahon (1999, summarized in OECD, 2000) used data from 78 countries to identify, and in some cases measure, indirect social benefits, including not only the effects on health and fertility mentioned above but also on democratization,

political stability and human rights, improved civic participation and social cohesion, poverty reduction, lower levels of crime and improved environmental quality. Although techniques for measuring such benefits are still being developed, researchers such as McMahon (1999) and Haveman and Wolfe (1984) argue that indirect benefits are large – possibly even larger than the direct labour market effects on employment and earnings.

IV. Measurement of a discounted cash flow

Age-earnings profiles give an estimate of the annual earnings differentials associated with education. A cost-benefit calculation requires these earnings differentials to be combined into a single figure representing the total monetary benefit to be derived from education, so that this can be compared with its cost. The simplest method would appear to be to add together each year's additional earning power, however this would make no economic sense as the costs of an investment must be incurred in the present in order to obtain income in the future and the expectation of receiving money in the future is worth less in the present than a corresponding amount actually received in the present. This is not simply a case of 'a bird in the hand is worth two in the bush' but rather reflects the fact that a sum of money received today can be invested at a positive rate of interest so that it will increase steadily and in time be worth very much more than its present value. The rate of increase depends, of course, on the rate of interest at which it is invested. A sum invested at 10 per cent will double itself in just over seven years whereas the same sum invested at 5 per cent will double itself in about 15 years. Thus, if funds can be invested at 10 per cent the promise of a dollar in seven years' time is worth only half as much as a dollar today and the promised sum must, therefore, be discounted. Just as the increase depends upon the rate of interest at which money is invested, so does the present value of a sum of money to be received in the future. The higher the rate of interest, or discount, the lower is the present value of money expected at a future date; and similarly the further ahead the promised date, the lower the present value. This is illustrated in *Table 4.1*, which shows how quickly one United States dollar (US\$) will grow if invested at 10 per cent compound interest as well as the present value of US\$1 expected in the future if the discount rate is 10 per cent.

Table 4.1 Compound growth and present values at 10 per cent rate of interest

Year	Amount to which US\$1 invested will grow at end of each year	Amount which US\$1 promised at end of each year is worth today
1	1.100	0.909
2	1.210	0.826
3	1.331	0.751
4	1.464	0.683
5	1.611	0.621
6	1.772	0.564
7	1.949	0.513
8	2.144	0.466
Etc.		

Table 4.1 can be generalized as follows:

1. A sum of money (A), invested at a positive rate of compound interest (r) for n years, will grow to $A(1 + r)^n$ by the end of the period. Thus US\$1 invested for 4 years at 10 per cent grows to $US\$1(1+0.10)^4 = 1.464$.
2. The present value of a sum of money (A), expected at the end of n years, when the discount rate is r , is $A/(1 + r)^n$. Thus, US\$1 expected at the end of 4 years at a discount rate of 10 per cent is now worth $US\$1 / (1 + 0.10)^4 = 0.683$.

All cost-benefit calculations involve the discounting of future flows of income, as the purpose of the calculation is to compare the present value of expected future benefits with the costs of the investment, which must be incurred in the present. If the costs of the project are spread over a period of years, these must also be discounted, so that all money values, whether negative (costs) or positive (benefits), are expressed in terms of their present value. The technique of measuring future streams of income in terms of its present value is called the

‘discounted cash flow’ technique and is a common feature of all kinds of investment appraisal. The technique is simple and involves no more than calculation of the present value at some given or assumed rate of interest of the income expected in each future year. The present value of the entire lifetime income stream is then given by the expression:

$$\sum_{t=1}^n \frac{E_t}{(1+r)^t}$$

where n is the life of the investment project, E is the expected income from the investment, r is the rate of interest and \sum denotes the sum of annual benefits from year 1 to year n . The calculation of discounted present values consists of multiplying successive values of E by a discount rate. This is now usually done by a simple computer programme but can be computed manually using tables showing the value of $(1+r)^t$ (compound interest) and its reciprocal: $1/(1+r)^t$ (discount rate) for any value of r and t .

V. Rate of return on investment in education

Once the costs and expected benefits of an investment project have been measured and discounted at an appropriate rate of interest, the essential elements of a cost-benefit analysis are available. All that is now needed is a simple means of summarizing the information so that the costs and benefits of alternative investments can be compared. There are three basic ways of presenting this information in a convenient form: first by means of a benefit-cost ratio; second by calculation of the present net value of the project; and third by calculating the internal rate of return of the investment. As the name implies, a benefit-cost ratio 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 rate of return of any investment project is simply the rate of interest that equates the discounted present value of expected benefits and the present value of the costs of the project. In terms of the symbols used in the previous section, the rate of return is the rate of interest at which the present value of expected benefits:

$$\sum_{t=1}^n \frac{E_t}{(1+r)^t}$$

and the present value of costs:

$$\sum_{t=1}^n \frac{C_t}{(1+r)^t}$$

are equal, or in other words the rate of interest at which the difference between discounted benefits and costs is zero. That is:

$$\sum_{t=1}^n \frac{E_t - C_t}{(1+r)^t} = 0$$

All three forms of cost-benefit analysis share the basic characteristics of measurement and discounting of costs and benefits as well as the presentation of this information in a single summary statistic. The main difference between them is that benefit-cost ratios and present net value calculations depend upon an assumed rate of interest whereas the rate of return on an investment is independent of any assumptions about interest rates and simply shows the rate of interest that equates costs and benefits. If a private firm wishes to assess the yield of an investment it is a simple matter to use the firm's own borrowing rate as the discount rate for cost-benefit calculations: The most profitable investment is then the project which has the highest benefit-cost ratio or present net value at the rate of interest which the firm must pay to obtain credit. Unfortunately, when we come to assess the yield of investment in education it is less obvious what rate of interest is appropriate. The relevant concept to compare with the yield of investment in education is the average alternative yield on public or private investment. Is this 10 per cent or 20 per cent? This remains a matter of controversy and the answer is likely to be different in different countries and at different times.

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 interest is not built into the calculation as it is in the case of benefit-cost ratios. It is possible to draw some conclusions from a cost-benefit analysis that show that the social rate of return to university education is 8 per cent whereas the rate of return to primary schooling is 15 per cent, even if there is still uncertainty about the rate of return to alternative forms of social investment. For this reason, most examples of cost-benefit analysis of education use the rate of return and the remainder of this booklet will concentrate on this particular type of cost-benefit analysis.

To sum up the arguments so far: Cost-benefit analysis of education usually consists of an attempt to measure the social or private rate of return to investment in particular types or levels of education. The social rate of return measures the relationship between the before-tax lifetime earnings differential associated with a particular type of education and the total social cost of that education measured in terms

of its opportunity cost. This rate of return can be compared with the rate of return on other types or levels of education or with alternative forms of social investment to provide a measure of the economic profitability of educational expenditure by the state. Similarly, the private rate of return, which measures the relationship between after-tax earnings differentials and those costs that are borne by the individual, provides a means of assessing education as a form of private investment. Once again, it is possible either to compare the rates of return to alternative types of education or to compare education with other forms of private investment such as the purchase of equity shares.

This bald summary will undoubtedly raise many questions in readers' minds about the validity of such a measure of the benefits of education, the extent to which earnings differentials really are the result of education and finally whether governments or individuals really do, or should, make educational decisions on the strength of assessments of economic profitability. The next chapter will examine some of the objections that have been made to cost-benefit analysis of education, particularly to attempts to measure rates of return.

VI. Objections to cost-benefit analysis of education

Early critics: the 1960s

Economists and educationists in the 1960s raised a number of theoretical and practical objections to cost-benefit analysis of education, particularly in developing countries (Vaizey, 1962; Merrett, 1966). These objections can be very briefly summarized as follows.

1. Earnings differentials reflect differences in the natural ability, motivation, social background, sex, occupation, non-formal education etc. of workers as well as differences of education, so that earnings differentials cannot be used as a measure of the pure benefits of education.
2. Education does not make workers more productive but simply acts as a 'filter' or 'screening device' that enables employers to identify those with superior natural ability. Earnings differentials therefore reflect this screening or certification function of education and employers tend to demand higher and higher educational qualifications, which leads to a waste of resources.
3. In addition, earnings differentials do not adequately measure differences in the productivity of workers due to imperfections in the labour market, so that differences in earnings do not provide a measure of the direct economic benefits of education.
4. Besides these direct benefits, education generates indirect or 'spillover' benefits, that is to say education may raise the productivity of people other than the educated worker him- or herself and these benefits are not shown up in earnings differentials. Nor are non-economic benefits reflected in earnings differentials.
5. Rate-of-return calculations assume full employment of educated workers whereas many developing countries are experiencing unemployment of graduates and secondary school leavers.
6. Age-earnings profiles drawn from cross-section data that provide the oasis for rate-of-return calculations reflect present and past demand-and-supply conditions, whereas it is future demand and

supply that concern the planner. Thus, rates of return provide a poor tool for educational planning.

7. Private rates of return are meaningless as individuals do not make educational choices as though they were making a purely financial investment decision.

This appears to be a formidable list of objections, on the basis of which some writers have attacked and rejected the whole concept of cost-benefit analysis of education. The purpose of this chapter is to take each objection in turn, see whether it is valid and whether it suggests that the whole concept of cost-benefit analysis of education should be abandoned or whether, less drastically, it suggests ways in which cost-benefit analysis must be modified in order to take account of specific problems.

Interrelationship between ability and education

Some of the earliest examples of cost-benefit analysis of education simply used the whole of the extra earnings of educated workers as a measure of the benefits of education. However, this is unrealistic and certainly open to challenge. The fact that higher earnings are associated with education does not mean that the whole of the earnings differential of educated workers is *attributable* to their education. Such workers are likely to be of superior ability and social background, to have different types of jobs and to have received more on-the-job training than less educated workers so that it would over-emphasize the benefits of education to attribute all the extra earnings to formal education. Education tends to be highly correlated with a number of other factors, all of which help to determine earnings. However, progress has been made towards isolating the pure effect of education on earnings and research in several countries, including the USA, suggests that even when some of these other factors are held constant, education alone has a strong effect on workers' earnings.

In the USA, a large-scale multivariate analysis of a sample of workers attempted to measure the individual and combined effect of some of the factors that determine relative earnings, for example sex, race, occupation, urban or rural situation, rank and performance in

school and education (Morgan, David, Cohen and Brazer, 1962). The conclusion was that length of education was the single most powerful factor in explaining differences in earnings. However, this study did not entirely distinguish education and ability, which are very highly correlated, nor did it fully allow for the fact that length of education is itself correlated with personal characteristics such as persistence or strong motivation. Other American studies threw some light on the question of the influence of ability. Becker (1964) reported a study of a sample of high school and university graduates who had been given intelligence tests at school that showed that even when intelligence quotient (IQ) scores were held constant, there was a strong relationship between length of education and earnings. Another interesting study reported by Becker confined itself to a sample of brothers with different levels of education that showed that brothers with more education had correspondingly higher earnings.

More recently this line of research has gone further in the USA, with studies of samples of identical twins that confirm earlier findings of a strong relationship between education and earnings when family background and innate ability are constant (Ashenfelter and Rouse, 1998, reported in OECD, 2000: 51).

Similar evidence that education has an effect on earnings even when differences in social class origins or ‘ability’ (defined in terms of scores in intelligence tests) are taken into account exists for other countries (Psacharopoulos, 1975, reviews research in this area). A plausible explanation is that while ability and home background are important, it is only in conjunction with additional education that they have a strong influence on earning power. On the other hand, these studies also demonstrate clearly that other factors such as ability, family background or simply motivation do have some effect on earnings that is distinct from the effect of education.

Thus, the question is not “Does education have an effect on earnings?”, but rather “How much of the observed earnings differentials of educated workers is actually the result of their education?” The American studies mentioned above suggest that roughly two thirds of earnings differentials of educated workers can be explained by their education rather than by other factors such as

ability. As a result, many rate-of-return calculations have taken two thirds of observed earnings differentials as a measure of benefits, simply by multiplying each differential by a coefficient of 0.66 (this has been called by some writers the ‘ability adjustment’ or ‘alpha-coefficient’).

The actual value of the alpha-coefficient is still a matter for debate. An estimate of 0.7 or 0.8 may be reasonable for the USA but it has been suggested that the effects of natural ability may be stronger at some ages or for some categories of educated workers than others, so that different values should be attached to the alpha-coefficient for different calculations. Others suggest that the effect of the alpha-coefficient and additional factors such as differences in educational quality that are often under-reported probably cancel each other out, so that some recent calculations of rates of return have abandoned the alpha-coefficient as an adjustment to earnings.

A greater problem is posed when measuring the benefits of education in developing countries. Apart from a few studies of earnings functions, there is very little evidence to clarify whether natural ability or social class exert a stronger or weaker influence on earnings in developing countries than in the United States. In these circumstances it seems best to make alternative assumptions about the proportion of earnings differentials which can be attributed to education and to calculate a range of values of the rate of return to education, corresponding to ‘strong’ or ‘weak’ assumptions about the influence of education on earnings. The desirability of calculating alternative estimates of the rate of return based on different assumptions of this sort will be further discussed in *Chapter VII*. For the moment, it is enough to emphasize that the fact that earnings are related to other factors besides education does not represent an insuperable problem for calculating rates of return.

Education as a filter or screening device

The fact that it is difficult to disentangle the effects of education and natural ability has given rise to the idea that education simply acts as a filter or screening device for the labour market, which means

that the important thing for the student is not what he or she learns during the education process but whether or not he or she emerges with a certificate at the end of it. According to this theory (see, for example Arrow, 1973), the main purpose of education is not, as is usually assumed, to impart knowledge and skills but rather to provide certification of the natural abilities, aptitudes and attitudes of students, which employers then use in selecting workers for highly-paid jobs.

The unfortunate result of this process of credentialism, according to the critics, is that it leads to a 'qualifications spiral' in which employers are constantly upgrading the qualifications that they demand for the most highly paid jobs simply in order to preserve the screening function of educational qualifications, and at the same time students are seeking higher qualifications simply in order to stay ahead in the race for these top jobs. The final result is simply a waste of scarce resources, as education is costly.

There is a certain element of truth in this over-simplified picture and it is probable that what Dore (1976, 2nd edition 1997) calls the 'diploma disease' does lead to unproductive use of resources in some developing countries. However the fact that some employers use educational qualifications to help them to identify certain abilities and attitudes does not mean that education has no other function than to act as a screening device. Economists in several OECD countries have tested what one called a 'strong' and a 'weak' version of the screening hypothesis and found very little evidence to support the strong version, which implies an unnecessarily limited and narrow view of education.

The value of the 'screening hypothesis', as it is often called, is that it reminds us that we need to know more about the ways in which education makes workers more productive. In particular, it emphasizes that education affects attitudes as well as imparting knowledge and that it develops latent abilities as well as creating new skills. It is useful to be reminded of these facts, however none of them need be inconsistent with the idea that education is a form of investment in human capital. In fact, a recent OECD study calls for a broader notion of human capital, including attributes as well as knowledge, skills and competencies (OECD, 2001: 18).

Relationship between earnings and productivity

One of the basic assumptions of all cost-benefit analysis is that relative earnings reflect the relative productivity of workers. Some economists deny this. They point to rigidities in the labour market, the strength of habit and tradition in determining wage rates, the power of trade unions or the importance of administered wages in the public sector that sometimes result in the persistence of archaic salary structures, particularly in developing countries, and argue that the pattern of earnings in an economy tells us nothing about the relative contributions of different workers to total output. This seems a rather exaggerated point of view. It would be absurd to deny that such factors do have some distorting effect on relative wages, that trade union bargaining power may artificially inflate wages in some sectors or that wages today may reflect the market conditions of the past. An obvious example is the fact that in some developing countries civil service salary scales still reflect the salaries that were paid to colonial administrators before the country achieved independence. A few private firms may practise ‘conspicuous consumption’ of graduates, employing them for prestige purposes while paying them more than their true economic value. Such factors would mean that earnings differentials overestimate the true social benefits of education. On the other hand, some workers with particularly scarce and valuable skills may be paid less than their real social value. All of this means that estimates of social rates of return must be interpreted with care. However, to argue that because of these distortions relative wages must be rejected completely as a measure of relative demand for different skills is too strong an assertion; it would involve, among other things, a total rejection of the price system throughout the economy.

It is not necessary to go so far. The central assumption of cost-benefit analysis is that the wage-and-price structure *reflects* the balance between supply and demand for different skills, even though it is an imperfect measure. If it is believed that there are serious distortions in the labour market and certain categories of workers are paid significantly more or less than their real economic value – what economists call their ‘marginal productivity’ – then it may be possible

to construct 'shadow' prices or wages which more nearly reflect the real productivity of workers and use these as a basis for cost-benefit calculations. There were a few attempts in the 1970s to estimate rates of return using shadow prices, however this approach has rather fallen out of favour. Instead, many rate-of-return calculations make certain adjustments to earnings (discussed in *Chapter VII*).

However, a simpler solution to this problem of estimating the 'true' rate of return to education, where it is believed that wage rates do not adequately reflect relative productivity, is to calculate alternative rates of return based on different assumptions about marginal productivity and relative wages. Such analysis can demonstrate the effects of alternative wage structures on rates of return.

Another approach adopted in cost-benefit studies is to measure benefits in terms of differences in physical output rather than earnings. Several World Bank studies compared the agricultural productivity of farmers with different levels of education and found that farmers with four years' primary schooling had significantly higher crop yields than farmers who had never been to school (Psacharopoulos and Woodhall, 1985: 46-49).

To sum up, there is now widespread although not unanimous agreement that although earnings do not perfectly measure productivity, there is plenty of evidence that education does increase workers' productivity, both in OECD and in developing countries.

'Spillover' benefits of education

Chapter III above pointed out that age-earnings profiles, which form the basis for rate-of-return calculations, do not reflect the indirect or 'spillover' benefits of education, which economists call 'externalities'. Nor do they include the non-monetary 'consumption' benefits of education. Some writers have rejected cost-benefit analysis on these grounds. The fact that education is valued for its own sake and that people may demand education as a form of consumption is no justification for ignoring or denying that education also adds to future income and is a form of investment. Cost-benefit analysis concentrates

upon the investment aspects of education and upon the measurable economic benefits of education, however it is increasingly recognized that education generates other benefits as well. The question of how much weight should be attached to these other benefits is partly a matter of public policy and partly a matter of fact. It is a matter of policy whether educational planning should give more weight to economic growth than to other objectives and, in the face of the multiplicity of educational objectives, cost-benefit analysis simply tries to provide an analysis of the economic impact of education. This cannot be the sole criterion for educational planning, but the ‘investment approach to educational planning’ rests on the belief that such an analysis should be an important element in decision-making.

The question of whether the indirect economic benefits of education outweigh the direct monetary benefits is on the other hand a matter of fact, even though techniques for measuring indirect benefits are still not fully developed. Several writers in the 1960s pointed out that education does yield indirect benefits. For example, workers with little education may find their own productivity increased by working in a team with highly educated workers; the education of one generation is likely to influence the achievements and productivity of the next generation and the education of women has a significant effect on fertility and health. Unfortunately, it is easier to specify such benefits than to measure them, although in principle they are measurable. Little progress was made in the 1960s and 1970s in identifying and measuring externalities or spillover benefits, particularly in developing countries. Recently, however, there has been renewed interest in measuring indirect benefits, spillovers and externalities. *Chapter III* above described the efforts of researchers such as Haveman and Wolfe (1984) and McMahon (1999) to measure externalities and reported their conclusion that indirect benefits are substantial and possibly even larger than direct benefits. Others have taken up this theme. For example, the joint UNESCO/World Bank Task Force on Higher Education and Society argued that rate-of-return analysis “entirely misses the impact of university-based research on the economy – a far-reaching social benefit that is at the heart of any argument for developing higher education systems” (Task Force, 2000: 39).

As a result of the new wave of research on indirect benefits, there is now general agreement that social rates of return calculated from earnings data represent underestimates of the total returns to education. This is important if we wish to compare the yield of education with other forms of social investment, although even here it is helpful to have first an estimate of the direct economic benefits of, for example, education compared with health expenditures. However if the purpose of cost-benefit analysis is to compare the profitability of two forms of education, the problem is less important. For while it is generally accepted that education generates external benefits, it is less obvious that, for example, higher education yields more indirect benefits than primary schooling. Thus, for the purpose of comparing the returns to different levels or types of education, the fact that rates of return present underestimates does not necessarily introduce a large bias. Research is still continuing on identifying and measuring externalities and indirect benefits. This is a welcome development that has already increased our understanding of the benefits of education.

Effect of unemployment on rates of return

Cost-benefit analysis of education in advanced countries generally ignores the problem of unemployment or non-participation among educated workers. However in developing countries where educated unemployment may be a serious problem and labour force participation rates low, estimates of the social rate of return must take account of possible unemployment of the educated. It is perfectly possible to make such an adjustment when measuring social rates of return. The simplest way to do so is to measure benefits in terms of earnings adjusted for differences in the rates of employment and labour force participation of workers with different levels of education. If such data are unavailable, some estimate must be made of the average rates of employment for workers of different ages in each educational category, so that the benefits of education can be measured in terms of earnings weighted by the probability of employment for educated workers. An example of such a calculation for India will be given in the following chapter.

Relationship between the past, the present and the future

Objections to cost-benefit analysis on the grounds that present rates of return reflect past investment policies and thus provide a poor guide for the future must be examined at two levels. First, there is the problem that the rate of return measures the profitability of *past* levels of investment in terms of the *present* relationship between supply and demand. The rate of return, as calculated, will serve as an estimate of *future* profitability only if the present relationship between supply and demand is maintained. Cost-benefit analysis is a form of marginal analysis and the rates of return that we have discussed are marginal rates of return that measure the effects of a small increase in investment in education. This means that the rate of return to investment in education, calculated from current data on earnings, will not provide a good estimate of the profitability of a large-scale expansion of education designed to fundamentally change the balance between supply and demand for educated manpower. What cost-benefit analysis can do in these circumstances is to focus attention on the need to analyze the likely effects of large-scale expansion on relative earnings. In other words, if educational planners are contemplating non-marginal changes in the education system, they must not assume that present rates of return will continue in the future but try to predict the future pattern of earnings differentials in light of a massive increase in supply. Due to this difficulty, some opponents of cost-benefit analysis deny that rates of return serve any useful purpose for forward planning. However, any attempt to predict the future is likely to be improved by a thorough understanding of the present and estimates of social and private rates of return can, therefore, be useful in providing information about the present balance between supply and demand. This information will be even more valuable if it is based on estimates of trends in rates of return over time. Evidence of trends in rates of return over time is still fairly limited, however Psacharopoulos (1981, 1989) compared time-series estimates of rates of return in a number of countries and concluded that in general there had been a slight decline over time but that the decline was not sufficient to suggest that education was over-expanded. Some economists have argued that countries such as the USA or the UK may experience 'over-education' and that rates of

return will decline in the future, but to date evidence (discussed further in *Chapters IX* and *X*) seems to suggest that in many countries the increased demand for skills has kept pace with the increasing supply of educated workers, so that declines in rates of return over time have been modest.

There remains the problem that age-earnings profiles based on cross-section data underestimate the earnings of workers in the future, as the workers will be employed in a developing economy with rising levels of real income. This means that if no allowance is made for future growth of income, estimates of the rate of return will underestimate the financial returns from education in the future. As a result, some writers have made an adjustment to rates of return calculated from cross-section data, corresponding to the assumed growth of real earnings in the future. Even so, this adjustment may underestimate the growth of earnings in the distant future, which would mean that the rate of return would be biased downwards. Fortunately this is not a source of serious bias as the process of discounting gives much less weight to future earnings than to earnings in the next few years. Therefore, rate-of-return calculations are less sensitive to inaccuracies in the measurement of benefits in the distant future than to inaccuracies in the early years of a young person's working life.

The meaning of the private rate of return

Most of the objections that have been discussed so far relate to estimates of the social rate of return. A quite different objection is sometimes made to calculations of the private rate of return to education. It is argued that students choose education for a variety of reasons that may be more than merely vocational and financial, and to assume that students or their families make calculations of the private rate of return is to ascribe too great an influence to economic and financial factors. This objection misses the point of cost-benefit analysis. Estimates of the private rate of return are intended to measure how profitable it is for the individual to spend money on his or her own education as a way of increasing his or her future earning power: They do not assume that this is the sole motivation for all educational decisions. Nevertheless, in developing and developed countries alike students and their families are usually well aware of the vocational

advantages of higher education and the desire for a better job and higher lifetime income is frequently an important factor influencing educational choices. When students make their decisions it is on the basis of fairly rough estimates of likely benefits compared with costs. Calculations of the private rate of return show more accurately and in greater detail what the balance is between financial loss in the present and financial gain in the future. Thus, estimates of the private rate of return may throw light on trends in private demand for certain types of education or trends in the emigration of educated workers, even though the hypothesis that students choose education for investment purposes does not provide a complete explanation of student motivation. *Chapters IX and X* give several examples of the way in which private rates of return have been used to analyze private demand for different types of education and to investigate gender differences in participation in terms of private costs and benefits.

More recent critics: the 1980s and 1990s

So far, this chapter has examined the objections to cost-benefit analysis that were first voiced by critics in the 1960s and 1970s. During the 1980s there were many new studies of rates of return and researchers continued to debate theoretical, practical and policy issues and to seek empirical evidence on topics such as the effects of ability, family background and other factors on subsequent earnings of educated workers, the screening hypothesis, the link between education and productivity and the magnitude of indirect benefits and externalities. Such issues continued as matters of controversy and subjects of research throughout the 1990s, but at the same time new criticisms of cost-benefit analysis were made and arguments between critics and advocates of the approach continue to this day. To bring the argument up to date, this section briefly summarizes some of the main criticisms that appeared in the 1980s and 1990s, while the following section considers the responses made by researchers and practitioners to their critics.

Several critics in the 1980s argued that conventional rates of return emphasized quantity of education, for example years of schooling, at the expense of quality and argued that ‘deepening’

schooling by increasing quality has a higher social rate of return than ‘broadening’ schooling by increasing quantity (Behrman and Birdsall, 1983). It is much more difficult to measure quality than quantity, however, and doing so may require cost-effectiveness rather than cost-benefit analysis, as discussed in *Chapter I*. There were also frequent criticisms of the data used to calculate rates of return. Not only did most studies use cross-section data – often badly out of date by the time the results appeared – but many relied on earnings data from small and unrepresentative samples and were often confined to formal sector employment in urban areas, neglecting the labour market situation in the informal sector and in rural areas.

Strong attacks on rate-of-return analysis were made by Bennell (1995, 1996 and 1998), who singled out for criticism the ‘updated’ review of rates of return published by Psacharopoulos in 1994 and the use – or, as Bennell termed it, the abuse – of rates of return on education investment by the World Bank. His criticisms fall into three groups: (a) technical and methodological weaknesses in many rate-of-return studies including poor data, unreliable samples and bias in measuring both costs and benefits; (b) incomplete coverage and inaccurate reporting of results, which lead to important caveats being ignored; and (c) non-comparability of studies undertaken by different researchers or in different countries, both resulting in unreliable aggregation and averaging of rates of return for sub-sectors such as primary education and making global comparisons unreliable, particularly for large groups of countries or whole continents such as Asia or sub-Saharan Africa. Many of Bennell’s criticisms focus on the way cost-benefit analysis has been interpreted and used by funding agencies, particularly the World Bank, as a guide to priorities and investment decisions. This is examined in more detail in *Chapter XI*.

Responses to the critics

Since cost-benefit analysis of education was first advocated and carried out on a large scale in the 1960s, there has been fierce argument and counter argument by critics and advocates of the approach. This chapter has summarized the main criticisms made over a period of 40 years. How have researchers and practitioners responded? Perhaps

the most obvious response is the continuation of research in this field. For example there have been many studies designed to test the 'screening hypothesis' first put forward in the 1970s. The conclusions of this research were discussed above in the section entitled *Education as a filter or screening device*. Another example is the recent surge of interest in identifying and measuring indirect and external benefits of education (discussed in *Chapter III*). The criticism that rates of return concentrate on quantity of education (for example years of schooling) rather than quality has stimulated efforts to combine cost-benefit and cost-effectiveness analysis by measuring effects of differences in students' performance in achievement tests on individual earnings and economic growth. Hanushek (2003) summarizes recent studies, admitting that most previous research concentrated on school attainment or quantity as it was easier to measure costs and benefits in this case, but "nonetheless, the policy issues today are ones of quality" (Hanushek, 2003: 1). We noted in *Chapter I* that most rate-of-return studies use years of schooling as a proxy for learning and knowledge acquired by students, even though, as Hanushek points out, "quantity of schooling is a very crude measure of the knowledge and cognitive skills of people – particularly in an international context" (Hanushek, 2003: 8). His review concludes that "measured achievement has a clear impact on earnings after allowing for differences in the quantity of schooling, the experiences of workers, and other factors that might also influence earnings" (p. 5) and secondly, there is evidence of "remarkable impact of differences in school quality on economic growth" (p. 8). Such research is still in its infancy, but a shift from concentration on quantity to exploration of quality issues is an example of how researchers are responding to earlier critics. The academic literature also contains many examples of 'replies' to their critics by individual researchers. For example, Psacharopoulos published a brief 'reply' to the criticisms of Bennell (1996) in which he acknowledged that many of the examples of rate-of-return analysis that he had summarized contained methodological flaws, but argued that "estimates of anything in a scientific profession will be subject to improvements and controversy. This is healthy" (Psacharopoulos 1996: 201).

This comment demonstrates the way in which many practitioners have responded to the critics of cost-benefit analysis by trying to make it more accurate and reliable, for example by improving data collection and analysis, adjusting raw earnings data to allow for the influence of other factors such as ability, measuring differences in quality of education and collecting time-series data to investigate trends in rates of return over time. Researchers and users of cost-benefit analysis have also tried to improve interpretation of rates of return and the way they are used to guide policy decisions, as discussed in *Chapters IX and XI*.

We have come to the end of the review of objections to cost-benefit analysis. We have seen that some of the objections can be met by making statistical adjustments when calculating rates of return; for example adjustments to allow for the proportion of earnings attributable to factors other than education, the possibility of unemployment among educated workers and future growth of earnings. The following chapter examines the practical problems of calculating rates of return, including that of obtaining the necessary data and methods for making the various necessary adjustments to rates of return.

However some of the problems we have mentioned cannot be solved simply by statistical adjustments. The final chapters of this booklet deal with the interpretation of rates of return in the light of the objections outlined above and illustrate the practical uses of cost-benefit analysis with some actual examples.

VII. Calculation of rates of return

Collecting earnings data and constructing age-earnings profiles

The first practical problem of calculating rates of return, particularly in developing countries, is one of data collection. The following list represents data requirements in ideal circumstances: (a) data on the earnings of a representative sample of workers classified by age, educational level completed or qualifications obtained including type of course as well as length of schooling, occupation, sex, social background, location of employment and some measure of natural ability such as scores in an intelligence test; (b) data on current expenditure of educational institutions, by level; (c) estimates of the capital value of educational buildings and equipment, by level; (d) estimates of private expenditure on fees, books, stationery etc., by level; (e) public expenditure on scholarships, by level; (f) average income tax rates; (g) data on labour market conditions, including rates of unemployment and labour force participation by age, sex and educational level.

These data, if available, could be used to construct age-earnings profiles before and after tax, which are needed for both the cost and the benefit side of the calculation and to provide estimates of the direct private and social costs of education. In practice, such detailed information is very rarely available but it is perfectly possible in most countries to obtain enough data to make rate-of-return calculations, even though certain gaps may have to be filled by making assumptions. The first essential step is a sample survey giving details of the earnings (or, failing that, the incomes) of workers classified by age and education. Some of the cost-benefit calculations in the USA and other OECD countries are based on census data but few countries include questions on incomes and education in the census. However, sample surveys showing the earnings of workers do exist in many countries and have

been used to construct age-earnings profiles and to calculate both social and private rates of return in many OECD and developing countries. The latest 'updated' summary and review prepared for the World Bank (Psacharopoulos and Patrinos, 2002) reported rate-of-return estimates for 98 countries. These calculations are often based on imperfect data but nevertheless can be useful in providing indications of the relative profitability of different levels of education.

Having dealt with the problem of data collection, we will now examine the successive stages of estimation and calculation needed for an estimate of social and private rates of return. Data on earnings by education and age provide average age-earnings profiles, which in turn provide estimates of the annual earnings differentials associated with education and earnings foregone during education. If we are calculating social rates of return, these pre-tax earnings differentials are sufficient to provide a measure of the benefits of education after adjustments have been made to allow for the effects of ability and other factors on earnings and unemployment. If we are measuring the private rate of return, it is also necessary to apply the prevailing income tax rates to discover after-tax earnings differentials. *Table 7.1* illustrates this calculation using data on the earnings of graduates and matriculates in urban India in 1960-1961. Although all the examples in this chapter date back 40 years, they are presented here as illustrations of the method of calculation and not as accurate estimates of earnings, costs or rates of return in India today.⁴

4. The examples in this chapter are drawn from Blaug *et al.*, 1969. Further details about the calculations are given in the book.

Table 7.1 Calculation of social and private returns to higher education in urban India, 1960-1961

Age	Average annual earnings of:		Pre-tax earnings differential of graduates	Post-tax* earnings differential of graduates
	Graduates (Rs. per annum)	Matriculates (Rs. per annum)		
18	-	495	-	-
19	-	998	-	-
20	-	1,174	-	-
21	-	1,403	-	-
22	1,480	1,453	27	27
23	1,691	1,456	235	235
24	1,765	1,483	282	282
25-29	2,923	1,959	964	964
50-54	5,405	3,109	2,296	2,246
55-59	4,214	2,492	1,722	1,698

Note: * Obtained by applying the standard rate of income tax payable by a married man with two children. Due to the low level of income tax levied in India, graduates and matriculates in the 18-30 age group do not, on average, pay tax, although they become liable to do so as their earnings increase with age.

Source: Blaug *et al.*, 1969: Table 7.1.

Table 7.1 also shows the earnings of matriculates aged 18 to 21 that represent the earnings foregone by students while they obtain a degree. These foregone earnings constitute one important element of both the social and private costs of higher education. In addition, data are needed on direct social and private costs.

Table 7.2 shows estimates of the direct social and private costs of higher education per student in India, derived from official statistics

and estimation. Section (a) of *Table 7.2* shows the annual costs of higher education. The minimum length of study for a degree is four years (two years to intermediate and two years for the degree). Section (b) shows the costs of higher education on the assumption that students require only the minimum time to obtain a degree. However, wastage and repetition rates are high in India and section (c) of the table takes account of the fact that on average it requires 6.9 years of teaching, rather than four years, to produce one graduate.

Table 7.2 Direct social and private costs of higher education per student, India 1960-1961 (Rs. per annum)

	Social costs, years		Private costs, years	
	1 and 2	3 and 4	1 and 2	3 and 4
(a) Annual cost:				
Current expenditure on teachers, etc.	302	494	-	-
Imputed rent	48	48	-	-
Expenditure on books	150	150	150	150
Fees minus average scholarship	-	-	106	227
(b) Total cost, excluding wastage	2,384		1,266	
(c) Total cost, including wastage	4,084		2,166	

Source: Derived from Blaug *et al.*, 1969: Tables 8.10 and 8.11.

Adjustments to earnings and cost data

The data shown in *Tables 7.1* and *7.2* are sufficient for calculations of the social and private rate of return after adjustments have been made for: (a) the proportion of earnings attributable to natural *ability*; (b) the probability of *unemployment*; (c) the expected *growth of incomes*. A fourth adjustment for wastage has already been incorporated into the estimates of cost shown in *Table 7.2*.

The ability adjustment consists simply in multiplying observed earnings differentials by a coefficient (the α coefficient) that corresponds to the proportion of earnings differentials attributable to

education. As there is no information for India which allows an accurate estimate of this proportion, the best solution is to carry out simple sensitivity analysis by calculating rates of return on alternative assumptions about the value of the α coefficient. Three values were chosen for this calculation: $\alpha = 1$ (no adjustment), $\alpha = 0.66$ and $\alpha = 0.50$. In other words, rates of return were calculated using the whole observed earnings differential as a measure of benefits as well as two thirds and half the observed differentials shown in *Table 7.1*.

Estimates of rates for India should also take into account the fact that, on average, matriculates have to wait for 1.4 years after matriculation in order to find their first job and graduates 0.5 years. These figures were derived from two labour surveys that showed the proportions of matriculates and graduates unemployed during each of the seven years after they obtained their qualification. The earnings shown in *Table 7.1* should be reduced to allow for the average period of unemployment and this adjustment must be made when measuring both earnings foregone on the cost side as well as earnings differentials on the benefit side.

Finally, some allowance must be made for expected future growth of incomes that will increase absolute earnings differentials, even if relative earnings remain constant. The simplest means of allowing for this factor is to add the expected annual rate of growth of incomes to the estimates of the rate of return. So, if for example a rate of return of 10 per cent is obtained from cross-section data on earnings, the addition of 2 per cent, which gives an estimated rate of return of 12 per cent, is equivalent to increasing all earnings during an entire working life by 2 per cent a year.

Other adjustments can be made to either costs or earnings if it is thought necessary. For example, some studies have adjusted earnings to allow for differential mortality rates, in a similar way to the unemployment adjustment. Others have increased the estimates of opportunity costs to take account of the value of unpaid domestic labour, which is not reflected in earnings foregone. Yet others have used unadjusted costs and earnings in the belief that the pluses and minuses will more or less cancel each other out.

Calculating social and private rates of return

The data shown in *Tables 7.1* and *7.2*, adjusted to allow for wastage, unemployment, the earnings attributable to factors other than education and future growth of incomes, can now be combined into one single figure: the social or private rate of return to a university degree. This consists of three steps: (a) the calculation of a net returns stream (benefits minus costs); (b) the calculation of the present value of these net returns at alternative discount rates (as described in *Chapter IV*); (c) identifying the discount rate at which the present value of the net returns is zero.

Table 7.3 illustrates this calculation of the social rate of return using, in order to simplify the presentation, the figures shown in *Tables 7.1* and *7.2* without any of the four adjustments.

The actual calculation of the rate of return involves nothing more than successive calculations of discounted net returns ($E_t - C_t$), using different discount rates for multiplication of $(E - C)$ until the discount rate is found at which the present value of net returns is zero. This can be done by trial and error, but there are now computer programmes available that do it very quickly. As the discount rate is changed, the value of the net returns stream changes from positive to negative; *Table 7.3* shows two discount rates: 10 per cent and 13 per cent. One is too high, the other too low. A process of trial and error or a computer programme would show that the rate of interest at which the present value of costs is exactly equal to the present value of benefits is 12.7 per cent. This represents the social rate of return to higher education in urban India in 1960, with no allowance for wastage, unemployment, etc. The cumulative effect of each of these adjustments is as follows: (a) the wastage adjustment lowers the rate of return to 8.8 per cent; (b) the unemployment adjustment increases this to 9.6 per cent (as unemployment rates are lower for graduates than for matriculates); (c) the ability adjustment depends on the chosen value of α . If $\alpha = 0.66$, the rate of return is 6.9 per cent and if $\alpha = 0.50$ it is 5.4 per cent; (d) the growth adjustment increases the rate of return to 8.9 per cent or 7.4 per cent (depending on the value of α).

Thus, as a result of these calculations showing the range of values, we are able to say that the social rate of return to a university degree in urban India in 1960 was between 7 and 13 per cent, depending on critical assumptions about the effects of ability, unemployment, wastage and growth on future earnings but with no allowance for externalities or spillover benefits.

Table 7.3 Calculation of the social rate of return to higher education in India

Value of t (age of worker shown in brackets)		Net returns ($E_t - C_t$) (Costs (C_t) = negative Benefits (E_t) = positive)	Discount rate $1/(1+r)^t$ $r=10\%$ $r=13\%$	
$t=1$	(18)	- 995 (- 495 - 500)	0.909	0.885
$t=2$	(19)	- 1,498 (- 998 - 500)	0.826	0.783
$t=3$	(20)	- 1,866 (- 1,174 - 692)	0.751	0.693
$t=4$	(21)	- 2,095 (- 1,403 - 692)	0.683	0.613
$t=5$	(22)	+27	0.621	0.543
$t=6$	(23)	+235	0.564	0.480
$t=7$	(24)	+282	0.513	0.425
$t=8.....12$	(25-29)	+964	0.466	0.376
.....				
$t=33.....37$	(50-54)	+2,296
$t=38.....42$	(55-59)	+1,722	etc.	etc.

At $r = 10$ per cent $\sum_{t=1}^{t=42} \frac{E_t - C_t}{(1+r)^t}$ is positive

At $r = 13$ per cent $\sum_{t=1}^{t=42} \frac{E_t - C_t}{(1+r)^t}$ is negative

At $r = 12.7$ per cent $\sum_{t=1}^{t=42} \frac{E_t - C_t}{(1+r)^t} = 0$

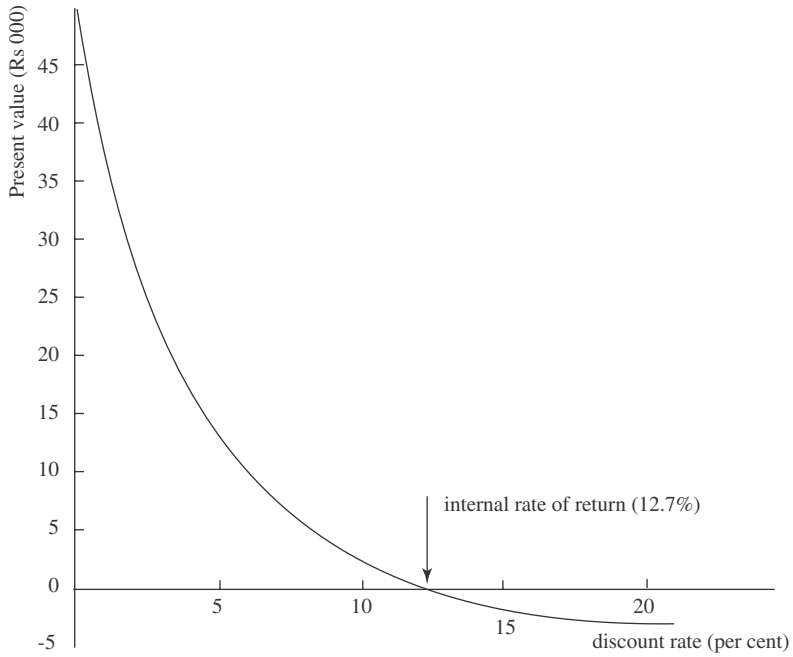
VIII. Alternative methods of calculating rates of return

The 'complete' method

If data are available for the calculation of age-earnings profiles the rate of return to different levels of education can be calculated, as described in the previous chapter, using either a computer programme or a simple calculator, discount tables and a process of trial and error by which alternative discount rates are used to calculate discounted net returns ($E_t - C_t$) until both the rate of interest is identified that makes discounted costs equal to discounted benefits and the present value of net returns is zero. This can be estimated graphically by plotting the present value of net returns on the vertical axis and alternative interest (discount) rates on the horizontal axis, as shown in *Figure 8.1*. The rate of return can be identified from this graph as the rate of interest (discount) at which the value of discounted net returns is zero and the curve crosses the horizontal axis (approximately 12.7 per cent).

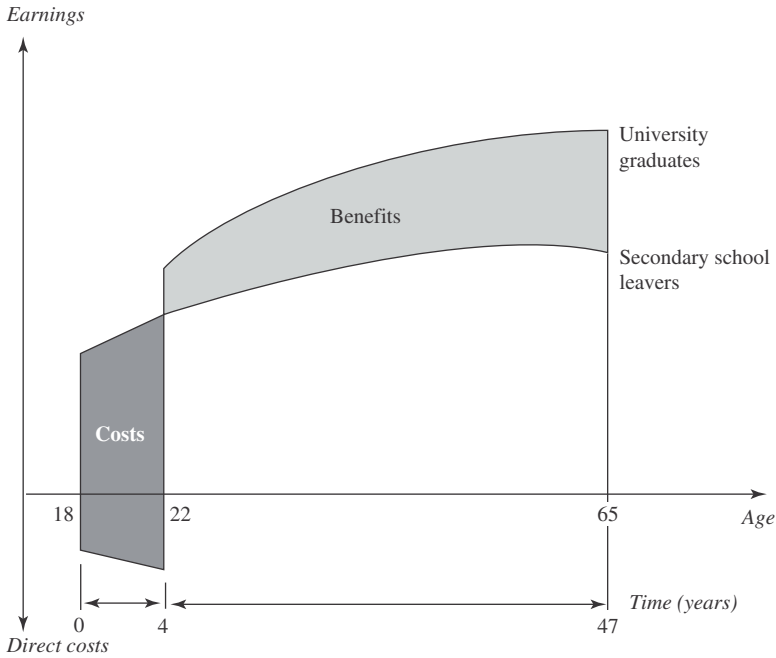
Many calculations of the rate of return to education use this method, which is sometimes described as the 'elaborate' or 'complete' method of calculation. This is based on actual age-earnings profiles shown in *Figure 3.1* and data on the costs of education, including both direct costs and indirect costs (earnings foregone), as explained in *Chapters II* and *VII*. Age-earnings profiles are used for the calculation of both benefits and costs as shown in *Figure 8.2*, which represents earnings differentials (benefits) as positive and foregone earnings (costs) as negative.

Figure 8.1 Discounted present value of net social returns to higher education in India



Source: Blaug *et al.*, 1969: 213.

Figure 8.2 Age-earnings profile for rate-of-return calculation using ‘complete’ method



Source: Mingat and Tan, 1988: 113.

In many cases, however, data are not available showing the earnings of workers of different ages and different levels of education that are necessary for calculation of age-earnings profiles. Two alternative methods for estimating the rate of return have therefore been developed and used in several studies in developing countries. One alternative method is based on the concept of an earnings function and the other uses a ‘short-cut’ method that gives a rough approximation of the rate of return. These two methods are described below.

The 'earnings function' method

The concept of an earnings function was used by Mincer in 1974 to explain the pattern of individual earnings in the USA. Individual earnings may be influenced or determined by a variety of factors including not only age, education, on-the-job training, occupation, the number of hours or weeks worked, urban or rural location, but also, in many cases, personal characteristics such as sex, race or ethnic origins, social class or family background, language, ability and motivation. Mincer used an earnings function to analyze the relationship between formal education (schooling), experience (including on-the-job training) and earnings of male workers in the USA. This involved testing the hypothesis that an individual worker's earnings are a function of variables including the length of schooling (S) and the number of years of work experience (EX).

The earnings function can be written in the form:

$$Y = f(S, EX)$$

and can be estimated using a multiple regression equation, specified in semi-logarithmic form:

$$\ln Y = a + bS + cEX + EX^2$$

where $\ln Y$ is the natural logarithm of income (Y),
 S is the number of years of schooling,
 EX is the number of years of work experience,
 a is a constant,
 b and c are regression coefficients,
 EX^2 is the square of years of work experience.

This form of an earnings function, sometimes described as a 'Mincerian function' as its use to analyze the pattern and determinants of earnings was first developed by Mincer (1974), is a simple one which assumes that earnings are determined only by two factors: amount of education (years of schooling) and work experience. However it is possible to estimate more complex earnings functions

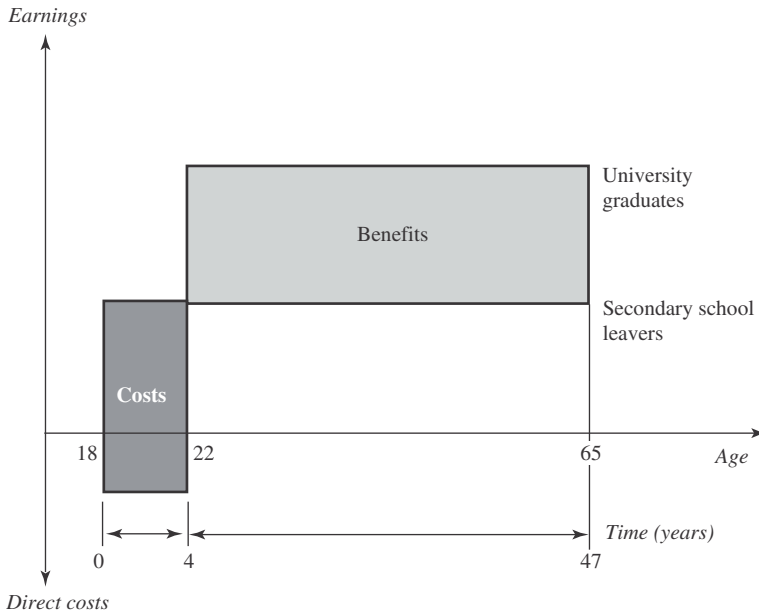
that incorporate additional variables and there are now many studies in both developed and developing countries that estimate earnings functions using a variety of variables including education, work experience and on-the-job training as well as number of hours or weeks worked, urban/rural location and a variety of personal characteristics including measures of ability.

Earnings functions are useful in two ways for cost-benefit analysis of education. First, an earnings function can be used to estimate the influence of different factors on earnings including ability, social class background and other factors that are usually reflected in the *ability* adjustment (α coefficient) that is used in rate-of-return studies to measure the effect of education on earnings. Age earnings profiles already measure the influence of two variables: level of education (which is measured simply by years of schooling in Mincer's original earnings function) and age (which can be treated as a proxy for years of work experience). The ability adjustment (α coefficient) can be regarded as a rough approximation of the influence of ability and other factors such as social class, whereas an earnings function could be used to measure the influence of these factors more precisely.

The second way in which an earnings function can be used in cost-benefit analysis is to estimate the rate of return to schooling by using regression analysis, regressing data on earnings (Y) of a sample of workers classified by educational level, on the number of years of schooling (S) to solve the equation:

$$\ln Y = a + bS$$

Figure 8.3 Age-earnings profile for rate-of-return calculation using earnings functions or 'short-cut' method



Source: Mingat and Tan, 1988: 114

Successive calculations of this equation, which assume specific values of S for different levels of education, for example primary education ($S = 6$), secondary education ($S = 12$) and higher education ($S = 18$) can be used to estimate the average rate of return to one additional year of education, as Mincer demonstrated that the regression coefficients (b) can be interpreted as the average rate of return (r). This is based on a number of simplifying assumptions, including:

1. The earnings differential associated with each level of education is constant throughout working life. In other words the assumed

age-earnings profiles are flat, as shown in *Figure 8.3*, as opposed to the conventional shape of age-earnings profiles shown in *Figure 8.2*.

2. Only indirect costs or foregone earnings are taken into account: The earnings function already incorporates earnings foregone, as shown in *Figure 8.3*.

Although these assumptions are not realistic, Psacharopoulos (1981) argues that they make little difference to the calculation and therefore that it is possible to use this method to estimate rates of return in the absence of the detailed data required for the 'elaborate' or 'complete' method, although it gives only a rough indication rather than a precise estimate as it underestimates costs. Several economists have questioned the assumptions underlying the use of earnings functions to estimate rates of return to education, but earnings functions have proved to be a powerful tool for analyzing the relationship between earnings, education and other factors and the earnings function method to estimate rates of return is still popular as it is easy to use and requires less data than the 'complete' method.

The 'short-cut' method

An even more simplified method, which is now known as the 'short-cut' method, is sometimes used. This method is used when no data are available for full calculation of earnings functions but there are data showing the average earnings at one point in time of workers with primary schooling, secondary schooling and higher education together with estimates of the annual cost of primary, secondary and higher education.

The short-cut method ignores the effect of age on earnings and assumes a flat earnings profile as shown in *Figure 8.3* that implies that the average earnings differential of graduates, or workers with secondary schooling, remains constant throughout their working life. The rate of return to higher education can then be estimated very approximately, using the formula:

$$r = \frac{E(\text{High}) - E(\text{Sec})}{n(E(\text{Sec}) + C)}$$

Where E (High) and E (Sec) represent the average earnings of university graduates (High) and workers with secondary schooling (Sec), n is the normal length (number of years) of higher education and C is the annual cost of higher education.

This formula can be used to estimate both the private and the social rate of return. For example, if we assume the following values, which are based very roughly on the Indian data used in the previous chapter:

Average earnings of graduates, E (High) = 2,923,
Average earnings of secondary school leavers, E (Sec) = 1,403,
Years of higher education, $n = 4$,
Annual cost of higher education, $C = 2,384$.

... the formula for the social rate of return would be:

$$\frac{2,923 - 1,403}{4(1,403 + 2,384)} = \frac{1,520}{15,148} = 10.0\%$$

This means that a rough approximation of the social rate of return to higher education using this short-cut method is 10 per cent, compared with a value of 12.7 per cent obtained from the elaborate or complete method shown above. This is consistent, therefore, with the conclusion of the previous chapter that the social rate of return to a university degree in India is between 7 and 13 per cent, depending upon what assumptions are used.

Mingat and Tan (1988) compared the pattern of rates of return derived from the complete and the short-cut methods and concluded: "The estimates from both the 'complete' and 'short-cut' methods show that all corresponding rates [of return] have the same order of magnitude and that the structure of returns – that is the way the rates relate to each other – is basically the same whichever method is used. The rates of return are not completely accurate, but for assessing investment priorities in education, precise figures are not essential" (Mingat and Tan, 1988: 116-7).

The ‘reverse cost-benefit’ method

Psacharopoulos (1995) refers to an even simpler ‘short-cut’ that can be used if there is information about the costs of an investment but no data on earnings (benefits). This involves asking the question: “Given the total costs of the investment, what level of benefits would be needed to produce a ‘required’ rate of return (for example 10 per cent)?” This method does not produce an actual rate of return but gives a very rough indication of the benefits that would be needed to generate a target rate of return. It should be regarded as only the first stage in a cost-benefit analysis, however it is included here as it is occasionally used as a very rough and ready form of project appraisal. Other forms of project appraisal will be discussed in more detail in *Chapter XI*.

IX. Interpretation of rates of return: making comparisons

Previous chapters have discussed the theory underlying cost-benefit analysis and the data and techniques needed for estimates of the rate of return on investment in education. As an example, *Chapter VII* showed the steps necessary for a calculation of the social rate of return to higher education in India. This led to the conclusion that the rate of return in 1960 was between 7 and 13 per cent. We now turn to the more demanding question of how to interpret such a figure. Can it be used by educational planners or policy-makers to guide investment decisions, identify priorities or develop new policies? By itself, a single figure, say 10 per cent, gives no useful guidance for decisions. Is it high or low? If, as previous chapters suggest, measurement of both costs and benefits is fairly imprecise, subject to doubt and possible bias and planners are told that the rate of return probably lies within the range of 7 to 13 per cent, depending on assumptions, they are likely to be extremely sceptical about the value of this information. In order to interpret rates of return it is necessary to make comparisons. Rates of return provide measures of relative profitability and are meaningful only in comparison with estimates of the yield of alternative forms of investment. This chapter describes six types of comparison that are commonly made in interpreting rates of return to education. Each section is quite brief and the purpose is to identify the kind of comparisons that can be made rather than to give extensive examples. *Chapter X* gives many examples drawn from both OECD and developing countries of such comparisons in practice and *Chapter XI* discusses how they have been used both by ministries of education and funding agencies to guide investment decisions and policy.

Comparing education with other forms of social investment

Some of the earliest work in the economics of education was concerned with comparisons between investment in human capital and investment in physical capital, either in the hope of explaining economic growth or as justification for government investment in education. A very early attempt to calculate rates of return to education in India was actually called *Investment in men versus investment in machines* (Harberger, 1966) and compared rates of return to investment in education with the rate of return to physical capital in industry. There are other examples of comparisons between education and physical capital but this is not the main focus of most rate-of-return studies. Although governments do have to set priorities between investment in human capital and improvements in physical infrastructure, such decisions are rarely made on the basis of detailed comparisons of rates of return. Many statements can be found in the literature, however, about whether rates of return to education compare well with some general figure such as the average rate of return on physical capital or the social opportunity cost of capital (a figure thought to represent an average for all alternative forms of social investment). There is little agreement about what figure should be used for such a comparison. Some writers have used 12 per cent while others have assumed higher or lower rates of return and many studies now use 10 per cent as a rough benchmark for the opportunity cost of capital in developing countries.

Another comparison between education and other forms of human capital investment, although mentioned in the literature, is rarely made in practice. One reason is that the failure mentioned above to measure non-economic and indirect benefits, spillovers and externalities is a particular problem if we are comparing sectors such as education and health that generate significant but as yet unmeasured external benefits. In the health sector, where many of the benefits are non-economic and difficult or impossible to measure in monetary terms, cost-effectiveness analysis is more likely to be used than cost-benefit analysis. A kind of reverse cost-benefit analysis that compares the costs of investing in a school and a hospital and asks what level of

benefits would be needed to generate a rate of return of 10 per cent in each case might be feasible. However in general the non-comparability of benefits in the two sectors makes such comparisons unlikely. There is, moreover, a growing belief that investment in education, particularly for women, may interact with investments in health and that improved understanding of health, nutrition and fertility may be an important indirect benefit of education.

Comparing levels of education

One of the most common kinds of comparison is between different levels of education. Many of the rate-of-return studies described in the next chapter compare the rate of return to primary, secondary and higher education. The purpose of such comparisons – whether explicit or not – is to help identify priorities for resource allocation either within ministries of education or funding agencies. The problem of measuring externalities is thought by many researchers to be less serious for comparisons between levels, as all levels of education generate indirect benefits. Unless primary education generates significantly more or less external benefits than either secondary or higher education, the fact that all rates of return omit these benefits will not lead to distortions.

Comparing types of education

Another common basis for comparison is type of education, whether in terms of different types of schooling, for example general secondary and vocational secondary schools, or between different fields of study in higher education. There are significant differences in the cost per student in schools offering general or academic courses and those offering vocational or technical courses. How do these compare with differences in the average lifetime earnings of those who attended each type of school? Comparing rates of return to different types of schooling may help to throw light on the debate on whether increasing vocational specialization in secondary education is desirable and profitable. Such comparisons are less likely to be troubled by problems of measuring externalities as the indirect benefits of both types of schooling can be assumed to be similar. There is a problem, however, if pupils at the two types of school differ in terms

of ability or family background, as these factors may influence earnings. Rate of return comparisons between different types of school have been criticized for neglecting this issue.

There are also significant differences in cost per student in different subjects or fields of study at college or university level and often large differences between the earnings of graduates with different subject specializations. Comparing social rates of return to university degrees in science and technology, medicine, law, education and humanities may be useful for two purposes. Comparisons of private rates of return can throw light on private demand for different types of university course. In some countries there is excess demand for places in medical and engineering faculties and unfilled places in teacher training colleges. Does the demand for places reflect students' perceptions of costs and benefits or other factors? Comparisons of social rates of return, on the other hand, may be useful in debates on government priorities. The Minister of Science and Technology may argue for increasing the supply of science and engineering graduates while the Minister of Education wants to expand teacher training colleges. A comparison of social rates of return in different fields of study could provide useful information. An example of such a study is discussed in *Chapter X*.

Comparing social and private rates of return

Education is both a public and a private investment and comparisons between the social and the private rate of return reflect how costs are shared between taxpayers and the individual beneficiaries of education and how taxes on income affect private benefits. *Chapter XI* gives examples of how comparisons between social and private rates of return to higher education have been used in debates on financing policy both in the UK and in developing countries.

Comparing rates of return for males and females

Many of the first examples of cost-benefit analysis of education in the 1960s were confined to the effects of education on employment and earnings of men on the grounds of the lower labour force

participation of women. Two of the American economists who first applied cost-benefit analysis to education, Becker and Mincer, suggested that education was likely to be less profitable for women than men as not only was labour force participation lower than for men, but lower wages for women meant lower earnings differentials for those in employment.⁵ There were few examples of rate of return calculations for women in the 1960s and 1970s. It was not until the 1980s and 1990s that strong interest developed in comparing rates of return for men and women and in developing new measures for the non-monetary and non-economic benefits of education for women, resulting in the statement by Summers, then chief economist at the World Bank, that “recent research and concrete calculations show that educating females yields far-reaching benefits for girls and women themselves, their families and the societies in which they live... once all the benefits are recognized, investment in the education of girls may well be the highest-return investment available in the developing world” (Summers in King and Hill, 1993: v). There is now a substantial body of work on investment in female education. This involves not only comparisons of rates of return for men and women but also extensive analysis of the ‘gender gap’ in educational participation and the widespread development of measures and programmes to reduce this gap. *Chapter X* includes examples of analyses of gender differences in returns to education and a study of the implications of human capital concepts for female educational participation.

Identifying trends in rates of return over time

Although rates of return are usually based on cross-section earnings data, which measure relative earnings at one point in time, *Chapter VI* emphasized the desirability of measuring trends in rates

5. Mincer’s first analysis of the effects of on-the-job training as a form of investment in human capital argued that “in view of the expected smaller rate of participation in the labour market, education of women is more strongly focussed on the ‘consumption’ sphere, and returns are in larger part non-pecuniary than for males” (Mincer, 1962, reprinted in UNESCO, 1968: 535) and Becker even argued that “women go to college partly to increase the probability of marrying a more desirable man” (Becker, 2nd edition 1975: 179).

of return over time but pointed out that such evidence is still fairly limited. There have been several studies since the 1980s that have tried to identify such trends, in particular to see whether rates of return to education decline significantly following expansion. Normally, economists predict that an increase in supply, for example of university graduates, will lead to a decline in the returns to higher education unless there is a corresponding increase in demand. Two studies by Psacharopoulos (1981 and 1989) found that in the countries where time trends were available there had been a modest decline in rates of return over time. He concluded, however, that the 'mild' rate of decline suggested that in the 'race between technology and education' the effects of technological change were such that demand for educated workers by and large kept pace with increased supply (see Psacharopoulos and Woodhall, 1985: 58-61 for discussion of this point). Further research on this issue is discussed in *Chapter X*.

International comparisons

A common type of comparison in this field is international comparison of the rate of return to education in different countries or regions. There are two main objectives in such comparisons. The first is to discover similarities or differences between countries at similar stages of development and explore the reasons for any differences. For example, there have been several studies that compare earnings and rates of return in OECD countries, comparisons between the USA and the UK and a recent study of private rates of return in 15 European countries. Some of these examples are discussed in *Chapter X*. There have also been comparisons between countries in Asia and Africa, although these have been criticized (for example by Bennell, 1996 and 1998) for neglecting issues of comparability between different studies. The same criticism is relevant to the other main objective of international comparisons: the search for global or regional patterns in rates of return (discussed further below).

Identifying global patterns

The first study to compile all available rate-of-return studies and try to identify general patterns was by Psacharopoulos (1973), who

compared social and private rates of return in 32 countries. He has since regularly updated this work: A review in 1985 covered over 60 countries, a 1994 update covered over 80 countries and the latest (Psacharopoulos and Patrinos, 2002) covers 98 countries. In order to identify general patterns, Psacharopoulos aggregated and averaged estimates of social and private rates of return for broad regions (Asia, Latin America, sub-Saharan Africa, Europe and the Middle East and OECD countries) and groups of countries (low-, middle- and high-income countries). Some of the conclusions are discussed in the next chapter. Inevitably such an exercise, based on 60, 80 or 100 countries, must simplify considerably and ignore differences in data quality, coverage, assumptions and warnings, qualifications or caveats made in the original studies. This is one reason why large-scale comparisons involving non-comparable studies have been attacked by critics.⁶ In fact, in their latest 'update', Psacharopoulos and Patrinos emphasize that estimates are rarely fully comparable and argue that as availability of rate-of-return estimates has grown exponentially, a more selective approach is needed in comparing returns to education and establishing related patterns.

This chapter has done no more than indicate possibilities for comparing rates of return as a way of interpreting findings. Examples of all these types of comparison are examined in the next chapter, including summaries of the global patterns just discussed above, and *Chapter XI* discusses how cost-benefit analysis has been used by governments and funding agencies to guide investment decisions and policy. Once again, this is based on concrete examples.

6. For example, Bennell (1996; 1998) argues that conclusions based on the global and continent-wide aggregate rate-of-return estimates compiled by Psacharopoulos have become 'received wisdom' and he questions whether this received wisdom applies in sub-Saharan Africa (1996) or Asia (1998). In his later article, Bennell concludes that aggregate rates of return for a whole region "should be discarded altogether in any serious discussion of education investment priorities for the Asian continent as a whole and individual countries" (Bennell, 1998: 118).

X. Examples of cost-benefit analysis of education

Evaluating educational investment: the 1960s and 1970s

The earliest examples of cost-benefit analysis of education in the USA were a result of the development of the theory of human capital formation, formulated in the early 1960s. The aim of rate-of-return studies such as those by Becker (1964 and 2nd edition 1975), Mincer (1962 and 1974) and Schultz (1961 and 1971), among others, was to explore the feasibility of applying cost-benefit analysis to education and to develop a theory of investment in human capital. Although the work had obvious practical implications, its first objective was to develop a new tool of economic analysis. In particular, Becker's work showed how the concept of investment in human capital helped to explain certain patterns of behaviour and economic phenomena such as the shape of age-earnings profiles and also showed that different activities such as formal schooling and on-the-job training could be analyzed by using the same tools of cost-benefit analysis. Further research in the US in the 1970s concentrated on such issues as regional and racial differences in rates of return, the influence of investment in education on the distribution of income, the application of cost-benefit analysis to the study of occupational choice, private demand for education and comparisons of alternative methods of financing education. All these issues are relevant to developing as well as developed countries.

There were a number of applications of cost-benefit analysis in developing countries in the 1960s and 1970s that attempted to measure the profitability of investment in education. For example the study of the rate of return on investment in India discussed in previous chapters (Blaug *et al.*, 1969) aimed to show which levels of education are most profitable and also whether there is any evidence of over- or under-investment in education. The data relate only to urban India,

so it is dangerous to draw strong conclusions about the overall profitability of education in India as a whole. However, the general conclusion of the study was that despite unemployment of graduates and school leavers, private rates of return to education in India were still high in 1960 but social rates of return were considerably lower. The most profitable investment in terms of cost-benefit analysis was primary education, which had the highest rate of return.

This study of rates of return on investment in education in India in 1960 provides an illustration of the interpretation and policy implications of cost-benefit analysis. The study was conducted at a time when higher education had been expanding rapidly – much faster than primary and secondary education – and there were more than half a million unemployed graduates and secondary school leavers. Cost-benefit analysis was used to analyze the causes of graduate unemployment and to suggest some remedies. The authors (Blaug *et al.*, 1969: 232-250) emphasized that the precise value of the rate of return depends on certain critical assumptions, for example about the effects of wastage on costs and ability on earnings. They therefore presented a range of estimates rather than a single set of figures, but even these imprecise figures suggested certain policy conclusions. In all cases, private rates of return were higher than social rates of return, reflecting high levels of government subsidies, which meant that social costs were much higher than private costs. Even after allowing for average rates of unemployment, the private rate of return on a university degree was high (14 to 21 per cent, depending on the subject, before making any adjustments for the effect of ability on earnings). This showed that education was a profitable form of investment for the individual and helped to explain excess demand for university places despite graduate unemployment. The social rate of return on university education, on the other hand, was not only below the private rate of return but also lower than the rate of return to primary and secondary education. Yet government targets for the expansion of university education had been higher than for primary education throughout the 1950s and 1960s, even though universal primary education had not yet been achieved. The study concluded on the basis of the rate-of-return estimates that Indian higher education was over-expanded in the 1960s in relation to lower levels, particularly

primary schooling. This had implications for both allocation of the government budget and financing policy and the study recommended increasing both resources for primary education, which showed the highest social rate of return and fees at the university level but with scholarships for students from poor families. An increase in fees, which would shift part of the costs of higher education from the taxpayer to the student, would reduce the private rate of return, make university education less profitable and therefore reduce private demand.

During the 1970s there were many new studies, both in the USA and Europe and in developing countries. The first attempt to compile and compare rates of return on education investment (Psacharopoulos, 1973) covered 32 countries and an update in 1981 covered 44 countries. In both these studies, Psacharopoulos tried to identify general patterns and concluded:

- The highest rates of return in developing countries are to primary education, followed by secondary education, with higher education appearing less profitable than lower levels of schooling.
- In all countries and levels of schooling, private returns are higher than social rates of return, as education is heavily subsidized.
- Most rates of return to investment in education in developing countries are well above the 10 per cent yardstick commonly used to indicate the opportunity cost of capital.
- Rates of return are higher in developing countries than in industrialized countries, due to the relative scarcity of human capital.

The following decades saw a steady stream of further cost-benefit studies as well as continued controversy about the theoretical soundness of the approach (summarized in *Chapter VI*) and its implications for policy. The next section gives examples of more recent rate-of-return studies in the 1980s and 1990s as well as the continuing search for global and regional patterns.

Educational investment: the 1980s and 1990s

During the 1980s and 1990s, new studies appeared in all the main world regions. Many of them calculated rates of return using the complete method described in *Chapter VII* on the basis of new sets of data, either for countries where no estimates were available or to update previous estimates. Others used the earnings function or short-cut methods described in *Chapter VIII*. This raises important questions of comparability between different studies.

Despite this problem, there were many comparative studies in the 1980s and 1990s. Some were conducted by independent researchers but several were carried out for agencies such as the World Bank; for example a comparative study of around 18 countries in Latin America and the Caribbean (Psacharopoulos and Ng, 1994). Many had a particular policy focus. For example, there were several cross-country comparisons between rates of return to education for males and females. Some of these were summarized by Schultz (1995) who suggested that, in many cases in countries ranging from the Ivory Coast to Peru and Thailand, estimated private returns were higher for women than for men and not lower as some early studies had assumed. One reason is that education increases the labour force participation of women as well as earnings; another is that earnings foregone are usually lower for women. If indirect benefits and externalities are taken into account, the social rate of return may also be higher for women than for men, as discussed in *Chapter III*. There were many other 'special focus' studies in the 1980s and 1990s. For example, a cross-country comparison of rates of return in transitional economies in the 1990s covering nine countries in Central and Eastern Europe, Russia and the former Soviet Union (Newell and Reilly, 1999) was concerned with the effects of changing labour market conditions after the collapse of communism and concluded that there was a tendency for returns to education to increase as labour market reforms took hold. A comparative study of returns to vocational education and occupational training in OECD countries (Cohn and Addison, 1998) found interesting differences between countries. For example, returns to vocational training appeared higher in the US than in the UK, while lifetime earnings profiles were much flatter and therefore estimated rates of return lower in the Nordic countries than in the UK.

The authors of this study referred to the controversy regarding general versus specific vocational training and this controversy is strong in developing countries also. Cost-benefit analysis has been used to investigate this issue by comparing the returns to general and vocational education. An example is a World Bank study comparing general and diversified schools in Colombia and Tanzania (Psacharopoulos and Loxley, 1985). This used both cost-benefit and cost-effectiveness analysis to compare pupil achievement, subsequent employment and earnings of pupils attending general (academic) schools and diversified schools offering specialized vocational or technical education. The authors observed: “curriculum diversification is expensive; the cost per student in a diversified school can be double that in a conventional (academic) school ... therefore policymakers should weigh this cost against the extra benefits (monetary and non-monetary) that such schools confer to the students and to society at large”, but concluded: “This study has failed to provide evidence that the measurable monetary benefits of diversification are greater than those of conventional education (Psacharopoulos and Loxley, 1985: 227). The rate-of-return estimates for Tanzania suggested that academic streams had the highest rate of return and technical streams the lowest, but the authors added a note of warning that the earnings data were collected early in the careers of graduates, and there were imperfections in the labour market making it difficult to interpret the results. All too often, however, such warnings are disregarded and the results of such studies treated as though they were unambiguous.

Psacharopoulos continued his compilation of rate-of-return studies and the search for global patterns, reporting in 1995 on over 80 countries and most recently, in 2002, on 98 countries (Psacharopoulos and Patrinos, 2002). On the basis of these comparisons he confirmed the four conclusions listed above, that: (a) the highest rates of return are for primary education; (b) private rates of return exceed social rates at every level; (c) most rates of return to education are above 10 per cent; (d) rates of return are, on average, higher in developing countries than in industrialized countries. In addition, the latest ‘updates’ conclude that:

- Rates of return to women's education are slightly higher than the rates for men, reflecting the fact that education increases labour force participation by women as well as increasing their earning power.
- Comparisons between general academic education and specialized vocational and technical courses in secondary schools suggest that general education is the more profitable investment as the cost of highly specialized vocational education at the secondary level is high while the benefits, in terms of increased earnings, are questionable.
- Rates of return to education tend to decline slightly as enrolment expands, but in general education remains a good investment.

Psacharopoulos has frequently drawn policy conclusions from these findings, including:

- Under-investment exists at all levels of education, especially in Africa.
- Primary schooling remains the number-one priority for investment as the social rate of return to primary education exceeds the returns to secondary and higher education.
- Reducing public subsidies to higher education and reallocating them to primary education would bring benefits in terms of both efficiency and equity.

Chapter XI examines the extent to which such conclusions have influenced policy-making in funding agencies, particularly the World Bank. For the moment, however, we remind readers of critics such as Bennell (1996, 1998), discussed in *Chapter IX*, who argue that attempts to derive global or even continent-wide patterns are too simplistic, often based on out-of-date studies and ignore data weaknesses and issues of comparability. Bennell's own conclusion is that many of the conventional patterns identified by Psacharopoulos do not prevail in either sub-Saharan Africa or Asia. There is evidence from Latin America also that in many countries primary education no longer has the highest rates of return. The most recent 'update' by Psacharopoulos and Patrinos (2002) shows that by 1989 Chile, Costa Rica, Honduras and Mexico all had higher rates of return – both social and private – for secondary than for primary education. Even more

recently, a study of Latin-American labour markets in the 1990s for the Inter-American Development Bank showed that returns to both secondary and higher education exceeded returns to primary schooling in almost all countries, however returns to higher education were increasing during the decade in most countries while returns to secondary education were declining (Duryea, Jaramillo and Pagés, 2003).

Other critics, as shown in *Chapter VI*, questioned the conclusions drawn from social rates of return, particularly as they frequently ignore or underestimate indirect benefits and externalities. However even if commentators express doubts and scepticism about the policy relevance of social rates of return, there is still a strong case for estimating private rates of return to improve understanding of private demand for education. Recent examples include a study of the private rate of return to higher education in science and technology in Trinidad and Tobago, based on data for 1997-1999 (Bourne and Dass, 2003) that showed high private rates of return to medicine, engineering and the natural sciences, but much lower rates of return to degrees in humanities and agriculture. This is reflected in the pattern of demand for places but not in the current pattern of subsidies and the authors suggest that differential subsidies “could achieve a pattern of demand for university education more closely aligned to the preferences of policy-makers” (Bourne and Dass, 2003: 10). Ways in which rate-of-return estimates have been used by policy-makers in some countries in the design of financing policies for higher education will be discussed in *Chapter XI*. The next section also summarizes recent studies of costs and benefits of higher education in OECD countries. First, however, we discuss another example of how the idea of private costs and benefits has been used to analyze demand for education.

Even though there may be doubts about the precise values of rate-of-return estimates – private or social – the *concept* of the private rate of return has proved useful as a way of understanding differential demand and participation. A recent study of women’s educational participation in Uganda (Kwesiga, 2002) argues that family, social and institutional factors interact to determine access to education for girls and women and that the human capital concept of education as an investment is an important, though implicit rather than explicit,

factor influencing family decisions about male and female education. She believes that the concept of investment in education “provides a unifying explanation of barriers to and determinants of girls’ education” (Kwesiga, 2002: 252), but argues strongly that in the African context the conventional manner of assessing costs and benefits of the investment through individual earnings in the labour market, taxation by the state or even estimation of spillover benefits is inadequate: “The issue is not whether the educated woman earns more but who will reap the dividends from this investment in the end” (Kwesiga, 2002: 251).

Investment in education: recent OECD and European studies

The OECD has recently produced several new publications on human capital and cost-benefit analysis, including an international comparison and summary of evidence on rates of return in OECD countries (1998), a review of cost-benefit analysis for appraisal of investments in educational facilities (2000) and a report on the role of human and social capital in promoting economic growth and well-being (2001). Presentation and analysis of data on returns to education are now included in the annual publications *Education at a glance* and *Education policy analysis*. All these studies focus mainly on OECD countries, however there has also been an interesting project involving the OECD, UNESCO and the World Bank that seeks to extend to selected developing and transition countries a programme designed to collect and analyze comparative education statistics and indicators: the World Education Indicators (WEI) programme, covering 11 countries (Argentina, Brazil, Chile, China, India, Indonesia, Jordan, Malaysia, the Philippines, the Russian Federation and Thailand). The 2002 analysis of these indicators focused on *Financing education: investments and returns* and concluded that investment in human capital had a stronger positive impact on growth in WEI countries than in OECD countries (OECD, 2002: 31).

Another comparative project involving 15 European countries was conducted between 1998 and 2000 and focused on *Public funding and private returns to education* (PURE). Research

concluded that there were significant differences in the private returns to education across Europe, with broadly three groups of countries: countries where average private returns were low (Scandinavian countries and the Netherlands), those with high returns to education (Ireland and the UK) and countries falling between these extremes.⁷ There was no evidence of convergence over time in returns to education across European countries, which the researchers noted could lead to higher mobility of highly educated workers between countries in the future. Another interesting finding was that *relative* earnings differentials of the highly educated had increased rather than diminished over time despite substantial increases in the supply of such workers, suggesting that demand for highly educated labour has expanded even faster than supply.

Evaluating education projects in developing countries

The examples given in this chapter have related mainly to comparisons between levels or types of education, between social and private returns and between countries. Such types of cost-benefit analysis can be useful, as discussed in *Chapter XI*, for decisions about resource allocation or about how costs of education should be shared between governments and individual students or their families. There is another type of problem to which cost-benefit analysis has been applied in recent years, namely the evaluation of individual education projects. This section considers some recent examples and the following chapter considers the extent to which funding agencies such as the World Bank use cost-benefit analysis to evaluate proposed education projects.

A World Bank higher education project in Vietnam used cost-benefit analysis as part of the project appraisal in 1998.⁸ The costs of

7. The research findings were published as a book (Harmon, Walker and Westergaard-Nielsen, 2001) and are available on the PURE website: <http://www.etla.fi/PURE/>
8. A description of the sector study conducted prior to the appraisal of the Vietnam Higher Education Project and a presentation on the economic analysis carried out as part of the project appraisal is available from: <http://www.worldbank.org/education/economicshed/research/wbpub/VFSSProc.htm>

the project, designed to strengthen the university system and increase its efficiency, flexibility and responsiveness, were expected to be about US\$100 million. Two types of benefit were expected. It was hoped that the project would improve university administration and generate economies of scale by encouraging mergers between small, over-specialized institutions. If achieved, this would lead to cost savings in universities. A study of university costs in 1995 had already demonstrated that unit costs were lower in larger, multidisciplinary universities than in small, highly specialized institutions. Secondly, by improving the quality and relevance of university teaching and modernizing courses the project would increase the quality of graduates; it was assumed that this could be measured by increased average graduate earnings. Data were available from a graduate tracer study (Moock, Patrinos, Venkataraman, 2003) showing that Vietnamese university graduates with language and computer skills earned significantly more than those lacking such skills and this differential was used as a proxy for the effects of improvements in university quality on graduate productivity. On the basis of various assumptions about the magnitude of the benefits, a rate of return of 17 per cent was calculated and sensitivity analysis showed that even if these assumptions were changed, the project was still likely to generate a rate of return above 10 per cent, the assumed opportunity cost of capital in Vietnam.

Other examples of World Bank projects that used cost-benefit calculations as part of the appraisal process include a higher and technical education project in Mauritius that calculated benefits in terms of the lifetime earnings of the extra graduates who would be trained as a result of the project and an education project in Barbados, which encouraged the amalgamation of small schools to achieve economies of scale by improving utilization of teachers and reducing unit costs. The calculation of benefits in this case was based on estimated cost savings as in the previous example and the cost-benefit analysis compared the costs and benefits of alternative policies on school amalgamation to identify the most profitable.⁹ A similar

9. Further details of the cost-benefit analysis of these two projects is available from: http://www.worldbank.org/education/economicssed/tools/hands/hands_index.htm

approach could be used to compare the costs and assumed benefits of other alternative strategies; for example replacement or repair of existing school buildings or alternative patterns of teacher training.

The use of cost-benefit analysis for project appraisal raises many questions, for example whether it is appropriate to use currently observed earnings differentials that may reflect a shortage of highly trained workers as a measure of the benefits of expanding supply. In the Vietnamese case, this problem was solved by using sensitivity analysis, including reducing assumed earnings differentials, to judge how sensitive the estimated rate of return is to changes in assumptions. There are other possible approaches to project appraisal that will be discussed in the next chapter. For the moment, it must not be forgotten that any estimate of the rate of return to a proposed project or a comparison between alternative options will be based on a number of assumptions which may be open to challenge. What is needed in project appraisal or for any investment decision is a systematic way to identify, measure and compare all the expected costs and benefits of a project and its alternatives (including doing nothing). The examples of cost-benefit analysis described in this chapter attempt to provide such a tool. The next chapter considers how cost-benefit analysis has been used in decision-making both by governments and funding agencies and the final chapter attempts to evaluate cost-benefit analysis as a practical tool.

XI. Using cost-benefit analysis to guide policy

So far this booklet has given many examples of cost-benefit analysis. In some cases these were conducted as a form of independent academic research, in other cases they were specially commissioned to throw light on particular policy issues or problems. Regardless of their original purpose, however, most of the studies presented their findings as relevant to the concerns and decisions of policy-makers. This chapter looks at how cost-benefit analysis has been used in practice by governments or funding agencies to guide policy decisions. It gives examples of the use of cost-benefit analysis to guide and justify three types of policy decisions: (a) allocation of resources between alternative forms of investment, particularly between levels of education; (b) developing new policies for financing higher education; and (c) appraisal of education projects by funding agencies.

Resource allocation

Many of the earliest studies of the rate of return to educational investment were designed to measure the contribution of education to economic growth and the widely publicized conclusions – that human capital contributes to economic growth just as surely as physical capital and that education is a profitable investment – were used by governments both in developing and advanced countries to justify increased public expenditure on education. More recently there has been a resurgence of interest in the effects of education on economic growth and social welfare. Reports by intergovernmental agencies, for example the OECD (2001), have reiterated the importance of human capital and investment in education, particularly in the context of the ‘knowledge economy’ and have underlined the need to take account of costs and benefits in formulating policies and setting priorities, but with a new emphasis on indirect social benefits as well as economic benefits. *Chapter IX* suggested, however, that few governments actually conduct detailed cost-benefit analysis as a step towards setting overall priorities in budget allocation. The allocation

of the public budget between different sectors is largely a political decision although it may well be influenced, explicitly or indirectly, by perceptions and beliefs on the part of both politicians and the public about costs and benefits. However there is one way in which the results of cost-benefit analysis may have a real impact on government decisions and that is through the influence of international agencies such as the OECD or UNESCO, funding agencies such as the World Bank and international donors.

There is evidence that in the last decade the decisions of funding agencies and donors have been more influenced by the results of cost-benefit analysis than in the past. In particular, several World Bank reports published in the 1990s used rates of return to justify conclusions and formulate advice to policy-makers in developing countries. This had an impact on resource allocation decisions in at least three ways. First, it influenced the high priority now given to the education sector as a whole and the relative priorities given to different levels or types of education within the World Bank's own lending programme. This is important, as the Bank's review *Priorities and strategies for education* pointed out that the World Bank is the largest single source of external finance for education in developing countries, accounting for about a quarter of all external support (World Bank, 1995: 145). Secondly, this dominant position gives the World Bank considerable influence with other multilateral and bilateral donor agencies, particularly at a time when donor co-operation is increasingly emphasized. Thirdly, the World Bank's role in providing policy advice to governments in developing countries (its clients) means that the Bank's own position on the overall priority of the education sector and on relative priorities within the sector is persuasively presented in policy dialogues with client governments. Indeed, the 1995 review just quoted argues that as World Bank funding for education represents less than 1 per cent of developing countries' total spending on education, "The World Bank's main contribution must be advice, designed to help governments develop education policies suitable for [their] circumstances ... Bank financing will generally be designed to leverage spending and policy change by national authorities" (World Bank, 1995: 15).

The 1995 review of priorities and strategies for education, which was intended to be a synthesis of World Bank work on education since the previous sector policy paper in 1980 and therefore represents a significant example of that advice, contains many references to cost-benefit analysis. In discussing the Bank's own support for education, it states: "Cost-benefit and cost-effectiveness analysis will be more systematically used both in sector work and in the identification, design and appraisal of education projects" (1995: 154). The first chapter explains the concept and principles of rates of return to education and presents a table of average rates of return by level of education and by region; the source of these figures is the 1994 review of rates of return by Psacharopoulos discussed in *Chapters IX* and *X*. The results in this table are cited as proof that "rates of return are very high in low- and middle-income countries", and "in general, in economies with less than universal basic education, rates of return are greatest for primary education" (1995: 21). This is translated into advice on resource allocation: "The Bank will continue to encourage its low- and middle-income country clients to give a higher priority to education and education reform" (1995: 154), and "In low- and middle-income countries the rates of return to investments in basic (primary and lower-secondary) education are generally greater than those to higher education. Therefore primary education should usually be the priority for public spending" (1995: 56).

Elsewhere the review used rates of return to justify giving increasing priority to girls' education and increasing cost recovery in higher education. High private rates of return together with the wide gap between average social and private rates of return were used to justify a reduction in public subsidies for higher education, which the World Bank believes represent a misallocation of resources: "Although private rates of return are 2.5 times higher than social rates ... public spending per student in higher education in Africa is about 44 times spending per student in primary school" (1995: 58). This line of reasoning is examined in more detail in the next section.

Although it expressed several words of warning about rates of return, including the neglect of indirect benefits and externalities, the 1995 review frequently used its summary of rates of return to justify the clear messages sent to governments and donors: (a) Education

should have a higher overall priority because “investments in all levels of education yield high rates of return” (1995: 920); (b) the highest priority for low-income countries should be primary education, particularly for girls; (c) levels of public subsidy for higher education should be reduced and resources reallocated to lower levels of the education system.

These messages had a powerful influence on governments and donors. Indeed, critics such as Bennell (1996) argue that they became part of ‘received wisdom’ and therefore not sufficiently scrutinized. The Task Force on Higher Education and Society (2000) looked at the influence of rate-of-return analysis, particularly comparisons between social and private rates of return and between levels and concluded that: “Taken together, these results provided a powerful justification – especially for international donors and lenders – for focusing public educational investment at the primary level ... The World Bank drew the conclusion that its lending strategy should emphasize primary education, relegating higher education to a relatively minor place on its development agenda. The World Bank’s stance has been influential, and many other donors have also emphasized primary, and to some extent secondary education, as instruments for promoting economic and social development” (Task Force, 2000: 39). The Task Force argued, however, that in this case cost-benefit analysis had resulted in distortion and imbalance in the guidance offered to policy-makers as it neglected the indirect social benefits of higher education: “The Task Force fully supports the continuation of large investment in primary and secondary education, but believes that traditional economic arguments are based on a limited understanding of what higher education institutions contribute” (2000: 39).

More recently, the World Bank has modified its message on the benefits of higher education, acknowledging that “investments in tertiary education generate major external benefits that are crucial for knowledge-driven economic and social development” (World Bank, 2002: *xvi*). Its new policy paper on tertiary education has very little emphasis on rate-of-return estimates or advice on re-allocation of public resources from higher to primary and secondary education in response to rates of return. Instead, it recognizes that tertiary education contributes to social and economic development by generating social

as well as economic benefits and emphasizes the need for more effective links between all levels of education. The need for systematic analysis of costs and benefits is still underlined: “The existence of [these] important economic and social benefits indicates that the costs of insufficient investment in tertiary education can be very high” (2002: 81-82) but both costs and benefits are defined more broadly than in previous reports and policy-makers are urged to consider the education system as a whole, to adopt a comprehensive approach to resource allocation and to establish a coherent policy framework (2002: 82-83). A vital ingredient of that policy framework is, of course, developing policy on finance to take account of both private and social costs and benefits.

Financing higher education

In the last 25 years many governments have grappled with the problem of how to adapt the financing of universities and other higher education institutions to the dramatic expansion of enrolments that has taken place in both industrialized and developing countries. A solution advocated or attempted in many countries is to introduce or increase cost-sharing through tuition fees, student loans and other types of private contribution. In several cases this policy has been justified by governments on the strength of evidence of high private rates of return to individuals. In the UK, for example, the introduction of student loans in 1989, the imposition of means-tested tuition fees in 1997 and the recent proposal to introduce ‘top-up’ fees in universities in 2006 were all justified by successive governments on the grounds that higher education is a profitable private investment and that graduates who benefit from better job opportunities and higher lifetime earnings (the so-called ‘graduate premium’) should contribute more to its cost. The UK government published a White Paper¹⁰ in 2003 that proposed that universities should be able to charge ‘top-up’ fees from 2006. It cited research on the returns to education in the UK and other OECD countries and concluded that in the UK “on average those with a higher education qualification earn around 50 per cent

10. In the UK, the term ‘White Paper’ refers to a government report which sets out proposals for policy changes in advance of legislation. The actual legislation must be debated in Parliament before it is enacted.

more than non-graduates ... the returns to HE [higher education] are higher in the UK than in any other OECD country” (Department for Education and Skills (UK), 2003: 59). This evidence was used to justify a higher contribution from those who benefited from higher education – not in the form of ‘up-front’ fees, which would discourage students from low-income families, but through income-contingent payments to a Graduate Contribution Scheme payable after graduation. At the same time, the White Paper recognized that higher education generated both direct economic benefits and indirect benefits for society as a whole that justified a substantial and increasing level of state support.

The 2003 White Paper did not quote precise figures for the rate of return to higher education, however, its policy recommendations drew on several studies commissioned by the UK government in the last 15 years that calculated both private and social rates of return. An earlier UK White Paper published in 1988 justified the introduction of student loans by a direct reference to cost-benefit analysis. Quoting social rates of return of 7 to 10 per cent compared with private rates of return of 25 to 30 per cent, it argued: “the personal rate of return on higher education is a great deal higher than the rate of return to society in general” (Department of Education and Science (UK), 1988: 40). This gap between social and private rates of return was used to derive clear guidance for policy: “That is why there is scope for the individual student to bear more of the cost of the investment” (1988: 10).

Other countries have similarly justified shifting part of the costs of higher education from taxpayers to individual students or graduates. For example, Australia introduced the Higher Education Contribution Scheme (HECS) in 1989; This was also justified on the grounds that both society and the individual derived benefits from higher education, so both should share the costs. What cost-benefit analysis does not do in this case is give precise guidance on the size of the relative shares. In 1973 in the USA, the Carnegie Commission on Higher Education published a report called *Higher education: Who pays? Who benefits? Who should pay?* Cost-benefit analysis can provide vital information to help answer these questions but it cannot by itself answer the last one. This booklet has argued that cost-benefit analysis

provides a signal for a change in direction rather than precise guidance on the magnitude of the change. Both the Australian and British governments promised to monitor the effects of the new financing policies on higher education participation, particularly of students from low-income families. Ideally, this monitoring should include new calculations of rates of return to assess the effects of the increase in private costs represented by 'top-up' fees or HECS. As in both countries payment by graduates is income contingent – payments are a fixed proportion of a graduate's income, for example in Australia in 2001-2002 HECS payments ranged from 3 to 6 per cent – it will be some time before the effects of these changes on private rates of return can be measured. However, in both countries mathematical models have been used to simulate the effects of increased fees or contributions on rates of return.

A similar strategy of increased cost recovery through introduction or increases in tuition fees, charges for food and accommodation and student loans has been recommended for developing countries by the World Bank, as noted in the previous section. One of the first examples of the World Bank's use of cost-benefit analysis to justify increasing cost recovery in higher education was a publication on *Financing education in developing countries* (World Bank, 1986) in which Psacharopoulos (one of the book's main authors) summarizes the global patterns in rates of return discussed in the previous section and in *Chapter X*, including the fact that private rates of return are consistently higher than social rates and that the returns to primary education exceed the rate of return to secondary and higher education. Psacharopoulos uses this evidence to recommend shifting more of the costs of higher education from taxpayers to students or graduates. A 'package' of reforms including increased cost recovery in higher education and reallocation of resources to lower levels was recommended in the 1995 policy review discussed in the previous section and in an earlier review of education policies in sub-Saharan Africa (World Bank, 1988). In all these reports, cost-benefit analysis and rate-of-return estimates are quoted in support of the policy package. There is less emphasis on financing in the 2002 World Bank report on tertiary education; however, the report notes approvingly that more countries and institutions are introducing cost-sharing measures and that there is "growing recognition that the cost of tertiary

education must be shared in a more equitable way” (World Bank, 2002: 94).

Project appraisal

Chapter X gave some examples of cost-benefit analysis for project appraisal. The use of cost-benefit analysis for investment appraisal has been advocated by funding agencies such as the World Bank and most recently the European Investment Bank (Squire and van der Tak, 1975). How often is it actually used for this purpose? A recent article by World Bank economists (Vawda, Mook, Gittinger and Patrinos, 2003) showed that although the World Bank had become by the late 1960s a leader in using discounted cash flow techniques for cost-benefit analysis in other sectors such as agriculture, “such sophisticated methodologies did not very often find their way into the World Bank’s education sector” (Vawda *et al.*, 2003: 647). There were a few examples, such as calculation of rates of return for vocational education projects in Chile and Thailand in the 1960s, but few cost-benefit analyses were carried out for education projects until the 1990s. The examples quoted in *Chapter X* of higher education projects in Vietnam and Mauritius and a school building project in Barbados were, until recently, unusual. The article quotes a World Bank Operational Policy guideline that, even in the early 1990s, exempted education projects from the Bank’s general requirement that cost-benefit analysis be conducted as part of project appraisal and included in every staff appraisal report.

The rationale for exempting education from the requirement to use cost-benefit analysis in project appraisal was that it was difficult to measure all the benefits of education, particularly externalities. But Vawda *et al.* point out that other sectors such as transport and power share the same problem and quote an economist in the Bank’s Operations Evaluation Department (OED), who stated in 1994:

“Having reviewed Agriculture and Education sector projects for the better part of 10 years I am struck by the fact that agriculture is subject to cost-benefit analysis and education is not. I can see no reason for this anomaly – the assumptions to be made in estimating an ERR [economic rate of return] for education are no

more challenging (or heroic) than those for agriculture” (quoted in Vawda *et al.*, 2003: 648).

By the mid-1990s this had begun to change and cost-benefit analysis was more frequently used in the appraisal of education projects. The World Bank now evaluates staff appraisal reports (SARs) for projects in all sectors in terms of the type of analysis used to justify the investment. Vawda *et al.* compared reviews of education project SARs in 1991, when none of them included cost-benefit analysis and in 1998, when 41 per cent did so. This same analysis judges whether the economic analysis in the SARs is ‘good’, ‘acceptable’ or ‘poor’ on the basis of a checklist of 10 types of analysis, including: (a) evidence of quantitative analysis of alternative project design; (b) completeness and internal coherence of cost-benefit or cost-effectiveness analysis; (c) sensitivity/risk analysis; (d) poverty and gender analysis; and (e) institutional capacity.¹¹ Vawda *et al.* noted that the proportion of education project analyses rated as ‘good’ or ‘acceptable’ rose from 74 per cent in 1993 to 94 per cent in 1998 (2003: 649). They used these analyses to test the hypothesis that World Bank education projects have a higher likelihood of being successful if, at the time of appraisal, there was good quality economic analysis. Their research was based on an analysis of 104 World Bank education projects. The most significant finding, for the purpose of this booklet, is the conclusion of Vawda *et al.* (2003: 657) that:

“There is a strong relationship between cost-benefit analysis or cost-effectiveness (CB/CE) analysis and project outcomes ... This is indicative of the importance of good quality CB/CE analysis at project design stage. Project economic analysis is a tool to weed out poor potential investments and to select potentially worthwhile investments. Project economic analysis could be used to select among alternative projects or to re-design project components so that they will be higher yielding and more likely to have satisfactory outcomes. It is the CB/CE analysis that provides clear guidelines in making such a decision.”

11. The full list of ten dimensions of economic analysis is available from: http://www.worldbank.org/education/economicسد/project/projwork/ten/ten_dimensions.htm

Cost-benefit analysis and cost-effectiveness analysis are, of course, only two kinds of economic analysis that can be used in project appraisal. Other types of analysis mentioned by Vawda *et al.* include analysis of demand, the fiscal impact of the project and analysis of what supply would be provided by the private sector in the absence of a project. For some projects these may be more relevant than cost-benefit analysis. Another article by three World Bank economists (Devarajan, Squire and Suthiwart-Narueput, 1997) argued for a shift in the emphasis of project evaluation away from a concern with precise rate-of-return calculations and towards broader approaches including public expenditure reviews and sectoral analyses, such as an examination of the rationale for public intervention and analysis of the fiscal impact of the project in terms of additional taxes that may need to be raised to finance it. These two points of view are not, in fact, contradictory. Both groups of economists advocate a systematic analysis of the costs and benefits of a proposed project as part of its appraisal. Where they differ, perhaps, is in their assessment of the value of rate-of-return calculations.

In some sectors, project appraisal may take the form of a simple comparison between estimated economic rates of return to different project options. In such cases, the investment decision is simple: choose the project design offering the highest rate of return. Experience, as reviewed by the World Bank economists summarized here and indeed as emphasized throughout this booklet, shows that rate-of-return estimates are not sufficiently precise for this rule always to be applied. Nevertheless, the clear message from this recent review of over 100 World Bank education projects is that cost-benefit analysis is a valuable tool for project appraisal, particularly if it is used sensitively and interpreted with care. It also appears to be a tool that is increasingly being used. The World Bank evaluations of SARs suggested that cost-benefit and cost-effectiveness analysis has been more frequently used since about 1996 than in earlier years. This is an indicator of the increasing influence of cost-benefit analysis, at least in the World Bank. The final chapter will consider more broadly the usefulness of cost-benefit analysis as a tool in educational planning.

XII. Conclusions: the practical usefulness of cost-benefit analysis in educational planning

Educational planners in developing countries are constantly faced with the problems of allocating resources to education and between different types of education in order to maximize society's goals. Economic growth is only one of those goals, but it is one to which high priority is attached so that any technique which promises to show which pattern of resource allocation will yield the greatest returns is likely to be welcome. In recent years, some exaggerated claims have been made for cost-benefit analysis and critics have been quick to point out that this new economic technique does not automatically solve problems of allocation, as *Chapter VI* showed. The investment rule 'to invest in those projects offering the highest rate of return' appears simple enough, but when it is recognized that the calculation of the rate of return depends upon critical assumptions about the extent to which earnings reflect productivity, the extent to which earnings are influenced by tradition or by the distribution of ability and family characteristics in the population, the extent to which future demand-and-supply relations will match those observed today and so on, it may appear that cost-benefit analysis has, after all, little to offer the educational planner.

Cost-benefit analysis does not offer an automatic solution to problems of resource allocation. It is often difficult to interpret social rates of return due to known distortions in the labour market, the fact that the future pattern of demand and supply is likely to be rather different from that prevailing today and as externalities are so difficult to measure.

Cost-benefit analysis also does not provide numerical targets for the planner. At best, it provides a direction indicator: 'to invest in this type of education', not 'to provide places for x thousand secondary school pupils or engineering students'. Single-valued estimates of rates of return may be misleading whereas sensitivity-analysis can do no

more than provide estimates of a range of values within which the 'true' rate of return will fall. At first sight, then, cost-benefit analysis does not provide the answers that educational administrators or planners seek.

On the other hand, cost-benefit analysis may point to questions which it is important to ask and which have been ignored in the past. What evidence does the pattern of earnings of educated manpower provide of a shortage or excess supply of certain types of manpower? What is the relationship between the costs of educating highly qualified manpower and its use in the labour force? What effect would a change in salary structures have on private demand for education? What scope is there for the government to influence private demand for education by manipulating financial incentives; for instance by changing student aid policies, introducing loans in place of grants or providing extra subsidies to overcome critical skill shortages? This is no more than the beginning of a list of questions that may be thrown up by cost-benefit analysis of education and techniques that suggest fruitful new questions may be as useful as answers to existing questions. *Chapter X* gives many examples of attempts to answer such questions.

But does cost-benefit analysis provide reliable answers? *Chapter XI* showed that it may be useful in decision-making in a number of ways: (a) Cost-benefit analysis may point to the need for changes in resource allocation in favour of those types of education offering the highest rate of return. As cost-benefit analysis is a form of marginal analysis, it can never show what will be the effect of a very large-scale change in the pattern of allocation or specify the precise magnitude of the change, but it can provide 'direction indicators'; (b) Cost-benefit analysis may suggest ways of increasing the profitability of education, either by increasing its benefits or lowering costs. Measures for improving the use of manpower will raise the benefits associated with education while measures to reduce wastage or exploit economies of scale will lower costs. In either case, the rate of return to education will increase; (c) Estimates of the private rate of return can be useful in explaining patterns of private demand for education both in terms of demand for different types of education or fields of study and in terms of the effects of different

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patterns of finance. For example, high private rates of return for university courses may lead to excess demand and graduate unemployment as in India in the 1960s or may justify increasing the private costs of education as in Australia and the UK in the 1990s; (d) Cost-benefit analysis can be useful in guiding investment decisions of funding agencies or donors by showing which education projects are likely to be profitable. Estimates of rates of return are only approximate and should not be used alone; but if combined with other forms of economic analysis, cost-benefit analysis can provide a useful tool in project appraisal.

Finally, perhaps the most important aspect of cost-benefit analysis is that it provides a conceptual framework for the examination of the costs of education in relation to the relative earnings of educated manpower. Both these elements have been neglected in some educational planning exercises in the past, when these were based solely on forecasts of manpower requirements or social demand.

Some of the literature on educational planning has represented cost-benefit analysis and manpower forecasting as mutually exclusive approaches to planning. This is unfortunate, as both manpower forecasting and cost-benefit analysis are attempts to achieve the same goal: the rational allocation of resources in order to avoid shortages or surpluses of educated manpower and to ensure the most efficient use of scarce resources in terms of economic growth. Detailed forecasts of manpower requirements are less common than in the past as a guide to educational planning, however there is still a strong case for analysis of labour market patterns and trends including estimates of supply and demand for particular categories of skilled workers. Cost-benefit analysis provides a means of assessing the current demand and supply situation in terms of earnings patterns. Short-term manpower forecasts may suggest ways in which the supply of educated manpower should be modified in order to achieve a new pattern of labour distribution. An analysis of the new pattern of earnings differentials then provides a means of assessing the responsiveness of the labour market to the new supply situation and an analysis of costs shows the resource implications of the change in supply. A new cost-benefit calculation can then provide a means of relating this information about supply and demand in such a way as to suggest further

modifications in supply. Techniques such as graduate tracer studies can be used both to analyze labour market trends and to collect earnings data required for cost-benefit analysis.

Used in this way, cost-benefit analysis can supplement the information provided by estimates of manpower supply and demand and tools for labour market analysis such as tracer studies, measurement of unemployment rates and job vacancies. At the same time, analysis of the labour market and manpower patterns can supplement cost-benefit analysis, for instance by making it possible to calculate 'shadow' rates of return which more nearly reflect true marginal productivities than those calculated from observed data.

In fact, it is the framework of cost-benefit analysis with its emphasis on both supply and demand for educated manpower and its emphasis on the costs of education as well as its supposed benefits that is likely to be of most value to educational planners in developing countries. *Chapter XI* suggested that numerical calculations of rates of return may be helpful for policy decisions, however it is more important to attempt some sort of systematic comparison of the costs and benefits of a proposed policy or project and the balance between them than to make precise estimates of rates of return. It may prove difficult in certain situations to obtain data for precise calculations of rates of return. These are, in any case, subject to some difficulties of interpretation, as this booklet has shown. On the other hand, if every proposed expansion of education were examined in the light of its real costs and likely effects on the relative wage structure in the economy, educational planners might well avoid some expensive mistakes.

Cost-benefit analysis is likely to be accepted more readily by educational planners when more progress is made towards the quantification of the indirect benefits of education. Even so, there will always remain objectives that cannot be measured in economic terms and *Chapter I* showed that cost-effectiveness analysis may be a more appropriate technique for measuring the success of education systems in satisfying such objectives. In the case of both cost-benefit and cost-effectiveness analysis, the essential principle is that an attempt is made to judge both the results of a project and its costs.

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In conclusion, we might return for a moment to the concepts of ‘opportunity cost’ and ‘alternatives foregone’ that were discussed earlier in the booklet. The virtue of cost-benefit analysis is that it focuses attention on the problem of choosing between alternative investment patterns yielding different combinations of benefits in relation to costs. Educational plans framed in terms of ‘requirements’ or ‘needs’ may obscure the obvious fact that all planning consists of choices between alternatives. If cost-benefit analysis does no more than remind policy-makers and planners of this truth and provide a tool for comparing alternatives, it will serve a useful practical purpose for educational planning.

References

- Arrow, K. 1973. "Higher education as a filter". In: *Journal of Public Economics*, 2(3), 193-216.
- Ashenfelter, O.; Rouse, C. 1998. "Income, schooling and ability: evidence from a new sample of identical twins". In: *Quarterly Journal of Economics*, 113(1), 253-284.
- Becker, G. 1964, 1975 (2nd edition). *Human capital*. Chicago: University of Chicago Press.
- Behrman, J.R.; Birdsall, N. 1983. "The quality of schooling: quantity alone is misleading". In: *American Economic Review*, 73(5), 928-946.
- Bennell, P. 1995. *Using and abusing rates of return: a critique of the World Bank's 1995 Education Sector Review* (IDS Working Paper No. 22, September 1995). Mimeo.
- Bennell, P. 1996. "Rates of return to education: does the conventional pattern prevail in sub-Saharan Africa?" In: *World Development*, 24(1), 183-199.
- Bennell, P. 1998. "Rates of return to education in Asia: a review of the evidence". In: *Education Economics*, 6(2), 107-121.
- Blaug, M.; Layard, R.; Woodhall, M. 1969. *The causes of graduate unemployment in India*. London: Allen Lane, The Penguin Press.
- Bourne, C.; Dass, A. 2003. "Private and social rates of return to higher education in science and technology in a Caribbean economy". In: *Education Economics*, 11(1), 1-10.

References

- Bowman, M.J. 1966. "The human investment revolution in economic thought". In: *Sociology of Education*, 39(2), 111-38. Reprinted in: M. Blaug (Ed.). 1968. *Economics of Education*, 1, 101-134. Harmondsworth: Penguin Books.
- Carnegie Commission on Higher Education. 1973. *Higher Education: Who pays? Who benefits? Who should pay?* New York: McGraw-Hill.
- Cohn, E.; Addison, J. 1998. "The economic returns to lifelong learning in OECD countries". In: *Education Economics*, 6(3), 253-307.
- Colclough, C.; Al-Samarrai, S.; Rose, P; Tembon, M. 2003. *Achieving schooling for all in Africa: costs, commitment and gender*. Aldershot: Ashgate Publishing.
- Colclough, C.; Lewin, K.M. 1993. *Educating all the children: strategies for primary schooling in the South*. Oxford: Clarendon Press.
- Coleman, J. 1988. "Social capital in the creation of human capital". In: *American Journal of Sociology*, 94, 95-120. Reprinted in: P. Dasgupta, I. Serageldin (Eds.). 2000. *Social capital: a multifaceted perspective* (pp. 13-39). Washington, DC: The World Bank.
- Dasgupta, P.; Serageldin, I. (Eds.). 2000. *Social capital: a multifaceted perspective*. Washington, DC: The World Bank.
- Department for Education and Science (UK). 1988. *Top-up loans for students*. London: Her Majesty's Stationery Office, Cm 520.
- Department for Education and Skills (UK). 2003. *The future of higher education*. London: The Stationery Office, Cm 5735.
- Devarajan, S.; Squire, L.; Suthiwart-Narueput, S. 1997. "Beyond rate of return: reorienting project appraisal". In: *World Bank Research Observer*, 12(1), 35-46.

- <http://www.worldbank.org/research/journals/wbro/obsfeb97/beyond.htm>
- Dore, R. 1976, 1997 (2nd edition). *The diploma disease: education, qualification and development*. London: Institute of Education, University of London.
- Duryea, S.; Jaramillo, O.; Pagés, C. 2003. *Latin American labor markets in the 1990s: deciphering the decade*. Inter-American Development Bank Working Paper No. 486, May 2003.
<http://www.iadb.org/res/publications/pubfiles/pubWP-486.pdf>
- Hanushek, E.A. 2003. *Some simple analytics of school quality*. Mimeo, January 2004.
<http://edpro.stanford.edu/eah/eah.htm>
- Harberger, A. 1966. "Investment in men versus investment in machines: the case of India". In: C.A. Anderson, M.J. Bowman (Eds.), *Education and economic development*. London: Frank Cass.
- Harbison, R.; Hanushek, E. 1992. *Educational performance of the poor: lessons from rural northeast Brazil*. Oxford: Oxford University Press.
- Harmon, C.; Walker, I.; Westergaard-Nielsen, N. 2001. *Education and earnings in Europe: a cross-country analysis of the returns to education*. Cheltenham: Edward Elgar Publishing.
- Haveman, R.; Wolfe, B. 1984. "Schooling and economic well-being: the role of non-market effects". In: *The Journal of Human Resources*, 19(3), 377-407.
- King, E.M.; Hill, M.A. 1993. *Women's education in developing countries*. Baltimore/London: Johns Hopkins University Press.
- Kwesiga, J. 2002. *Women's access to higher education in Africa*. Kampala: Fountain Publishers.

References

- Levin, H. 1983. *Cost-effectiveness: a primer*. Beverley Hills/London/New Delhi: Sage Publications.
- Levin, H. 1995a. "Cost-benefit analysis". In: M. Carnoy (Ed.), *International encyclopedia of economics of education* (2nd edition) (pp. 360-364). Oxford: Pergamon.
- Levin, H. 1995b. "Cost-effectiveness analysis". In: M. Carnoy (Ed.), *International encyclopedia of economics of education* (2nd edition) (pp. 381-386). Oxford: Pergamon.
- McMahon, W. 1999. *Education and development: measuring the social benefits*. Oxford: Oxford University Press.
- Merrett, S. 1966. "The rate of return to education: a critique". In: *Oxford Economic Papers*, 18(3), 289-303.
- Mincer, J. 1962. "On-the-job training: costs, returns and some implications". In: *Journal of Political Economy* (supplement), 70(5), 50-80. Reprinted in UNESCO. 1968. *Readings in the economics of education*. Paris: UNESCO.
- Mincer, J. 1974. *Schooling, experience and earnings*. New York: National Bureau of Economic Research.
- Mingat, A.; Tan, J.P. 1988. *Analytical tools for sector work in education*. Baltimore: Johns Hopkins University Press (for the World Bank).
- Moock, P.R.; Patrinos, H.A.; Venkataraman, M. 2003. "Education and earnings in a transition economy: the case of Vietnam". In: *Economics of Education Review*, 22(5), 503-510.
http://www.worldbank.org/education/economicssd/research/econseries/moock_index.htm
- Morgan, J.; David, M.; Cohen, W.; Brazer, H. 1962. *Income and welfare in the United States*. New York: McGraw Hill.

- Newell, A.; Reilly, B. 1999. "Rates of return to educational qualifications in the transitional economies". In: *Education Economics*, 7(1), 67-83.
- OECD. 1998. *Human capital investment: an international comparison*. Paris: OECD.
- OECD. 2000. *The appraisal of investments in educational facilities*. Paris: OECD.
- OECD. 2001. *The well-being of nations: the role of human and social capital*. Paris: OECD.
- OECD. 2002. *Financing education: investment and returns: analysis of the World Education Indicators (2002)*. Paris: OECD.
- Psacharopoulos, G. 1973. *Returns to education: an international comparison*. Amsterdam/London: Elsevier.
- Psacharopoulos, G. 1975. *Earnings and education in OECD countries*. Paris: OECD.
- Psacharopoulos, G. 1981. "Returns to education: an updated international comparison". In: *Comparative Education*, 17(3), 321-341.
- Psacharopoulos, G. 1985. "Returns to education: a further international update and implications". In: *The Journal of Human Resources*, 20(4), 583-604.
- Psacharopoulos, G. 1989. "Time-trends of the returns to education: cross-national evidence". In: *Economics of Education Review*, 8(3), 225-231.
- Psacharopoulos, G. 1994. "Returns to investment in education: a global update". In: *World Development*, 22(9), 1325-43.
- Psacharopoulos, G. 1995. "The profitability of investment in education: concepts and methods". World Bank Human Capital

References

- Development and Operations Policy (HCO) Working Paper.
Mimeo.
<http://www.worldbank.org/education/economicssed/research/wbpub/psacharopoulos>
- Psacharopoulos, G. 1996. "A reply to Bennell". In: *World Development*, 24(1), 201.
- Psacharopoulos, G.; Loxley, W. 1985. *Diversified secondary education and development: evidence from Colombia and Tanzania*. Oxford: Oxford University Press.
- Psacharopoulos, G.; Ng, Y.C. 1994. "Earnings and education in Latin America". In: *Education Economics*, 2(2), 187-208.
- Psacharopoulos, G.; Patrinos, H. 2002. *Returns to investment in education: a further update* (World Bank Policy Research Working Paper No. 2881). Mimeo (Forthcoming, 2004, in: *Education Economics*, 12(2)).
http://econ.worldbank.org/files/18081_wps2881.pdf
- Psacharopoulos, G.; Woodhall, M. 1985. *Education for development: an analysis of investment choices*. Oxford: Oxford University Press.
- Robinson, E.A.G.; Vaizey, J. 1966. *The economics of education* (Proceedings of a conference of the International Economic Association). New York: St. Martin's Press; London: Macmillan.
- Schultz, T.P. (Ed.). 1995. *Investment in women's human capital*. Chicago and London: University of Chicago Press.
- Schultz, T.W. 1961. "Investment in human capital". In: *American Economic Review*, 51(1), 1-17, March 1961.
- Schultz, T.W. 1970. "The reckoning of education as human capital". In: W.L. Hansen (Ed.), *Education, income and human capital* (p. 302). New York: National Bureau of Economic Research.

- Schultz, T.W. 1971. *Investment in human capital*. New York: The Free Press; London: Collier-Macmillan.
- Squire, L.; van der Tak, H. 1975. *Economic analysis of projects*. Baltimore: Johns Hopkins University Press.
- The Task Force on Higher Education and Society, 2000. *Higher education in developing countries: peril and promise*. Washington, DC: The World Bank.
- UNESCO. 2002. *EFA Global Monitoring Report 2002*. Paris: UNESCO.
- Vaizey, J. 1962. *The economics of education*. London: Faber and Faber.
- Vawda, A.Y.; Moock, P.; Gittinger, J.P.; Patrinos, H.A. 2003. "Economic analysis of World Bank education projects and project outcomes". In: *International Journal of Educational Development*, 23(6), 645-660.
<http://www.worldbank.org/education/economicssd/research/econseries/vawda.pdf>
- Woodhall, M. 1973. "Investment in women: a reappraisal of the concept of human capital". In: *International Review of Education*, 19(1), 9-29.
- World Bank. 1986. *Financing education in developing countries: an exploration of policy options*. Washington, DC: The World Bank.
- World Bank. 1988. *Education in sub-Saharan Africa: policies for adjustment, revitalization and expansion*. Washington, DC: World Bank.
- World Bank. 1995. *Priorities and strategies for education: a World Bank review*. Washington, DC: World Bank.
- World Bank. 2002. *Constructing knowledge societies: new challenges for tertiary education*. Washington, DC: World Bank.

Suggestions for further reading, information sources and study tools

The references listed in the previous section cover in more detail most of the issues discussed in this booklet, however many assume a knowledge of economics.

The following lists represent some of the most important items in the literature for an understanding of the concepts of human capital and cost-benefit analysis as well as examples of cost-benefit analysis in both OECD and developing countries and reports which discuss the implications of cost-benefit analysis for policy purposes.

A brief new section provides suggestions of material available on the Internet.

The concept of human capital and theory of cost-benefit analysis

Becker, G. 1964, 1975 (2nd edition). *Human capital*. Chicago: University of Chicago Press.

Carnoy, M. (Ed.) 1995 (2nd edition). *International encyclopedia of economics of education*. Oxford: Pergamon.

This book includes summaries of the literature on many topics, including:

Woodhall, M. "Human capital concepts"	pp. 24-28
Solmon, L.C. "Benefits of education"	pp. 114-125
Wolfe, B.L. "External benefits of education"	pp. 159-163
Levin, H.M. "Cost-benefit analysis"	pp. 360-364
Carnoy, M. "Rates of return to education"	pp. 364-369
Levin, H.M. "Cost-effectiveness analysis"	pp. 381-386.

- Hough, J. 1994. "Educational cost-benefit analysis". In: *Education Economics*, 2(2), 93-128.
- McMahon, W. 1999. *Education and development: measuring the social benefits*. Oxford: Oxford University Press.
- Mincer, J. 1974. *Schooling, experience and earnings*. New York: National Bureau of Economic Research.
- Psacharopoulos, G. 1995. *The profitability of investment in education: concepts and methods* (World Bank Human Capital Development and Operations Policy (HCO) Working Paper). Mimeo.
<http://www.worldbank.org/education/economicssed/research/wbpub/psacharopoulos>
- Schultz, T.P. (Ed.). 1995. *Investment in women's human capital*. Chicago and London: University of Chicago Press.
- Schultz, T.W. 1971. *Investment in human capital*. New York: The Free Press; London: Collier-Macmillan.

Examples of cost-benefit analysis

- Blaug, M.; Layard, R.; Woodhall, M. 1969. *The causes of graduate unemployment in India*. London: Allen Lane, the Penguin Press.
- OECD. 1998. *Human capital investment: an international comparison*. Paris: OECD.
- Psacharopoulos, G.; Woodhall, M. 1985. *Education for development: an analysis of investment choices*. Oxford: Oxford University Press.

Applications of cost-benefit analysis to policy issues

- OECD. 2001. *The well-being of nations: the role of human and social capital*. Paris: OECD.

Cost-benefit analysis in educational planning

World Bank. 1986. *Financing education in developing countries: an exploration of policy options*. Washington, DC: World Bank.

World Bank. 1988. *Education in sub-Saharan Africa: policies for adjustment, revitalization and expansion*. Washington, DC: World Bank.

World Bank. 1995. *Priorities and strategies for education: a World Bank review*. Washington, DC: World Bank.

Internet sources

The World Bank's web site has a link to a section on the economics of education, which includes many items on cost-benefit analysis. The main URL is:

<http://www.worldbank.org/education/economicسد/>

There are links to:

1. Psacharopoulos, G.; Patrinos, H. 2002. *Returns to investment in education: a further update* (World Bank Policy Research Working Paper No. 2881). Mimeo. http://econ.worldbank.org/files/18081_wps2881.pdf
2. A selection of 'Learning Tools':
http://www.worldbank.org/education/economicسد/tools/tools_index.htm

This list of tools includes several 'hands-on modules' quoted in this booklet:

- School amalgamation in Barbados: a cost-benefit exercise
- Mauritius Higher and Technical Education Project: a case study

See also, under 'Learning Tools':

- RR: A program to estimate the rate of return to investment in education
- Cost-effectiveness analysis in education

*Suggestions for further reading,
information sources and study tools*

3. Items on project appraisal:
<http://www.worldbank.org/education/economicshed/project/index.htm>
4. A section on research:
http://www.worldbank.org/education/economicshed/research/research_index.htm

This includes:

- i. Key readings, including details of several books and articles on human capital concepts and cost-benefit analysis, listed above under 'References'; see:
http://www.worldbank.org/education/economicshed/research/keyread/keyread_index.htm
- ii. World Bank Publications, including several on cost-benefit analysis (listed above, under References), including: Devarajan *et al.*, 1997; Psacharopoulos, 1995; Vawda *et al.*, 2003; World Bank, 1995. See:
http://www.worldbank.org/education/economicshed/research/wbpub/wbpub_index.htm
- iii. Economics of Education Series, including several on cost-benefit analysis (listed above, under References); see:
http://www.worldbank.org/education/economicshed/research/econseries/econseries_index.htm

There is a web site for the European research project: Public funding and private returns to education (PURE); see:
<http://www.etla.fi/PURE/main.htm>

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