Educational Planning in the Context of Economic Development

1. Introduction

It is only in recent years that economists became interested in educational planning. Several factors combined to arouse such interest: the problem of the *residual* in attempting to account for the sources of economic growth; the resurgence of the concept of *human capital* and the development of a theoretical framework for the analysis of investment in man; the postwar universal preoccupation with economic growth and development, and the general interest in economic planning as an instrument to further such objectives.

Viewed within such context it is not surprising that the notion that aside from its cultural value, education has important economic aspects and that it can and should be used as a means for the promotion of economic objectives, became, within a short space of time, almost universally accepted. Interest in education as an economic activity produced a veritable flood of publications. International organizations such as the OECD have devoted much of their resources to research into problems of planning of the educational sector, and the design of actual plans for various countries. It would now seem that the analysis of the economic aspects of education has passed the stage of being a mere fashion or fad and has acquired a permanent place within the discipline.

Nowhere has the interest in educational planning been so keen, and faith in education and in the benefits that can accrue from the planning of the educational sector so great, as in the less developed countries (L.D.C.). Some empirical evidence and a lot of circumstantial evidence as to the role of education in the process of development have result in the establishment of Human Resources sectors in many a planning

ministry, and in the appearance of a least a chapter on education in every *respectable* strategic development plan. Yet our knowledge, save for the most nebulous kind of generalities, of the causal relationship between education and development is of the most primitive type. Moreover, the various approaches to educational planning which have been put forward are often adopted without regard to their serious shortcomings and to problems relating to their applicability within the development context.

It is to this latter problem that this paper will be addressed. Various approaches to educational planning will be reviewed with the emphasis placed on exploring the assumptions underlying them and discussing their strengths and weaknesses when used for the planning of education in the general context of underdevelopment. Given that general socio-economic context is different from that to be encountered in developed countries (for if not the rationale for studying economic development as distinct from growth becomes obscured), such analysis of the various approaches to educational planning becomes necessary. Computing rates of return to various forms of professional training may constitute a kind of indicative planning of higher education in the USA; it may be a meaningless exercise in Brazil.

2. Rate-of-Return Analysis of Educational Investiments

One of the fundamental notions underlying modern work in human capital is that educational expenditures are similar to other investments in that they involve incurring costs in the form of use of current resources in the expectation of future returns. Thus, if the economic costs of, and returns from education can be quantified, investment decision theory and one of its central tools – the rate of return – can be applied to the problem of determining an optimal allocation of resources to education in general and within the educational sector in particular.

As Solow has pointed out in his *Capital Theory and the Rate of Return* "... the central concept in capital theory should be the rate of return on investment".[1] The use of such "organizing concept" does not merely enable us to avoid many of the perhaps insoluble dilemmas which have plagued capital theory and which are carried over when the theory is extended to include human capital: the problem of how to measure capital and how to define the "period of production". More importantly, the use of such concept would appear to be indispensable

[1] Solow, Robert M. *Capital Theory and the Rate of Return.* Amsterdam, North Holland Publishing, 1963, p. 16.

as an allocative guide for an integrated theory of capital. Whether we consider investments in various forms of physical capital, education, migration of research and development, the rate of return by summarizing the relationship between the present value of costs and returns is essential for rational saving-investment decisions.

The internal rate of return to education (or any other investment) is defined as that rate of discount which equates the sum of the present expected value of costs incurred in the acquisition of education to the sum of the present expected value of the net benefits which can be attributed to it. By distinguishing between private and social costs and benefits, private and social rates of return are computed: the former providing a measure of the private profitability of education and the latter of its social productivity. Both rates are necessary for economic decision making in the educational sector. As it is supposed that the individual, in making his economic decision as to how much and what type of education he should acquire, compares the profitability of this investment in himself with other ways in which he can dispose of his resources, the private rate of return is an important indication of the private demand for education. On the other hand, as education is, for the most part supplied publicly, the social rate of return to education when compared with rates of return to alternative social investments, will indicate whether education, or any particular form of it is characterized by condition of underinvestment. Is is clear that public policy should be guided not merely by reference to the social rate of return but also by taking the private rate of return into account. It in conceivable for the social rate of return to a particular form of professional training to be quite high, indicating underinvestment and yet for the private rate of return and the demand for it to be relatively low. In such case public policy should be designed to alter the relationship between the private costs and returns with the aim of raising the private rate of return and stimulating private demand.

The advantages of using rate of return analysis for the determination of resources allocation to the educational sector and within it seem obvious. Such advantages derive from the fact that the analysis rests on an optimizing model which makes possible the generalization of the concepts of capital and investment. It is interesting to note, however, that it is typical for educational planners, especially in L.D.C., to ignore such analysis, considering it as an elegant methodology more suitable for the writing of Ph.D. dissertations than for the serious busi-

ness of dealing with actual problems of educational planning. Such attitude results not just from the fact that rate of return analysis can at best merely provide an indication of the direction in which changes should be made (i.e. "invest more in primary education and less in university education") rather than the magnitudes of the required changes. It is normally explained by the shortcomings of the analysis which are said to become particularly serious when it is applied in the development context. As we shall see these shortcomings are real, and are indeed serious enough as to raise doubts regarding the usefulness of such analysis.

Education is an activity where the disparities between private costs and benefits on the one hand, and social costs and benefits on the other would appear to be quite considerable. It is this, among other things, which has always made education subject to public intervention and has often brought the provision of education within the public sector. The pervasiveness of the external effects in education and the manner in which it is financed necessitated the distinction between the private and social rates of return made above. This conceptual distinction, however, is of little help to educational planners, for the estimation of the true social rate of return presents considerable difficulties resulting from two fundamental problems: a) when economic interaction occurs outside the market, it is almost always impossible to put a price tag on its effects; and b) even when the interaction is transmitted through the price system there is little way of knowing, and good reasons for questioning, whether the resulting prices actually reflect the real effects.

The first problem is the traditional externality problem which has been extensively dealt with for the case of educational by Weisbrod,[2] and little needs to be said about our inability to quantify most of the likely external effects. It does seem, however, that in the development context such external effects – both positive and negative – become very important, and failure to incorporate them in an estimate of the social rate of return may give seriously misleading signals for resource allocation. On the benefit side, the role played by education in enhancing the diffusion of technology and thus advancing the level of technology which is practiced; the undoubted impact of education in making for a more flexible labour force; and the general effect of education on the receptivity to change and the possibilities for the implementation of structural changes in the economy, are all factors the importance of which

[2] WEISBROD, Burton A. *External Benefits of Public Education: An Economic Analysis*. Princeton, Industrial Relations Section, Department of Economics, 1964.

in the process of development cannot be overstressed. The other side of the coin is also important. Education is often the only open avenue for social mobility and is acquired with high expectations which in many cases cannot be realized due to the limited *absorptive capacity*[3] of the economy, resulting in social frustration, political instability and emigration of talent and skill. All these effects are usually ignored when the social rate of return is estimated, with the result that what is called the social rate of return merely summarizes a relationship between private benefits and public *internal* cost. To base educational plan on such a rate alone would indeed be utter folly.

The second fundamental problem is whether earnings actually reflect marginal productivities and consequently whether earnings-differentials reflect marginal productivity-differentials. Here too one can proceed on the supposition that institutional rigidities; wage structures which are *tradition bound* or tied in one way or another to such administered prices as the pay scales in the public service; and excessive compartmentalization of the labour market associated with rigid skill labeling,[4] despite very large differences in quality and hence productivity, are conditions which are to be found with greater frequency in L.D.C. All these factors are likely to introduce a wedge between earning-differentials and productivity-differentials associated with different levels of education and thus bias the estimates of the social returns to education. Moreover, the direction of such bias will be known only if studies of wage and productivity structures exist, which is not normally the case.

It is important to note, however, that rate of return analysis does not rest on the assumption of labour markets which are competitive. Rather than depending on such assumption, the analysis in fact can provide a test of whether such markets are characterized by competitive conditions.[5] If restrictive practices limit entry into a given occupation, we would expect the private rate of return in that occupation to be higher than in occupations which require similar educational qualifications but into which entry is free. None of this, however, will in and by itself bias estimates of the social rate of return by use of earnings data.

[3] For a discussion of the concept with reference to L.D.C. see LEWIS, W.A. Education and Economic Development. *Social and Economic Studies.* Jamaica, vol. 10, jun. 1961, p. 113-127.

[4] See, for example, LEIBENSTEIN, Harvey. Shortages and Surpluses in Education in Underdeveloped Countries: A Theoretical Foray. In: ANDERSON, C. Arnold and BOWMAN, Mary Jean (ed.). *Education and Economic Development.* Chicago, Aldine Publishing, 1965, p. 51-62.

[5] See BLAUG, Mark. The Rate of Return on Investment in Education in Great Britain. *The Manchester School of Economic and Social Studies.* Vol. XXXIII, 1965, p. 229.

For whatever restrictive practices cause earnings in a given occupation to be higher than they would otherwise be, would also cause the marginal productivity to be higher.

Another problem confronting the rate of return analysis results from the fact that given the high correlation between education and such factors as ability, social class, parental income and education etc., earning-differentials cannot be atributable to education only. In L.D.C. although the correlation between native ability and the level of education may be quite weak due to the undemocratic selectivity features of the educational system, the correlation between parental education, income and social class and the level of education will probably be higher than in more developed countries, with the result that the total effect of these factors may remain the same or perhaps even increase.

Most attempts at separating that component of the earning-differentials which is attributed purely to education have not been successful and most empirical studies have relied on some more or less arbitrary proportion.[6] Ignorance of the *ability etccoefficient* seriously undermines any attempt to employ rate of return analysis to its full advantage by comparing the rate of return to education with rates of return to investments in physical capital[7] so as to determine the optimal allocation of resources to the educational sector as a whole. This, however, is by no means the only problem which has to be surmounted before rates of return to education and to investment in physical capital are made comparable and this advantage of the analysis can be utilized empirically.

To estimate the age-earnings profile associated with a given level of education, cross section data must be used to project lifetime earnings. The rate of return which is thus estimated depicts an *ex post* relationship between the supply and demand for people with a given level of education. This estimation method ignores the "linkages between education and economic development over time.[8] It is obvious that in the process of development, with changing technology, vast changes in the relative importance of the various productive sectors, and the consequent

[6] E. F. DENISON, for example, makes the explicit assumption that three-fifths of the reported *income* differentials of groups with different levels of educational attainments, are due to education. He claims for this assumption no more than plausibility and admits that it is arbitrary. DENISON, Edward F. *The Sources and Economic Growth in the U.S. and the Alternatives Before Us.* New York, Committee for Economic Development 1962, p. 69-70.

[7] For example, HARBERGER, Arnold C. Investment in Men Versus Investment in Machines: The Case of India. In: ANDERSON, C. Arnold and BOWMAN, Mary Jean (ed.). *Op. cit.* p. 11-50.

[8] ANDERSON, C. Arnold. and BOWMAN, Mary Jean. Theoretical Considerations in Educational Planning. In: BLAUG, Mark (ed.). *Economics of Education 1,* Baltimore, Penguin Books, 1968.

drastic shifts in the demands for different types of labour, to ignore such linkages is to neglect what is perhaps the most essential, and obviously what is the most important reason for engaging in educational planning to begin with.

Finally, it should be remembered that the employment of the rate of return approach to educational planning implies that economic conditions and objectives are such that marginal analysis is applicable to the situation at hand. For the rate of return is nothing but that rate of discount which equates the present value of *marginal* costs with the present value of *marginal* returns.[9] For a developing economy striving to reform and convert an antiquated and atrophied educational system into a system which can readily respond to new demands for new skills and abilities, and which is capable of adjusting to the dynamics of growth and change, alignments at the margins may be of relatively little importance compared with the radical structural changes which economic development will probably require.

This catalogue of shortcomings does not, however, mean that rate of return analysis is useless and that its use forever damns its user as many educational planners believe. As will be seen presently, no perfect approach to the problems involved in educational plannings exists, and the shortcomings of one alternative: the forecasting of manpower requirements are equally serious. Rate of return analysis can be of use if it is employed in conjunction with other approaches and if the signals which it provides are interpreted judiciously.

3. The Forecasting of Manpower Requirements as a Methodology for Educational Planning

In contrast with rate of return analysis which is designed to lead to an overall efficiency in the allocation of resources by allowing a comparison of the time pattern of costs of, and benefits from educational investments with those associated with other investments, thus providing signals which in an idealized situation can be used for arriving at an optimum position, the forecasting of manpower requirements approach rests on theoretical foundations which are wholly deterministic. Neither prices nor costs play any part in the model, and the model's predictions are "simply single-valued quantitative forecasts".[10] There are those who argue that

[9] Despite the fact that in practice our estimates are for the average cost and return, and the assumption is made that average and marginal quantities are equal.

[10] PARNES, H.S. Manpower Analysis in Educational Planning, reprinted in BLAUG (ed.), *op.cit.*, p. 267.

presenting the manpower approach as an alternative to cost-benefit analysis serves only to confuse the issue.[11] This view is not shared here. In a trivial sense it is correct, for given the assumptions underlying the manpower approach (see below), and assuming also that fairly accurate forecasting is at all possible, and that production in the educational sector efficient, then one has to concede that "... meeting skill requirements [is] a satisfactory approximation to maximizing returns".[12] These, however, are very heroic assumptions, and the resulting similarity with cost-benefit analysis is too superficial to be of much use in addition to stripping cost-benefit analysis of much of its content. The manpower approach, failling to quantify the costs of, and returns from education, makes it impossible to consider their distribution in time. The notion of educational expenditures as an investment is thus abandoned with the result that it is impossible to compare not only educational alternatives (for no alternatives exist) but also educational and non-educational alternative uses of social resources.

Basic to the manpower approach is the argument that all educational decisions involve forecasting of manpower requirements of some sort, whether such forecasts are made explicitly or implicitly. Granted that a systematic approach to the design of such forecasts may be better than one which is not, the concept of requirements has to be explained. Parnes goes to great lengths in explaining and defending this concept. He emphasizes that it is a "technological" rather than an economic concept, and that requirements should not be confused with demand in the economic sense of a functional relation between price and quantity. This does not mean however, that the concept of *requirements* is devoid of economic content. As Anderson and Bowman rightly point out, it simply means that *exante* zero demand elasticities[13] are assumed. It also implies certain assumptions about the nature of production activities so as to justify such extreme assumptions concerning the demand for manpower, although these are not made explicit.

Pains are also taken to explain that *forecasts* should be understood in the conditional sense. The requirements which are forecast are conditional on the atainment of the general economic objectives as specified by the global economic plan.

[11] See for example, HIGGINS, Benjamin. *Economic Development.* (Revised edition). New York, W.W. Norton, 1968, p. 412.

[12] *Ibid.*

[13] ANDERSON, C. Arnold and BOWMAN, Mary Jean. *In* BLAUG (ed.), *op. cit.*, p. 364.

Given such conceptual underpinnings the methodology itself is rather simple, although as will presently be seen, each stage in the estimation procedure is beset by considerable difficulties. The estimated Gross Domestic Product in the target year is broken into the various sectors and/or industries. For each occupation an average labour-output coefficient by sector or industry is then estimated. This estimated occupational structure is then translated into a structure of educational qualifications which is *required*. Finally, taking account of present manpower stocks properly adjusted for mortality etc., and given estimated wastage rates during the educational process, the number or *required* enrolments in the various levels of the educational system is computed.

This approach to educational planning suffers from many shortcomings, some resulting from its scope, others from its underlying assumptions, and still others from the nature of the estimates which are necessary to arrive at the forecasts. These will now be discussed with special reference to the development context.

Despite the fact that the model is concerned with manpower requirements, it deals only with the formal educational system. Apprenticeship programmes, on-the-job training and the like are ignored. This is a serious omission specially if the educational system is antiquated and overly rigid, where curricula are heavily oriented toward the classics, languages etc., as is the case in many L.D.C. In addition to this, educational requirements are expressed simply in terms of the number of years of schooling. This one-dimensional index is of little help to educational planners: engineers and physicians have roughly the same number of schooling years, yet clearly the relevant question is how many openings are necessary in engineering as against medical schools. To simply say that by year X the economy will need Y people with Z years of schooling is not very helpful. Strangely, despite the technological rigidities assumed on the production side, great flexibility seems to be assumed in the educational sector. The allocation as between different types of training requiring the same number of years of schooling is left to the determination of some unspecified forces, and that despite the fact that the model takes no account of the private demand for education, or of how should such private demand be reconciled with social *requirements*. But surely this misses some important aspects of educational planning. One of the problems characterizing higher education in Latin America Countries, for example, is the fact that training in some disciplines such as Law, and more recently Economics, is extremely popular and is often

regarded as a prerequisite for social advancement and entry into the educated elite, and that despite the relative paucity of opportunities to exercise such professional training. Clearly, a mere determination of the number of university graduates required, specially if university training may mean practically anything in terms of quality, will not be of much help.

The fact that the model rests on the assumption of *exante* zero demand elasticities has already been discussed. This assumption is much stronger than that of *ex post* zero elasticities. The latter simply means that given current technology, various occupations are engaged in the production process in proportions which are fixed. The former, however, extends this supposition to the technology which will prevail at some future point in time, and implies that such technology will be chosen without regard to relative factor prices. As L.D.C. have a relatively wide range of technologies to draw upon and are supposed to adopt that which best fits relative factor prices, such assumption greatly weakens the model. Moreover, estimates of labour productivity (or rather its inverse: the average labour-output ratio) have often been arrived at by the practitioners of the approach through international comparisons. This also may involve ignoring relative factor availabilities and prices in predicting technology and estimating productivity.

The model implicity assumes that at present labour markets are in equilibrium. The problem to which it is addressed is the determination of manpower *requirements* which are necessary so as to allow the planned growth in output between the present and the target year to be realized. But at present labour markets may in fact be characterized by conditions of *surpluses* of *shortages.* If this is the case, the true *requirements* may be smaller or larger than those forecasted by the model. If this is not the case and the assumption of equilibrium at present holds, then this is an indication that autonomous market forces acting through the price mechanism to function reasonably well. The need for forecasting and with it the whole rationale of the model collapses.

Great difficulties surround the various estimation stages which are necessary before the forecast are arrived at. These are problems which are not peculiar to this approach. Nevertheless, the fact that the model is so demanding in the respect, and that given the present state of the arts such estimates may involve high degreess of error, particularly given the dearth of reliable data in L.D.C., inevitably diminishes the usefulness of the model and the credibility of its forecasts. Especially serious

are the problems involved in estimating the sectoral distribution of output at the target date, predicting technology and productivity, and those relating to the translation of occupations into the educational qualifications necessary to exercise them. Various methods have been used to arive at such estimates such as international comparisons, employers' replies to questioners etc. The discussion of these methods and their limitations is outside the scope of this paper. Suffice it to say that on the whole they do not induce confidence in the estimates and hence the forecasts.

The forecasting of manpower requirements approach to educational planning is distinguished by its emphasis on the direct link between the productive part of the economy and the educational sector which turns out one of its inputs-trained manpower. Its great merit is in that it stresses the link over time between growth and development on the one hand, and the preparation of the human resources which are necessary agents for the realization of the growth objective, on the other. Its limitations which have been discussed at some lengths are, however, many and serious. To them must be added the observation that planning is not a once-and-for-all but rather a piecemeal affair, where hopefully past mistakes are constantly being corrected. This, to a large extent, the approach does not allow. For if a forecast is found to be erroneous there is little way of knowing, even *ex post,* where in the complex chain of questionable estimates was the error made so as not to repeat it.[14]

4. Programming Models for Educational Planning

Recently two attempts to apply the technique of linear programming to problems of educational planning have been published.[15] Although still at the pioneering stage, these attempts are extremely interesting in that they try with considerable degree of success to avoid some of the shortcomings of the rate of return analysis and the forecasting of manpower requirements approach. The methodology employed is that of constrained maximization over a given planning horizon. A number of planning periods is covered, allowing for the intertemporal relationships within the educational sector and also between that sector and the rest of the economy. The models thus belong to the mainstream of economics,

[14] BLAUG, Mark. Approaches to Educational Planning. *Economic Journal,* Jun. 1967, p. 267.

[15] BOWLES, Samuel. The Efficient Allocation of Resources in Education. *The Quarterly Journal of Economics,* May 1967, p. 189-219; and ADELMAN, Irma. A Linear Programming Model of Educational Planning: A Case Study of Argentina. In.: ADELMAN, Irma, and THORBECKE, Erik (ed.). *The Theory and Design of Economic Development.* Baltimore, The Johns Hopkins Press, 1966, p. 385-417.

both in the assumption they employ and in the technique utilized. They involve explicitly the consideration of cost and benefit patterns over time, and address themselves to the problem of determining an efficient allocation of resources to the educational sector and within it.

Bowles' model which has been applied to Northern Nigeria an Greece and is currently being applied to Brazil, deals solely with the educational sector. The objective function which is maximized represents,

> the net economic benefits associated with the educational activities, namely the present value of the economic benefits associated with the output of all levels of the educational system over a number of years minus the present value of the associated costs.[16]

The constraints are of two types: a) those relating to inputs supplied exagerously; and b) those relating to inputs supplied from with in the educational system, such as teachers and continuing students. The instrument variables are enrolment levels for each type of education as well as the use of general resources. The solution to the model depicts an optimal pattern of resource allocation within the educational sector. The solution to the dual problem yields shadow prices for the inputs into the educational system.

By means of parametric programming and use of alternative assumptions concerning technology used, the model allows the explorations of "the production possibility set for the educational system" [17] and thus the analysis of various proposed modifications in educational policy. An additional advantage is that the objective function can also be constrained by some boundary conditions representing socio-political considerations which enter into the determination of the conditions under which education is provided.

While the potentialities of such model in educational planning are considerable, its main limitation derives from the weak link between the educational sector and the rest of the system, which is all that this model allows. As the rest of the economy is not explicitly included, demand functions for educated labour are exogenously given, and observed relative earnings are assumed to reflect relative social productivities. In this respect the model suffers from limitations similar to the ones surrounding rate of return analysis, in that estimates of earning-differentials based on cross section data have to be taken as measures of the future social returns to education.

[16] BOWLES. *Ibid.* p. 195.
[17] BOWLES. *Ibid.* p. 194-195.

To overcome such problems a model has to be such as to include, in addition to the educational sector, the productive sectors of the economy which demand educated manpower, and seek an optimal allocation of resources, subject to the various constraints, for the system as a whole. This is precisely what Adelman's model is designed to do. Given an objective such as the maximization of G.N.P. to a set of constraints relating to technological conditions of, and resources available for the educational sector on the one hand and for the productive sectors on the other. The model is realistic enough as to have a two way relationship between the educational sector and the productive sectors. The demands of the productive sectors on the educational system are generated by the model, and the output of the educational system serves as a constraint to production, with simultaneous optimization for all sectors.

The model incorporates cost-benefit analysis in that the comparison between marginal social cost and marginal social benefit for each type of education determines the resources allocated to it.

Adelman's model is perhaps the most ambitious and sophisticated of all educational planning models to date, and probably the most promising. Yet interestingly enough, its results, when the model is applied to Argentina, are not very interesting due to some arbitrary assumptions made for some critical relationships. Nevertheless, it probably is this kind of model — one which manages to overcome many of the shortcomings of other approaches — which holds promise for rational planning of education.