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9. ABSTRACT

In this report, "On Methodology for Education Sector Analysis," we prescribe procedures for analyzing the education sector, and propose criteria for improving them. Two central chapters describe and explain these procedures: chapter four, " A Brief Description on an Education Sector Analysis Methodology" and chapter five, "Questions and Answers Concerning the Methodology." The two chapters mentioned draw extensively from the methodology of an education sector analysis project initiated by the government of El Salvador in July 1973 and scheduled to terminate in December 1975.

Chapter two, "Some Special Problems and Characteristics of an Education Sector Analysis" highlights those distinguishing procedural aspects that have their origin in the nature of education. In chapter three, "Some Common Mistakes and Widespread Misconceptions in Current Analyses of Education" we try to explain why certain current approaches do not have a central role in the proposed methodology; and in chapter six, "Some Policy Issues not Addressed by the Proposed Methodology" we present additional considerations which we think should be taken into account in improving methodology for education sector analysis.

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INTRODUCTION

In this report, "On Methodology for Education Sector Analysis," we prescribe procedures for analyzing the education sector, and propose criteria for improving them. Two central chapters describe and explain these procedures: chapter four, "A Brief Description of an Education Sector Analysis Methodology" and chapter five, "Questions and Answers Concerning the Methodology."

Although one person has written this report and is exclusively responsible for its mistakes and omissions, the two chapters mentioned draw extensively from the methodology of an education sector analysis project initiated by the government of El Salvador in July 1973 and scheduled to terminate in December 1975. The design and execution of the project has been the overall or administrative responsibility of the Ministry of Education Planning and Organization Office (ODEPOR) directed by Ing. José Juan Interiano, and the operating responsibility of ODEPOR's Department of Planning, headed by Prof. Julio Cesar Rosa Manzano, and ODEPOR's Department of Statistics, headed by Ing. Edgardo Alfonso Martínez. The Agency for International Development was invited by the government of El Salvador to collaborate in the project. This collaboration has provided the author with an opportunity which he has valued highly: the opportunity of working with, and learning from, the extremely competent and highly dedicated officials just mentioned. They should not be blamed for the many failings of a report which they did not write nor review, but should be given major credit for whatever light it sheds on education sector analysis methodology.

In addition to the El Salvador officials just mentioned, the author is indebted to various members of a highly professional group of officials of the U.S. Bureau of Census who have also had the opportunity of collaborating in the El Salvador project: David P. McNelis, Chief of the group; Robert O. Bartram, data processing specialist; Floyd E. O'Quinn, mathematical statistician; Anthony F. Boni, education data/systems specialist; and Robert Bair, specialist in computer programming. The author hopes that these officials will be able to set aside time to expand on this report in their respective areas of specialty, as well as correct those portions in which ignorance of the various disciplines involved in sector analysis has led to important mistakes.

As suggested previously, in chapters one, two, three and six, we present our rationale for the proposed methodology and some criteria for improving it. Chapter one, "What is Sector Analysis?" is a description of the general characteristics of this relatively new kind of undertaking. It lays down methodological requirements that should be met by a sector analysis, whatever the sector in question may be. Our acknowledgment of assistance and borrowings with respect to this chapter concerns members of the Sector Analysis Division, established in November 1970 under Louis G. Sleeper, then Assistant Director of the Office of Development Resources. The present or past Sector Analysis Division staff members referred to are Samuel R. Daines, Richard E. Suttor, Russell Misheloff and George V. Poynor. They share responsibility for whatever light is shed on the methodology of sector analysis. They are not responsible for the misconceptions and oversights that may appear in this chapter.

A brief statement about the remaining chapters would appear to be in order. Chapter two, "Some Special Problems and Characteristics of an Education Sector Analysis" highlights those distinguishing procedural aspects that have their origin in the nature of education. In chapter three, "Some Common Mistakes and Widespread Misconceptions in Current Analyses of Education" we try to explain why certain current approaches do not have a central role in the proposed methodology; and in chapter six, "Some Policy Issues not Addressed by the Proposed Methodology" we present additional considerations which we think should be taken into account in improving methodology for education sector analysis.

Comments, criticisms and suggestions concerning this report will be greatly appreciated by the author who wishes to make clear that the judgments and opinions that are expressed herein do not necessarily represent the views of the Agency for International Development.

Chapter One

WHAT IS SECTOR ANALYSIS?

I. "Development"

Early interest in sector analysis grew in a context of dissatisfaction. Dissatisfaction with the progress obtained by nations striving for "development" spread to related issues and concerns, and before long there was dissatisfaction with the meaning of "development," a term or concept that was frequently vague and, when clear, excessively limited; dissatisfaction with the extent of achieved understanding of the relatively few, although very broad problems which were widely accepted as "development problems"-- problems such as increasing gross national product, per capita income, and foreign exchange reserves-- and dissatisfaction with the development policies that had been pursued to date.

Insofar as policies were concerned, it was noted that there were comparatively few differences among the policies that were being pursued in countries which were clearly in many ways unlike. Since achievements were more often than not falling short of expectations, it could be provisionally inferred that the problems had been misconceived and were proving to be more complex and varied than had been recognized. The standard solutions to problems, however defined, might not be succeeding because the factors involved from country to country and within countries, from region to region, were much more dissimilar than had been realized to date. This was, at the very least, a suspicion, and led to the conclusion that comprehensive and disaggregate analyses --

analyses of substantial depth, breadth and precision -- would have to be carried out to obtain an adequate understanding of the national, regional, and local development problems involved.

This extremely general statement can be taken as a basic tenet of sector analysis. Such analysis is concerned with social development and with planning for social development. In other words, it is concerned with social change that is directed towards achieving a situation which is considered preferable to the original situation. In this broad sense sector analysis cannot be distinguished from most other social analysis.[1] What does distinguish it is its commitment to a highly detailed examination of a part of a society -- a "sector"-- and its commitment to a determination of some of the more important relationships of that part or sector to the rest of the society.

Of course, no analysis of any kind can, by itself, bring about specified changes in a society; and to maintain a proper perspective on analysis it may be desirable to view it in its proper place alongside the other kinds of activities required for development. The analysis of social phenomena or events can be looked upon as the first logical step in a cyclical process under which those phenomena are treated in terms

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[1] As should be clear by now, we use the term "social"in the wide sense that includes "economic." It may also be appropriate here to point out that the extreme generality of a "preferable situation"can be resolved into greater specificity only on a case to case basis, as will be set forth at some length in section III, "Multiple Problems and Objectives."

of the following steps: (1) analysis; (2) planning or strategy; (3) program or project design; (4) implementation; (5) evaluation of the analysis, strategy and implementation in the light of implementation results; (6) a subsequent and fresh analysis utilizing updated or more recent data, as well as the results of the evaluation, with the subsequent analysis having broader scope and greater depth.

Although this report dwells on analysis, it should be clear from the above that analysis is conceived as but the first of five logical stages, all of which are essential to development. The sixth stage initiates the next cyclical process-- a process which constitutes an attempt to deal with two fundamental factors or conditions: a) the historical nature of social phenomena, and b) the consequent need to include a continuous learning process in our dealings with social phenomena.

Perhaps this perception of analysis in the general context of social development can be supplemented with some comments concerning analysis in the similarly broader context of inquiry into and reflection about social phenomena. The type of analysis considered here is predominantly empirical in nature and can be looked upon as standing between theory and policy. It will draw on theory and lead to policy, but must be clearly distinguished from both. It will avoid research the main intent of which is to test theories or hypotheses of no perceived immediate importance for policy. It is policy oriented in the sense that it concerns itself with current or anticipated social problems.

And it will avoid being pre-cast into policy through the premature adoption of conclusions that are for some reason accepted or preferred before the analysis is carried out.

Finally, as well as being logically prior to policy, sector analysis is open and welcoming with respect to the disciplines it employs. For example, it does not view itself as economic analysis,nor, for that matter, sociological analysis. And it avoids such identifications, among other reasons, because it will not pre-cast development problems or limit itself to the issues in the manner in which these disciplines and other social sciences are inclined to pre-cast problems and pre-select issues. On the other hand, sector analysis will draw on any discipline that provides concepts and techniques which can contribute to the achievement of development goals. Obviously, the discipline of economics plays a fundamental role. In sum, sector analysis is multi-disciplinary in nature with respect to the theoretical and procedural tools it employs. And, as will be seen in section III, it serves to define "development"at the level of sectors on a case by case basis by specifying the multiple problems and the correlate objectives on which each given sector analysis is focused and in terms of which that sector analysis is structured.

II. What is a Sector?

Many of the comments appearing in the previous section apply to the analysis of social phenomena without limitations of coverage or

scope. But our subject is "sector analysis"and we must now try to answer the question above: what is a sector?

Speaking very generally, a sector is a complex of identified social activities treated as an interrelated system for purposes of analysis, planning and policy. Since all the activities of a society are related, to a greater or lesser extent, the boundaries of a given sector are basically a matter of definition. Negatively, a sector can be defined as a complex of activities less broad than the society as a whole, and broader than the activities generally included in or addressed by a project. More positively, a sector is comprised of activities which are not usually limited to a particular region, may be considered a basic human occupation or need, and are either sufficiently homogenous, having at least one important shared characteristic, or closely enough interrelated to warrant special identification and treatment in analysis, the formulation of policies, and the allocation of resources.

An example or two may help clarify this necessarily broad definition. Consider the agricultural sector. In the analysis of agriculture, the agricultural input industries (tractors and fertilizers, for instance), agricultural marketing, and food and fiber processing industries are often included with primary agriculture as the "agricultural sector." The rationale for including these three sets of activities (agricultural inputs, marketing, and processing industries) along with farming is that these activities are "closely enough interrelated" to primary agricultural production activities "to warrant special identification and

treatment in analysis, the formulation of policies, and the allocation of resources."

In contrast, the activities included in the "education sector" will often be less closely related to one another than they are to other activities in the society. The activities taking place in the law schools may be closely related to activities in the courts and to the national system of jurisprudence. The activities taking place in industrial schools may be closely related to the current industrial technology and practice. In such cases these relationships may turn out to be closer (in the sense that changes in one are more promptly and markedly reflected by changes in the other) than the relationships law and vocational school activities have to primary education activities, for instance. Were such the case, it would appear that the "education sector"activities have been selected on the basis of a "specific, shared characteristic"-- all of them being deliberate attempts to induce skills or knowledge or both.[1]

In no country are health or education activities limited to a particular region, and in all countries they are looked upon as addressing a basic human need. As a result, they have traditionally had public revenues allocated to them. This is not to say the <u>only</u>

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[1] This is not to say that activities that are "educative" in effect, though not by intent, are disregarded. How they are dealt with falls under section V, "Comprehensiveness."

reason health and education are sectors is that they have been viewed and dealt with as such, nor that the identification of these sectors is predicated on the fact that countries tend to have education and health objectives. For it should be noted that in each one of these cases, we are not merely talking of a "subject" in some abstract sense, but of a set of identifiable activities. If social conditions in any given society are sufficiently altered perhaps the "sectors" will undergo change over time. But the definition of a sector, new or old, must be such that the activities pertaining to it can be unambiguously identified. In sum, each sector analysis is at liberty to provide its own definition of the sector in question, but it must be a definition which serves to clearly identify the activities in that sector. Admittedly, such flexibility could lead to the definition or delimitation of "sectors"the analysis of which might prove to be of little value in solving important problems. Indeed, the determination as to whether a set of activities should or should not be considered a sector will depend in large part on whether analyses of those activities as a system or set turn out to be fruitful procedures for attaining important goals or objectives.[1] The relationship between analysis and objectives is the topic dealt with in the next section.

[1] In some programming systems a distinction is made between "goals" and "objectives"-- the latter term being reserved for quantified targets which are expected to arise out of broader, non-quantified "goals." Under such a nomenclature "increasing or maximizing agricultural production" is considered a "goal" and "increasing wheat production to X metric tons in region Y,"an "objective." Whatever the advantages of these definitions or distinctions for programming purposes, they do not apply to the present discussion in which "goals" and "objectives" have the same meaning.

III. Multiple Problems and Objectives

In this section the terms "problems" and "objectives" are used in a special sense and are to be accepted or viewed as correlates. The broad problems and objectives specified here are in one-to-one correspondence. They are the overall "problems" and "objectives" which the analysis is focused upon and which serve to structure it. For instance, if increasing national agricultural production has been selected as one of the objectives towards which an agricultural analysis is directed, this is because there is a need to increase agricultural production and because presumably some change in strategy or policy is required in order to satisfy that need. That is to say that the need is not presently being met, or that it is believed that it will not be satisfactorily met at some future time in the absence of changes in present or future policy. It is to say, in short, that increasing national agricultural production constitutes a "problem."

The above remarks may dwell upon the obvious at unnecessary length. The intent behind them, however, is to call attention to the fact that the objectives that help structure sector analysis have their roots in the human needs that exist at a particular time and place-- broadly, in the specific society involved and, more narrowly, as these impinge upon the institution conducting the analysis. This observation, banal or not, is offered to counter the frequent allegation that the objectives are necessarily arbitrary-- an allegation that will generally rest upon sweeping statements concerning "subjective" or

"political" factors as if these constituted some final inscrutable mystery concerning which it would be impossible to make any inquiry in order to arrive at warranted judgments.

Objectives are rooted in problems, and are seldom pulled out of the air or the top hat of some cabinet member. Of course, the "problems" we are referring to here can be misconceived, and the matching or correlate "objectives" will then be inappropriate. Moreover, since problems change, objectives change. They will not change, generally speaking, during the course of a given analysis. And this is so not only because such a change would present methodological complications, but also because the relative importance or priority of a given objective cannot be accurately determined (nor, a fortiori, can reasons be found for discarding it as a priority objective) if it is withdrawn from an analysis before completion of that analysis. Obviously, the initial selection of objectives-- a selection that is carried out before the analysis begins-- constitutes a preliminary judgment or appraisal concerning priorities. Such an appraisal may prove to be wrong-- somewhat as a hypothesis in any scientific endeavor may prove to be wrong-- but in both cases such a conclusion requires completion of the inquiry in question.

For example, including the objective of increasing agricultural employment in an agricultural sector analysis reflects the belief that agricultural employment is an actual or potential "problem." But how big a problem is it? That's one of the questions that needs to be

answered by the sector analysis. Conceivably, the initial appraisal, even the initial data, may prove to be incorrect: one of the analytical conclusions may be that agricultural unemployment is not a significant problem. The negative character of such a conclusion does not affect its importance as a finding with substantial policy implications. The fact that it had been considered a problem probably means that resources had been used or would have been used in some way to "solve" it. Assuming, on the other hand, that agricultural employment did prove to be a problem of major dimensions, we would then need to know what sort of a problem it is. A seasonal problem? A problem of physical mobility? Of inappropriate wage structures? A problem that is best solved by expanding employment in the agricultural sector, the industrial or service sectors? And if all three, how much in each? As can be seen, the final detailed nature of the objective hinges on the nature of the problem after that problem has been fully explored and defined.[1]

The major feature of problems and objectives insofar as sector analysis is concerned-- their multiplicity-- is implicit in the above discussion. This is a fundamental characteristic. Clearly, it would be a serious

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[1] This provides another perspective on the correlate relationship between problems and goals, and highlights the main reason that we prefer not to distinguish between goals and objectives. As the highly general, yet-to-be-quantified problem is analyzed, various kinds of specific relationships, including quantitative relationships, accrue to the definition of the problem, and corresponding or correlate quantitative and non-quantitative relationships accrue to the re-defined goal or objective.

mistake to concentrate on agricultural employment in isolation, ignoring other needs and objectives-- for example, increasing agricultural production and realizing a more equitable distribution of agricultural income. In fact, it can be questioned whether the problem of agricultural unemployment can be studied adequately in the absence of other important objectives. This is to suggest that an analysis which addresses various objectives is more likely to uncover relationships of significance for each. It also suggests that each objective is qualitatively distinct, important or potentially important in its own right, and that no single objective such as "maximizing consumer surplus" can serve as a proxy for all. An example that can be cited is that of a recent analysis of the Colombian agricultural sector which was structured in terms of five major objectives: 1) increasing agricultural production, 2) increasing agricultural productivity, 3) increasing national employment, 4) redistributing national income in the direction of greater equity, and 5) increasing the level of foreign exchange reserves.

One of the purposes of a sector analysis is to arrive at a better understanding of the relationships among the various selected objectives-- an understanding which will include quantitative estimates of the complementarities and trade-offs among them. The specific data selected for analysis will depend therefore on the objectives in terms of which the analysis is carried out. This point merits some emphasis. The idea that one can collect and "analyze" all the data bearing on, say, the agricultural or health sector is a misconception that is surprisingly widespread.

Any "study" of the health sector, however ambitious, must be limited in scope, and will invariably "leave out" an immeasurably greater amount of data than it could possibly include. The objectives do not only serve to delimit the analysis. The objectives help define the analysis; they are criteria for the selection of data; and it is their character as correlates to identified problems that make them acceptable as criteria. The main final purpose of a specific sector analysis is to help determine the strategy for achieving the objectives selected. But means and ends form a continuum. Strategies developed to achieve certain goals also serve to specify the implications of these goals. One of the functions of a sector analysis is therefore to determine the relative importance of the objectives in terms of which it is structured, and, as has been noted, the results of the analysis or a change in the situation may lead to a change in objectives. Since the objectives serve to structure analysis, any change in these will point to the need for a new analysis in which freshly uncovered means-ends relationships can serve as an improved basis for policy.

IV. Disaggregation and Interrelation

The utilization of disaggregate data is another basic principle followed in sector analysis. It reflects the recognition that the highly aggregate data in terms of which much economic analysis is conducted masks great variations and ranges, and that policy based on such data is much more likely to err in its identification of problems and consequent

selection of ends, and in the selection of means for the achievement of ends. Sector analysis is sensitive to the fact that one sign of progress in scientific endeavor lies in the making of finer distinctions, that averages can be very misleading, that data can cover, as well as uncover, the underlying factors involved, and that the probability of this will increase with the degree of aggregation that overlooks or fails to represent important differences.

Since a difference is important if it affects or can affect the problems and objectives under investigation, and since this is seldom known a priori, one of the purposes of analysis is to distinguish between trivial and significant detail. To make this distinction the analysis must begin with data that is disaggregate in terms of geography and in terms of activity. In education, for example, working with the primary education dropout rates for each school, county and province is obviously better than working with a single primary education dropout rate for the nation. When dropout is a major concern, such disaggregation of the data is necessary for determining the varying magnitudes of the problem and for determining the precise geographical location of those different magnitudes without which analysis and corrective measures cannot be effective. The level of aggregation with respect to activity is an equally important consideration, and it is again assumed by sector analysis that the lower levels of aggregation will be of greater analytical utility-- that location, diagnosis and treatment will be more effective when working with dropout rates for each grade than with a more aggregate rate for the

grades, say, one through eight. In an agricultural analysis the importance of geographical location with respect to production and markets is so obvious it would hardly need to be mentioned were it not for the fact that considerable national planning is based on aggregate data in which spatial factors do not appear and later prove to be major obstacles and bottlenecks which should have been taken into account. Similar considerations apply with respect to the level of activity. An analysis aimed at achieving income redistribution and increased employment which were conducted, for example, only in terms of farms as the primary production activity, and distinguished these only in terms of their sizes, would be overlooking the significant differences that exist among crops, and among technologies within crops, with respect to their impacts on employment and on the distribution of income.

The above remarks have touched upon the significance of disaggregate data for determining interrelations. As can be seen, the use of disaggregate data facilitates the search for factors and variables affecting the major problems and the correlate desired outcomes or goals. Such disaggregation and search suggests that sector analysis almost invariably involves the manipulation of a large, possibly massive, amount of data-- a manipulation that has been made possible with the automatic data processing capacity of computers. The emphasis on disaggretion and interrelation also suggests that sector analysis can be looked upon as an attempt to bridge the fatal gap in economics that has separated speculation concerning so-called micro-phenomena from theories, analyses and policies

concerning so-called macro-phenomena. With respect to micro-phenomena, sector analysis attempts to place less reliance upon deductions based on over-simplified assumptions concerning individual motives, and to utilize more data which records the observations and measurements of individual behavior.

Since the volume of data entailed by disaggregation is invariably great, and since the data processing involved in the search for interrelations is a correspondingly large job, there is always a need to limit this task. This is one reason why disaggregate analysis tends to be sector or sub-sector analysis. We are obliged to delimit that part of society which will be dealt with in such great detail. On the other hand, the finer detail, or more disaggregate data, collected for the sector greatly facilitates the determination of interrelationships between sector and non-sector activities-- a point that will be considered in the section that follows.

V. Comprehensiveness

The attempt to achieve comprehensiveness-- to examine connections between the sector and the rest of society-- is another main feature of sector analysis. Of course, the relationship of sector and non-sector activities that need to be identified and quantified are those that bear on the major problems and their correlate objectives. For our purposes here these objectives can be classified as intra-sectoral and inter-sectoral. An agricultural sector analysis, for instance, might have five

basic objectives: 1) increase agricultural production, 2) increase agricultural employment, 3) increase national income, 4) redistribute national income in the direction of greater equality, 5) increase the level of foreign exchange reserves. The first two objectives can be classified as intra-sectoral, and the latter three as inter-sectoral.

Speaking broadly, the process of focusing on the agricultural sector-- the decision to carry out an agricultural sector analysis-- is called for or required by the two intra-sectoral objectives: it has been assumed that an increase in agricultural production and employment requires magnification and particularly close examination of activities in the agricultural sector. For instance, the output composition-- the actual and potential production levels of each crop-- must be taken into account to prevent overproductions and consequent failure to achieve the objective in question. However, the interrelationships among sectoral and non-sectoral activities need to be identified and quantified in order to achieve any one of the five objectives, and not merely the three inter-sectoral objectives. They are also needed to assure that the achievement of sectoral objectives does not prejudice non-sectoral objectives unduly.

All the reasons for this come down to one reason. The interrelationships of actions and social events does not come to an end at the edge of a sector: actions have their chain effects; problems in one sector may sometimes be solved most efficiently and effectively by actions taken in another; the problems and goals of a sector may require changing its relationship with another; indeed, "corrective" actions in one sector may have

negative or counter-productive effects in another. To the extent feasible within the time allotted and the analytical resources available, such relationships need to be identified and such consequences predicted. Although the policies and resources at stake or most likely to be altered as a result of the analysis are those of the agricultural sector, the re-shaping of these policies and re-allocation of these resources must consider how actions taken in the agricultural sector will affect inter-sectoral objectives, and how actions taken outside the agricultural sector will affect the agricultural objectives, and what combination of policies, selection and arrangement of actions will contribute most to interrelating the objectives so that these become as integrated and as complementary as possible.

VI. Resource Constraints

A major part of the activity that is carried out under the rubric of sector analysis arises from the traditional economic assumption that resources are invariably scarce. What distinguishes sector analysis procedures for dealing with scarce resources from most other kinds of analysis is that the "allocation" and "utilization" of these resources are to be determined in terms of multiple problems and their correlate objectives or goals. The optimum allocation is no longer necessarily that which contributes most to "growth" as it is at once measured and defined by prices or market "value-added," but it is, rather, the allocation and utilization that contributes most to the realization of various objectives.

Is the pursuit of multiple objectives less likely to bring about "growth"? Setting aside the extremely difficult issues involved in the definition of "growth," it is first necessary to recognize that the attainment of other objectives may in some sense entail a sacrifice to "growth."[1] However, the nature of this "sacrifice" needs to be closely examined, and we must be particularly careful to steer clear of misleading terminological habits.

A recent agricultural sector analysis aiming at maximizing, among other things, agricultural production and national employment led to the conclusion that expansion of a specified set of production activities during the plan period or years in question would serve both to attain substantial increases in agricultural production and national employment, but that, after reaching these new levels, there was no unique set of increments in these production activity levels which would provide equal service to both objectives. One might express this conclusion by saying that the two objectives proved to be largely complementary, with trade-offs presenting themselves only after fairly high levels for both objectives were reached. This means that to speak of the "trade-offs" between these objectives would be misleading if such discussions were not accompanied by a discussion of complementarities.

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[1] We will also set aside all issues concerning the period of such sacrifices- whether these are short or long term. Such issues can hardly be clarified in the abstract since they vary in accordance with the specific situation, problems and objectives involved.

The second point to be made about such "trade-offs" concerns the illumination they provide concerning the context in which they appear as conclusions. In other words, we are generally "given," or assume, a set of present and future factors, such as certain technological levels and a certain geographical distribution of population. With these so-called exogenous variables we arrive at a composition of activities carried out at different specified levels in which the complementarity among objectives has ceased and a trade-off begins to take place between, say, employment and income. These analytical outcomes not only serve to predict and measure the trade-offs if such "givens" prevail, but also, equally important, to highlight the "givens" that need to be altered, or changes that need to be made, if such trade-offs are to be reduced to a minimum.

Although all social activities necessarily compete for scarce land, labor and capital, the fairly widespread belief that planning objectives are competing for resources in a similar way is, in our view, a gross misconception. One function of a sector analysis is to bring out the varying feasible relationships among objectives; another is to determine how the various objectives can be achieved. Since these objectives correspond to real problems and needs-- to pulls and demands within the society-- it is conceivable that harmonizing or integrating the objectives will prove, at least in some cases, to be the best way to obtain a maximum amount of each. Rather than begin by assuming that total production, employment and a more equitable distribution of income are necessarily in

conflict, it may be more fruitful to see to what extent these could be complementary objectives. In sum, there is no reason to believe that the pursuit of multiple objectives is less likely to bring about growth, and it can be argued that an analysis so structured is more likely to reveal hitherto unperceived relationships and thus lay the basis for policy under which greater growth will be achieved.

Whether the objectives are so-called equity objectives, or both, the use of disaggregate data and the pursuit of comprehensiveness through the determination of interrelations across sectors make it possible to arrive at more precise determinations concerning the composition and level of investment required to attain these objectives. At issue in any sector analysis is the allocation of available resources-- whether in the financial form of government revenue, commercial credit, or whatever-- among sectors and within the sector in question in order to attain objectives to the greatest possible extent. By moving beyond conventional considerations for determining these resource allocations, sector analysis provides new criteria for re-allocation among sectors. A health sector analysis, for example, may lead us to the conclusion that additional funds are not to be channeled to curative medicine activities, but rather to public work activities which improve sanitation, and towards agricultural activities aimed at developing protein substitutes for beef in order to improve nutrition, since the latter activities contribute more to the objective of reducing morbidity and mortality (as well as increasing employment if that happens to be one of the intersectoral

objectives). Similarly, the backward linkages of agricultural marketing and processing might be such that a reduction of credit for primary agricultural activities in favor of marketing and processing makes a greater final contribution to the objective of increasing production and employment in primary agricultural activities.

Indeed, the insistence of sector analysis on the utilization of disaggregate data which provides the greatest possible detail concerning geographical location, composition and relationship, reflects its central concern with the scarcity of resources. It is not enough to know the amount of cultivable land a nation possesses. It is also necessary to know the varying kinds of soils and rainfall, their locations, the crops which can be grown on them, their populations, their distance from markets, and so on and so forth. Since a detailed accounting of present and future resources lies at the heart of sector analysis, a continuous process of analysis can provide the nation that has established it with a system of periodic resource accounting reports that distinguish, among other things, between renewable and non-renewable resources in their estimates of future availabilities.

VII. Computation

In previous sections we have suggested that in order to carry out a sector analysis it is necessary to delimit the sector, specify the basic problems and objectives, and to identify the disaggregate data (whether already available or to be generated through special surveys) that is

required for the determination of the most comprehensive possible set of interrelationships that bear on the resolution of problems and the attainment of the objectives, with special attention placed on the scarce resources involved. Obviously, the highly indirect and highly complex nature of the intra- and inter-sectoral interactions that take place among the various activities are not directly revealed by the data. Estimates or quantitative approximations of these interactions and relationships are arrived at through computations which, in addition to handling the large amount of numbers arising from the collected data, are also likely to entail fairly complex mathematical structures that reflect the theories and hypothetical relationships being used to interpret the data.

As was previously suggested, these computations will be very frequently carried out in the form of "models." These models can be looked upon as a set of postulated relationships with a corresponding set of computational procedures, after the symbols and the quantities representing selected factors in the specific situation in question have been supplied. Construction and utilization of the models requires large-scale automatic data processing equipment and considerable computer science personnel time. Close cooperation between analysts and computer science personnel is therefore a common basic characteristic of a sector analysis.

For example, two techniques which have proven to be fruitful analytical tools for the analysis of the agricultural sector are input/output

analysis and linear programming. In the case of the former, a mathematical procedure referred to as inversion, and carried out by means of automatic data processing, of an input/output economic transactions matrix of, say, 250 sectors, provides coefficients or numbers which represent both the direct and indirect effects in 249 or less sectors of a dollar increase in deliveries to the remaining sectors. In this way the chain effect throughout the economy of an expansion or contraction in any given sector can be estimated. Interested in increasing employment and achieving a more equitable distribution of income, we may have allocated resources to sector 5 in preference to sector 17 because the more easily estimated direct employment and income distribution impacts are greater in the case of sector 5, although, unknown to us, the total effects of an investment in sector 17 are greater. By quantifying disaggregate economic interrelationships, i.e., the indirect as well as direct effects, through the design and utilization of the input-output matrix we can avoid making such a mistake.

A linear programming model that incorporates the direct and indirect quantitative relationships estimated by means of the input/output inversion can then be utilized to estimate the extent to which each of the objectives in question could be attained with the scarce resources, specified in terms of disaggregate resource constraints, when the allocation of these resources is directed to the maximum attainment possible of any one of the given objectives. These linear programming outcomes provide not only preliminary estimates of complementarities and trade-offs

among objectives when these are handled seriatim, so to speak, but, perhaps more importantly, detailed utilization accounts of differing distributions of resources that highlight which resources are likely to constrain, and which are not, given the specified objectives, and where and how constraint is likely to take place.

It may be useful to point out that these two models are constructed with particular purposes in mind and that as the result of operations with symbols carried out by their means we are provided with specific kinds of new symbolic information. Thus, the models are a component or a part of the methodology employed and are not to be mistaken for the analysis itself. Nor should any model or interlocking set of models be taken for, or confused with, the existential situation they symbolize for particular and limited purposes.

Computer models are essential for computations involving massive amounts of data. Without them most large-scale analyses cannot be carried out. However, this fact should not so absorb us that it leads us to lose sight of another: such models are invariably highly partial constructs. Among other things, this partiality consists in the following: 1) The concepts and terms (variables) are always limited by the current knowledge and theory. However unlikely it might be that all these could be "included" in a model, were such a model or construction possible (whether or not it were desirable) it would remain a highly simplified construction as compared to the existential state of affairs which it is presumed to "represent." 2) Every inquiry is partial, which is another

way of saying that every inquiry has an object. However vague or indeterminate it may be at the start, a successful study terminates in a specific finding. It focuses on a particular problem, or, if you will, set of problems. In the case of sector analysis, the problems or correlate objectives specified at the start of the analysis structure and limit this analysis, both in terms of the kinds of data selected for processing and the kinds of computational procedures utilized.

"Models" are self-enclosed constructs. This can be looked upon as both a virtue and a defect: a virtue because such enclosure permits mathematical and deductive manipulations without interference. As a result of these manipulations or computations, relationships emerge that would not otherwise be perceived. The self-enclosed nature of a model can be looked upon as a defect because those relationships may be vitiated by false assumptions underlying the "model" and because the model, as such, does not provide for observations which would constitute an empirical check on results. The inescapable partiality or restrictiveness of any "model" and its inescapably symbolic or representational nature constitute two of the reasons for which any model should be looked upon as a component or part of the total methodology. The model or set of models employed are tools or instruments of the analysis. They are not commensurate with it.

The temporal position of models in an analysis should also be considered here. Models are intermediate, not terminal: they are constructed in the process of an analysis, utilize data, reveal and quantify hitherto

ignored relationships, and this new information must then be examined in the context of other available and relevant information. In other words, the "results" of a model are seldom final "solutions": they constitute new data and highly partial, provisional results-- symbols and notations which must be integrated with, and interpreted in the light of, the other available information. Any view of models which fails to acknowledge their instrumental or intermediate role and tends to attribute exaggerated faculties of completeness, adequacy and finality to them can lead to uncritical acceptance of the outcomes obtained from running a model. Such a view of models often underlies the failure to subject these deductive results to further needed interpretation.

VIII. Sector Analysis as a Continuous Process

Since social problems vary among nations, and among regions within a nation, no nation can safely utilize another nation's sector analysis results, nor, a fortiori, adopt the policies based on such results. Although a nation may fruitfully apply an analytical methodology tested and refined upon elsewhere, it will not find an adequate substitute for the establishment of sector analysis as a continuous process.

Such a process does not refer to a single un-ending analysis, but to a series of discrete analyses that follow one upon the other. If a sector analysis requires a minimum, say, of 18 months, and a maximum of 36 months for completion, three to seven sector analyses can be carried out by the responsible institution in the course of a decade. It seems

reasonable to assume that each of these three to seven analyses will build on the accomplishments of the analysis that preceded it, and that the nation will thereby acquire an increasing understanding of the problems involved, improving its planning and policies and more fully attaining its objectives.

The carrying out of sector analysis requires a fairly wide assortment of talents, as well as a large volume of data. Generally speaking, there is much more of both than is recognized. A surprising amount of data that can be used for sector analysis is collected in most countries. Moreover, the methodology of Sector Analysis-I will depend at least in part upon the data available when this process begins. The constant use of data for analytical purposes will also serve to distinguish between useless data which, for some reason or other, has been regularly collected, and information which is needed for the solving of short, medium, and long-range problems. Hence, when a country has moved from its Sector Analysis-I, through its Sector Analysis-II, etc. and arrived at its Sector Analysis-N, it may have ceased collecting some of the data which was gathered when Sector Analysis-I was conducted, as well as specified new or additional data collection requirements. Under such a process, with one analysis building on another, we would expect not only a deepened understanding of the problems and goals to take place, but also the steady addition of new problems and goals, hitherto neglected. For instance, problems and goals related to pollution, the conditions of work, and family cohesiveness could conceivably be added to problems of production, foreign

exchange reserve levels, employment and income distribution, after fuller understanding of, and greater control over, these problems has been achieved as the result of prior analyses.

Of course, sector analysis should not be looked upon as any institution's intellectual monopoly. Generally speaking, sector analysis has been carried out by the ministry charged with major responsibilities in the sector, such as the Ministry of Agriculture, Education, or Health. With time, other institutions, both public and private, may be expected to carry out their own sector analyses, and such analyses may serve to bring new problems and objectives into needed consideration.

IX. Relationships among the Analyses of Different Sectors

As everyone knows, a policy or set of activities is often carried out in a sector in order to solve or ameliorate problems that have been created or aggravated by a policy that has been carried out, and continues to be carried out, in another. The policy carried out in the second sector may be "rational," in the sense that it is accurately aimed at solving a particular problem and at achieving the correlate goal, but it may at the same time be creating a major problem in the first-mentioned sector.

To say that a sector analysis attempts to identify and quantify the broadest possible set of interrelationships relevant to its multiple problems and objectives, some of which are intersectoral, is to say that any given or single sector analysis seeks to reduce the "inner contradictions" or, if you will, national conflicts referred to in the previous

paragraph. The intersectoral objectives that correspond to national problems extending through all or a number of sectors are, by their very nature, major elements of cohesion. But the way these are treated will also depend on the intra-sectoral objectives. For example, national employment and national income redistribution goals are inter-sectoral goals, but the means for achieving these goals will be different if a sharp reduction of rural to urban migration is one of the intra-sectoral goals of the ongoing agricultural sector analysis. Moreover, the identification and quantification of the inter-sectoral relationships that affect the intra-sectoral problems and objectives also help establish the basis for a more coherent set of national policies. The analysis of education from the point of view of its relevance may serve not only to alter certain educational activities, but also to alter employment practices, and thus utilize education and training which has not yet been put to work.

To the extent that the analyses in the different sectors can be related to one another, the basis for establishing a more coherent set of national policies should become broader and firmer. In the first place, one would expect that the inter-sectoral objectives of any given sector analysis would be among the goals considered when designing the methodology of analysis in any of the other sectors. If an increase in overall or inter-sectoral employment and a redistribution of national income are to be found among the objectives of an agricultural sector analysis, they should also be included among the objectives of an industrial sector analysis. In the second place, the intra-sectoral goals of the different analyses should be as consistent as possible with one another. Clearly,

the consistency or lack of consistency among the intra-sectoral objectives of the different sector analyses at any given moment in time cannot be determined a priori. By and large the degree of consistency will be revealed by the completed analyses, and this is one of the reasons that sector analysis should become a continuous ongoing process. Both common goals and the harmonization of means for the achievement of intra-sectoral goals will serve to link policies from sector to sector. Moreover, it is likely that the detailed and comprehensive analysis of each sector, and the linkages among sectors, will help eliminate the piecemeal approach under which each problem, large or small, in each sector, is dealt with individually, and without regard to the possible impacts of its "solution" on other problems and goals. It seems likely that the execution of comprehensive sector analyses, and the linkage of analyses across sectors, would have an integrating effect upon policy, serving to replace a large number of programs (each one designed to focus independently on an isolated problem) with considerably fewer programs. Such a reduction in the number of programs should constitute a diminuition in the government's organization and workload.

Moreover, the solution of major overall problems and the achievement of the correlate objectives should have the effect of eliminating these problems and objectives as structural elements in the analyses that immediately follow. However, the need for analysis is not likely to abate. The satisfaction of social needs always gives rise to a new set of demands, and we can confidently expect to have new problems, conflicts

and objectives to deal with, as well as the inherited problems and objectives which past analysis was unable to handle. As the methodology of each kind of sector analysis becomes more sophisticated, coordination and exchange of ideas and techniques among the different sector analyses will also probably undergo change.

Since the above remarks have dwelled upon possible developments within and among sector analyses, it is perhaps appropriate now to refer to the first section of this paper in which analysis-- macro, sectoral, sub-sectoral or whatever-- was viewed as the first stage of a process under which social phenomena are treated in terms of the following steps: (1) analysis, (2) planning or strategy, (3) program or project design, (4) implementation; (5) evaluation of the analysis, strategy and implementation; (6) a subsequent and fresh analysis which utilizes updated or more recent data, as well as the results of the evaluation. Analysis by itself is insufficient, and we have placed it once again in this context to underscore both the experimental character of most social programs and the tentative nature of analytical conclusions. Full recognition of both these facts is, we believe, a basic condition for the improvement of policy.

In closing it might be appropriate to briefly consider two major intellectual obstacles to the improvement of analysis and policy: (1) uncertainty and confusion concerning how the different social sciences could be related to one another; (2) a lack of understanding concerning how these disciplines relate to the values involved in the problems and

objectives of a society. By drawing on the various social sciences, sector analysis may help shed some light on the way these disciplines can be best interrelated and used. By including new problems and goals under the succeeding analyses that are carried out in the various sectors, sector analysis may help illuminate how these disciplines can be most fruitfully utilized for realizing the values of a society.

Chapter Two

SOME SPECIAL PROBLEMS AND CHARACTERISTICS OF AN EDUCATION SECTOR ANALYSIS

I. The Nature of the Sector: Problems of Delimitation

As was pointed out in the previous chapter, the definition of a sector should be such as to make perfectly clear which actions fall within it and which actions do not. In order to define or delimit the education sector it may be necessary to begin by posing an old thorny question: what is education? The question may provoke a groan, but it cannot be avoided, and even a brief general answer will make it easier to assess the concepts and techniques proposed here for utilization in an analysis of the "education sector."

The conception of education utilized in this paper is extremely broad--practically commensurate, in fact, with communication and social continuity. We shall define it as the deliberate means by which a society transmits its interests, purposes, attitudes, beliefs, knowledge, information, skills, and practices. 1/

Which activities or practices are we to classify as educational? In which environments does learning take place? The two questions are not the same. To the extent that an individual in any given

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1/ See "Democracy and Education" by John Dewey, chapters 1-4: "Education as a Necessity of Life; Education as a Social Function; Education as Direction; Education as Growth."

social environment shares or participates in some cojoint activity, appropriating purpose, method and subject matter, and acquiring needed skills and appropriate emotional attitudes, he is undergoing that form of adaption generally referred to as learning. And it is obvious therefore that learning takes place in almost every kind of environment, and that the "learning sector" in any given society is as broad as the society itself.

We define as education activities those which have as an explicit, though not necessarily exclusive, purpose, the achievement of learning. The activities that comprise the education sector are, thus, a subset of learning activities. Clearly, this definition comprehends a very large range of activities, such as, all schooling from kindergarten through post-doctoral studies, correspondence courses, apprenticeship and on-the-job training, literacy programs, agricultural extension, and family planning instruction.

Does this mean that activities which have learning as a result, but not as a purpose or end-in-view, should be ignored or disregarded in an education sector analysis? Since a sector analysis is aimed at providing the information needed for solving problems and attaining correlate goals, the information attainable concerning activities which have learning as an effect, though not as an intent, should be included in the analysis. As a result of the inclusion it might be determined that certain of these activities constitute more effective and efficient means for attaining selected objectives and that their expansion is therefore to be preferred to the expansion of a corresponding set of education activities. Indeed, "comprehensiveness" was identified in the preceding chapter as one of the main characteristics of a sector analysis precisely because the

composition and levels of activities outside the sector in question affect intrasectoral problems and objectives, as well as intersectoral problems and objectives.

It may be necessary to point out the term "comprehensiveness", taken literally, represents an ideal direction or maximum limit towards which specific sector analyses should tend. An attempt to include all non-education activities with learning effects in a given analysis would be patently absurd, not only because such a large endeavor would constitute an unmanageable task, but also because an undiscriminating inclusion of activities would reflect confusion about the specific issues, problems and goals in question. Indeed, such considerations serve to highlight the need to make education sector analysis a continuous process. Under such conditions it becomes possible to systematically add a reasonable increment of selected new activities in each succeeding analysis and thus carry a manageable workload. The selection of specific activities will depend, in turn, on the problems and objectives upon which the analysis is focused -- a matter to be considered in the following section.

II. Objectives

Objectives are probably the most difficult structural components to specify in an education sector analysis. The enormous number of important objectives in the education sector and their great variety--the radical differences among them with respect to their qualities and relationships--is a basic fact we must confront. And although we do not expect to stand enthralled and helpless before the mysteries of education, we are convinced great harm would result from expensive and time-consuming sector analyses

in which major aspects of education are ignored or impatiently thrust aside. Since we are looking for practical results, we must know what the limitations of our methodology are. And we can determine what the methodology can and cannot do only if we begin with an explicit acknowledgment of the range and complexity of the subject matter.

The acquisition of information is a part of the educational process, and it has the attractiveness of its presumed measurability, but it remains a part that does not stand alone, however frequently it may be taken for the whole by pedants. In part because knowledge is retrospective and thinking primarily prospective, the possession of information does not imply, much less constitute, the ability to think and to solve problems. What do we learn and why do we learn it? What should be learned, by whom, and how? Knowledge for what? These have always been and probably will always remain extremely fruitful questions.

Thinking cannot take place without information and knowledge. These are, so to speak, the working capital for thinking. But the fact that their mere possession does not bring about good thinking, or the solving of problems, can hardly be overemphasized. Most systems of education fail to bring about an adequate development of the capacity for thinking and for the solving of problems. Many, if not most, education systems, manage to dampen the curiosity of individuals and to spread their kind of narrowness among them. In view of these facts, we must be very careful to avoid identifying the acquisition of certain information, easily distinguished and measured, as the main purpose of education.

Acknowledging the multiplicity of specific objectives and their variation with respect to the age of the people, the subject-matter, environment,

occupation and interest involved and leaving aside the issue of measurability, we will proceed to some general statements about educational objectives.

We must first register an objection. Many recent analyses of education seem to view "production" and "consumption" as the two final social realities which, when employed as categories, reflect all the meanings with which serious educational planning must deal. Given this assumption and point of departure, education becomes a primarily productive activity. The education then has a rather simple and direct function: to satisfy the occupational demands of a pre-existing economy. The economy needs literate workers, doctors and engineers, and the education system "supplies" them. Whatever else takes place in the education system can be summed up in the word "Consumption"-- some sort of immediate enhancement or enjoyment, a minor aspect of no concern for planning.

Clearly, "production" and "consumption" constitute one way of dichotomously classifying a society's activities; and it may be a useful one in dealing with a whole array of problems and issues generally characterized as "economic". But when education activities are subsumed and retained for analytical purposes in such a dichotomous scheme, an extremely one-sided and limited view of education is the result -- a view that even from a so-called economic standpoint, involves serious distortions. Educational activities and other social activities are in constant interaction; neither can be looked upon as independent or exogenous "variables." A healthy education system would be a mere passive responder only in a completely

static society. For example, it is a function of the university to increase our understanding of physical and social relations; and new conceptions of these relations usually leads to new occupations. In other words, education is a stimulus, as well as a response; it creates, as well as satisfies "demands": to view it only as "supply" is to misconceive its nature.

Specification or statement of the educational objectives in a sector analysis should reflect not only the principal problems and needs of the society and the individuals that compose it, but its aspirations and purpose as well. These should take into account occupational or manpower requirements, the need for increasing, or at least renewing among the younger generations, the cooperation of individuals with other members of the society, for improving thinking and the solving of problems in a variety of subject-matters, for increasing sensitivity to stimuli and a corresponding expansion in the range of responses and enjoyments, and for broadening sympathies beyond that which affects the individual directly or immediately. Though such a list of desideratum would probably be accepted by most individuals interested in education, these desideratum are so general, the acceptance or consensus could turn out to be merely verbal and therefore without much significance. Consequently, if such general aims are to be something more than empty rhetoric they must be translated into specific objectives and targets. Moreover, such translation should be carried out-- the more specific decisions must be made-- at the individual and the local level, as well as at the levels of province, region and nation. One purpose of a national education sector analysis is to acquire the understanding of present activities required

for an improvement in the present exchange of information among the different government levels and for improvement in present decision-making processes. For without such improvement the translation of very general aims into specific measurable goals and objectives is not likely to take place.

The determination of specific objectives in education circles mainly around issues and questions of content. They do not focus simply on how certain predetermined things are most efficiently "learned", but on what things should be learned. Cooperation, for instance, is not learned in a vaccum, but in terms of specific tasks. And which specific tasks are most likely to develop habits of cooperation in a given individual or community is precisely one of this issues which must be faced in planning for the education of that individual or community. Similarly, the desire for and pursuit of learning, however greatly it may later broaden in scope, has its origin in learning experiences of specific subject-matters in which satisfaction and consummation have been achieved. As a consequence, the selection, or more precisely, the determination of objectives is the analytical component most difficult to deal with in an education sector analysis, as well as the component which probably distinguishes an education analysis most sharply from other sector analyses.

In the current thinking about education there are two viewpoints which are not as new as they seem, but are, rather, fairly recent revivals, and which have come together to create a substantial methodological

complication. On one hand, there is an increasing acceptance of the implications of education for life-- a reluctance to limit learning to the recall of information and the exercise of easily measurable formal skills pertaining to academic subjects. On the other hand, the increasing scarcity of resources for education and increasing doubts concerning the effectiveness of schools, have led to a much broader definition of the education sector, and have increased our interest in the possibility of identifying and accurately measuring all the learning events that take place within and outside the sector in order to best formulate policy and allocate scarce resources. In short, at the same time that the subject-matter of education has become broader, more varied and complex, the demand for greater rigor and precision in the study of this subject-matter is being made in many quarters. Although both demands are reasonable demands, the complexities of the problems that must be dealt with in attempting to satisfy such demands should not be brushed impatiently aside as they so often are.

Is the relationship of national objectives and individual objectives the same in education as in agriculture? As we see it, they are not the same in practice, and should not be precisely the same in analysis. Were it possible to identify or create some undifferentiated "learning" unit, homogeneous to all of the disciplines, and were it possible to obtain all the information necessary to bring about the maximization of such units, the undertaking and accomplishment would constitute an unmitigated absurdity. In an agricultural sector with large-scale unemployment and underemployment,

the maximization of employment is an obviously reasonable goal.[1/] Moreover, from the point of view of employment it does not matter what proportion of it is due to increased production in corn and what proportion is due to increased production in potatoes--so long as the effective demand constraints insure against over-supply. Education goals are extremely numerous, and, as has been pointed out, a major task facing education is the translation of general objectives into specific objectives. It would seem reasonable to expect these objectives to vary from community to community, and from individual to individual, and to expect that this variance would not be determined exclusively by decisions taken at the national level. The different character of education decision-making at local and other decentralized levels, and the relative scarcity of needed information concerning the sector at the national level are factors that must be taken into account in formulating national education goals. Finally, the goals utilized in structuring the analysis may lead to a different set of goals--formulated after the analysis has been carried out, and based on relationships revealed and quantified by the analysis.

1/ It should be noted, however, that such a goal, although a reasonable objective in many situations, if pursued as an absolute, that is to say, as the only goal, will lead to irrational resource allocations, viz., to resource allocations which entail the frustration of other basic human aspirations. The mania of fastening on the goal or objective in fashion, as if its attainment would automatically settle everything, (the common assumption, for instance, that growth will automatically solve the problems of employment, that employment expansion will solve the problem of income distribution, that income distribution will solve the problem of work satisfaction, and so on and so forth) this fundamental and mistaken assumption stands behind many of the flaws in national and international policies. A prior analysis of the situation makes it possible to identify the major problems and deficiencies and therefore to determine what the various goals should be, and how much of each can and should be attained with the available resources.

In education as well as in other domains, ends as well as means, should be subjected periodically to re-examination. This is one of the reasons analysis should be a process, rather than a one-time affair. For then revision or refinement of ends is easier to carry out.

In the agricultural sector, as we have pointed out, the main national purposes are usually comparatively easy to determine before analysis, and the reason is that the overall correlate problems are obvious: more food is needed, unemployment is extensive, and foreign exchange is chronically scarce. What needs to be done in agriculture? A straightforward answer can usually be given: increase production, employment, and foreign exchange. How this is best done with available resources becomes the whole purpose of the analysis. Past failures suggest that there has been serious misunderstandings of the factors involved, and analysis is needed primarily, although not exclusively, to focus on the means, on those conditions which will bring about the desired outcomes or ends. And it may be useful to point out that, once achieved, these ends may themselves become means to other selected outcomes or ends.

Unfortunately, in education the overall "problems" are not as clear, and as a result, the desired outcomes, the ends, are more difficult to formulate or select. The major agricultural needs and corresponding deficiencies are much easier to determine than those of education. And the common attempt to establish educational objectives in the abstract, i.e., without a thorough and detailed understanding of current educational needs, practices, and accomplishments, is often a grave mistake. Before

making irrevocable decisions about what different people should learn, it may be useful to examine specific envirnoments to find out what different people are presently learning, how they are learning it, and how they are using it. Perhaps as a first step, the analytical process should inquire into the present status of the sector, concentrating on the measurement of the knowledge, skills and attitudes presently attained, the various processes by which they're attained, the resources utilized in these processes, the range of efficiencies in these processes, and the uses to which the learners are putting their learning. After conducting such an inquiry all levels of government, schools and other institutions should be in a much better position to formulate more specific objectives.

III. The Individual

It may seem idle to point out that a specific act of learning involves both a subject-matter (be it plowing, arithmetic, or nuclear physics) and an individual. And yet, the history of deliberate or formal education seems to indicate rather clearly that more often than not one of these two elements is emphasized at the expense of the other. There have been times in the schools when student initiative and interest have been relied upon to such a great extent, "the curriculm" is practically discarded. At other times educational fashion has oscillated to the other pole, student differences are disregarded and "the curriculum" becomes a detailed, highly scheduled, inflexible program, allowing for no deviation in terms of subject-matter or timing.

It is clear that both extremes should be avoided. If the individual or "student" is not a fount of wisdom merely waiting to be unstoppered, neither is he clay or putty that can be automatically pressed into shape by some mould. However young or pliant, the individual enters a specific learning environment with active tendencies and interests, desires and experiences, fears and limitations. His possibilities of learning are greatly increased if the nature and timing of events in the learning process represent adjustments that have taken both the individual and the "curriculum" into account.

All these observations may seem obvious, but they have implications for measurement and the formulation of objectives which are often disregarded in practice. Although increasing attention is being given to measurable objectives and periodic testing to determine progress, it is surprising how seldom pre-assessment of the individual is proposed.

Although current measurement techniques are less than satisfactory, it would seem reasonable to assume that pre-assessment--that is, the most extensive possible assessment of the individual before the learning program begins--would increase the possibility of exploiting native powers, relating prior interests and tendencies to desired learning outcomes, and that pre-assessment would also decrease the possibility of selecting inappropriate or unrealizable goals. The current insistence on measurable objectives and frequent measurements may turn out to be a major factor in bringing about continuous evaluation of and adjustment in the instructional process. Extending measurement to a greater range

of elements and including pre-assessment in the measurement process should contribute to a better determination of ends and to a reduction in the number of educational failures.

Individuals are active, not passive, creatures and they learn most effectively when the **particular** environment or program engages their interests or active tendencies, and channels them toward the chosen objectives. Learning outcomes are greatest when these are the conscious aims of the individual and when there's a deliberate sequential process. It's useful to remember that routine, as well as caprice, is antithetical to learning. Individuals are not inert homogenous raw material that can be subjected to a standard or fixed, mechanical, iterative operation guaranteeing production of identical or near-identical "outputs". Perhaps individuals can be transformed into such material; but such transformation can only take place after the process of education and its measurement has been artifically reduced through the removal of any concept or method not taken or borrowed from engineering. Admittedly, we do not now possess a deep and detailed understanding of the different learning processes, but we do know that they are not carried out with inert homogenous material. Closer inspection also reveals that effective learning processes involve frequent changes in ends, as well as changes in means. The significance of this fact has yet to be appreciated, or, at any rate, acted upon, for it means that the process itself should be subjected to continuous adjustment and, in certain environments, to rather frequent change. We return to our original assertion: each act of learning involves a subject-matter and

an individual. Any deliberately designed program of learning should therefore take into account the individual that enters it. The content of a "curriculm" can be looked upon as a statement of possible objectives, and the instructional process should be so designed it will make effective connections between the individual's background, occupation and interests and the selected learning objectives.

IV. Requirements of Data and Measurement

(a) The Identification and Measurement of Means

Since a detailed analysis of a country's entire education sector has never been carried out to our knowledge and constitutes a rather new idea or proposal, it is not surprising that such an analysis will be faced with data insufficiencies. But the insufficiencies can be used as pretext for inaction only if analysis is looked upon as a one-time affair, rather than the continuous process it should be. Since education policies are made and educational decisions are taken, with or without analysis, there are decided advantages, when analysis is initiated, in preparing a work plan and schedule that will serve to limit the duration and scope of what may be referred to as Analysis I. The conclusions arising from Analysis I, if carefully conducted, will reflect the limitations of the available data and the methods employed; and the analytical process and outcome will contribute to the further identification of data gaps, some of which may be filled in time for a more detailed Analysis II. The use of data for analytical purposes constitutes an interaction which can be expected to lead to better procedures for the collection and tabulation of information and to improved methodologies for assessing this information and for determining its implications for policy.

Recent data collection experiences in various countries indicates that considerable information concerning the resources utilized by the schooling system is available, but is not generally tabulated in ways useful for analysis and planning. In other words, the availability of data and its potential utility for analysis and planning is much greater than generally recognized.

Although the education sector roughly defined or delimited in Section I is considerably broader than the school system, the availability of substantial information concerning the schools and universities makes it feasible to initiate the analytical process, quantifying inputs such as students, teachers, classrooms, expenditures, etc. and making preliminary measurements of functions or elements of the schooling system such as flow, costs, access and to a lesser extent, relevance. Generally speaking, this is information on means - partial measurements of the resources and processes of the schooling system. Which resources and processes can be attributed and how they can be "charged" to the learning that takes place outside of deliberate educational programs is a matter that will be considered in chapter four.

(b) The Identification and Measurement of Consequences

Were we asked to make a criticism of all extant education systems, and to limit this criticism to a single sentence, it would be the following: There has been insufficient attention paid to the precise determination of the relationship between the means and the consequences of education programs. Of course, before such a determination can be made,

the resources and processes constituting the means, and the changes in individual skills, acquired information and attitudes constituting the consequences, must be identified and measured. And since an education program has desired outcomes or ends, it would be useful to determine first if these are to be found among the effects of the program, and then to proceed to their measurement. It is important to recognize that goals or ends are those specific desired consequences which have determined the selection of means. On the whole, insufficient attention has been paid to the measurement of desired consequences and it would seem appropriate therefore to improve the measurement of these desired outcomes or ends before undertaking the more complex task of identifying and measuring other anticipated consequences, as well as unanticipated consequences. The tendency of teachers and schools all over the world to concentrate on providing the "program", neglecting to specify clear objectives, to design procedures for measurements, and to apply them periodically to indicate the degree of attainment, has masked the need for constant adjustment of the instructional processes.

It is important to distinguish between a "program" and its results, between what is very generally or even vaguely described in a catalogue or syllabus, and the educational outcomes--the results of an interaction between individuals and an instructional process. The selection of outcomes and measurement of performance should therefore be continuous activitives throughout the education sector. Although the extensive selection of goals and the measurement of attainments may also characterize other sectors, experience demonstrates that this function is much

more complex and much less likely to be satisfactorily carried out in the field of education.

The complexities of this chapter lie beyond the scope of this chapter. Nevertheless, the identification and measurement of effects or consequences in general, and of objectives in particular, is a subject that cannot be ignored in the discussion of an education sector analysis, and some broad preliminary suggestions will therefore be made. The first suggestion was already put forth: pre-assessment of the individual is a necessary precondition of the selection of feasible objectives, and of the precise measurement of the progress attained as a result of the program.

Should the individual be aware of the objectives when he begins a program? Should he share in the aims? Although this subject cannot be adequately dealt with here and though the question obviously varies in meaning and calls for different answers among different environments and age groups, the probability of achieving desired learning outcomes appears to increase significantly when the individual is consciously pursuing a subject, and has a general idea as to what mastery of that subject entails. Perhaps this is another way of saying that engaging individual interest is an inescapable requirement of effective education.

The need for assessment or measurement at various points in time has become increasingly evident. Without periodic assessment during the course of a program, we are lacking the signals that may indicate the need for adjustment or change in the instructional process. Assessment upon completion of the program--the assessment most frequently carried out--is needed to measure the program realized and to determine whether minimal levels of the original objectives were attained. Finally, the

assessment that is seldom made, and that needs to be made with increasing frequency, is the assessment that is carried out months or years after the program in question has terminated.

What results are fairly permanent in individuals and what results quickly disappear? For example in any given national education sector, what percentage of the rural people that have had two or three years of primary schooling lapse back into illiteracy--and under what conditions? Using examples from another level of schooling, how much do lawyers and doctors retain of their legal and medical training? The tendency to take graduates as a proxy for learning objectives is frequently and properly criticized. And yet, that practice in a given setting can be neither approved nor disapproved, nor, for that matter, adequately qualified until better measurements of the performance and the capabilities of graduates are taken over time. Tracer studies of graduates of different kinds provide useful insights into the workings of an education sector, and into its relationships with other sectors. But these studies should be expanded beyond correlations between occupation and training, and include the identification and measurement of the skills and knowledge most utilized, including the new learning obtained, as well as the old learning retained. The amount of individual learning that takes place in simple, or even primitive, stable, integrated communities may be less than in modern societies, but more of that learning is used or applied and transmuted into character. In other words, less of the learning is wasted. Fuller identification of the kinds of learning needed, and measurement of the learning achieved, in rapidly changing societies may constitute an important first step in reducing misdirected intellectual

activity and its resulting subsequent frustration.

V. Educational Technology

In discussing education, it is perfectly proper to use the term "technology", for it calls attention to the fact that every educational situation involves a distinguishable process and identifiable materials. But since the term is used most frequently in discussing industry and agriculture, there is once again a danger that important differences between education and other sectors will be overlooked.

What are some of these differences? In industry, a specific technology constitutes an iterative process in which a fixed amount of nearly identical inputs is utilized in producing a fixed amount of nearly identical outputs. We have already pointed out that educational processes are not the fixed iterative affairs that are to be found in industry or agriculture. Admittedly, there are different technologies in agricultural and industrial sub-sectors, commodity or product lines, and this fact has misled some observers into assuming that the situation is similar. But the individual - education's main "input" - does not possess the homogeneity of industrial and agricultural inputs. Nor is he the passive inert material certain social scientists would like him to be in order to twist him beyond recognition and force him into their Procrustean conceptual beds.

What are the "outputs" of education? We believe this term is misleading and have preferred to speak of ends and consequences. We have attempted to suggest that these consequences are embedded, so to speak,

in the individual who will deal with certain materials and respond to certain life situations in ways that he would not have dealt with and responded in the absence of such education. Can we identify and measure these ways? Perhaps we can summarize the position taken in the preceding section by suggesting that if we insist on an "output", and identify this output with test scores we will have indulged in a classic piece of pedantry treating indicators or means - events which are strictly intermediate or instrumental - as if these were our main purposes or ends. Too often these measurements are simply a way of carrying out sterile rankings and invidious comparisons that have harmful moral and psychological effects and are not particularly useful for planning which, it is worth pointing out, is concerned with estimates of future possibilities in order to take present actions.

Most testing is misconceived and as a consequence improperly used. It is precisely because the variance is so great that measurement is constantly needed. Every learning situation is different: the times change; communities vary; individuals are never the same. Hence, every learning process is different. Were the design of tests based on sound psychological theories, perhaps the results of these tests could be looked upon as indicators and utilized in a more precise and continuous adjustment of the "technology" of the process--the procedures or general ways in which the learner interacts with materials and with other individuals.

VI. Empirical Analysis and the Development of Objectives

Although completed analysis in any sector will provide new information and insights that may lead to a reformulation of goals, most sector analyses begin with national goals or objectives that are limited in number and unambiguously defined. The case is different in education. A national education sector analysis, like all other analyses, must begin with objectives that help determine the data to be collected and analyzed, but to a greater extent than other sector analyses, an education sector analysis constitutes a search for goals, as well as a search for means. The goals of education are related to a much larger range of human values and concerns and, as we have pointed out, education is not only the broadest sector but probably the one least understood. Speaking generally, without a better understanding of where they stand now in education, most nations cannot determine intelligently where they can or should go.

In other words, the goals of education should be true possibilities selected from alternatives and not mere wishes or unrealizable preferences. And the premature determination of ends is likely to lead to fixation on the impossible and, perhaps more importantly, failure to realize potential. Goals should be chosen, but not frozen for long periods. The process of adjustment should inculde ends and not be limited to means. Before selecting a set of ends, reformulating policies and reshaping activities, it may be desirable for a nation to first get a fuller understanding of what learning is actually taking place, and the extent and ways in which that learning is used. The latter task is essential and complex. Carrying it out entails extensive compilation, arrangement and

interpretation of facts in the areas of occupation, family, and social life.

Although the tasks we have described are great, they can be successfully carried out if they are broken up into stages, each of which is carefully scheduled. The analysis of the education sector is more likely to provide sound conclusions for policy if it is established as a continuous process of succeeding analyses of one to three years duration that build on their predecessors. In analysis I, so to speak, it seems likely that the system of schooling should constitute the central core of the analysis which can be subsequently widened by means of a gradual addition of other activities. Of course it is desirable to include in the first analysis as many non-school activities as practical, so as to obtain some comparisons of costs and benefits, but the number of activities included should be manageable.

Since the schooling system involves a large number of people and utilizes a substantial amount of resources concentrating on it would seem a desirable way to begin. Such a policy also has advantages for methodology. There appears to be general agreement concerning the broad problem areas of the schooling system. These are increasingly accepted as efficiency, relevance, and access. By definition these problems or problem areas have their correlate goals which can be expressed as that of increasing efficiency and access and improving relevance. Although the last-mentioned goal is expressed by a collective term that comprehend a wide variety of specific objectives, the other two are conceptually simpler and involve comparatively straightforward tasks. Admittedly, measurement

of the phenomena bearing upon efficiency and access confronts the kinds of difficulties that have been described in preceding parts of this paper. Nevertheless,it is clear that the quantification of these two problem areas can be carried out and, with time, made more precise. And even preliminary estimates of the extent to which access and efficiency can be increased at disaggregated or local levels, and at aggregate or national levels, will facilitate the development of procedures for measuring the educational efficiency and impact of activities that fall outside the system of schools and universities. Similarly, estimates of present and future occupational and social needs and the assessment of academic programs in terms of these needs will make it easier to subsequently assess the educational value of other activities.

VII. Empirical Analyses and Theoretical Developments

Discussion of the fairly numerous special difficulties faced by an education sector analysis may have given some readers the impression that an initial inquiry of substantial value is not possible. This is not the case. A fuller understanding of, and a consequent improvement in, the schooling system alone can be achieved by most nations with data that is available or readily obtainable. Quantifying the limited resources in the sector is an extremely important first step. Identifying and classifying education activities, determining their geographic distribution, the kinds and magnitudes of resources utilized by each activity, making preliminary estimates of the effects of activities, and their relation to tentative goals are, generally speaking, tasks which can be presently carried out. Moreover, when other non-school factors can be

significantly correlated with performance and when social needs can be significantly compared with present consequences and objectives, we will be obtaining considerable insight into issues of efficiency and relevance. Computerization of this information facilitates its utilization and manipulation, and many of the computational techniques developed in this process can probably be later utilized in the analysis of non-school activities.

Since the statements appearing above dwell upon the useful results that can be expected from an analysis of the education sector, it may now be appropriate to call attention to its limitations. The main task of an education sector analysis is to improve the allocation of education resources by utilizing current educational practices, some of which may be contracted and others expanded. By measuring and comparing the efficiency and relevance of different education activities, the analysis provides criteria for expansions and reductions. The analysis does not attempt to explain current practices, nor to develop a theory from which new practice could be derived.

In short, empirical, largely statistical analysis, is essential, but insufficient. A narrowly empirical approach can be ultimately self-defeating. Theoretical developments are also needed. They are needed, among other reasons, to assist in the interpretation of empirical data. For example, considerable time and energy can be wasted in fruitless attempts to sort out, then isolate and measure the factors involved in cases in which schooling fails to achieve the intended results. In many such cases, the existence of vicious circles or patterns of reinforcing factors can be identified, and in such cases adequate treatment may require going

below surface phenomena and applying psychological and sociological theory.

There is at present a deplorable tendency in many educational circles to brush aside such subject-matters as the theory of learning and to deal with educational problems in a purely ad hoc superficial manner (the attractiveness of the implicit advice resting on fashion or familiarity, rather than on carefully tested ideas). Education is much too complex an affair to be successfully conducted on a hit or miss basis. The predominantly empirical sector analysis we have been proposing here should not preclude theoretical activity, but on the contrary, reinforce such activity, and be complemented or reinforced by it.

Activities which are predominantly empirical and activities which are predominantly theoretical can be mutually illuminating. We cannot ignore the fact that a theory of learning, however crude or implicit, is involved in any activity which is deliberately educational. If the assumptions or preconceptions underlying educational practice are not made explicit, there is no way of testing their validity. Governments, communities and private organizations concerned with the improvement of their education systems need not attach themselves to any single theory of learning or philosophy of education. Nonetheless, they should articulate the major underlying conceptual systems, be these singular or plural. Articulated theory can be used to determine the extent to which present practice departs from theory, and theory can be used to design educational experiments which, if successful, might lead to the widespread

adoption of new and better practices.

VIII. Analysis as a Continuous Process leading to a Systematic Expansion in Coverage and to a steady increase in Precision

The type of analysis that is proposed in this paper is concerned with the use of resources, in detail and in the aggregate, and with the relation that education activities bear to other activities in the society. Such an analysis is conceived as a support to the short-range decisions and the longer-range plans which are constantly made at many levels. More often than not education plans are formulated without an adequate prior analysis and when plans are properly preceded by an examination or assessment of the sector, the study is very seldom used as the basis for further inquiry. Although various important studies of the education sector may be carried out during a decade in a nation, they often appear to be characterized by discontinuity. It is rather seldom that an inquiry in this field seems to build upon a previous one, filling information gaps and refining or revising conclusions.

By establishing an orderly and continuous process of analysis, coverage of the sector can be systematically expanded and precision steadily increased. How much coverage can be expanded, and how much precision can be increased, will depend on many factors, of course, including the willingness of the nation concerned to assign capable personnel to the task,

We have referred to independent studies of different segments or aspects of the education sector. Where should such studies take place? Everywhere. If education, by definition, is the primary determinant or shaper of the thinking, knowing and feeling of citizens, there is no nook or corner of it which can dispense with critical attention or sensitive intelligence. As suggested in the previous section, we can expect significant improvement in practice only if there is some fairly widespread awareness of the theory that underlies practice. Although the problems of access, efficiency and relevance are aggregately defined by means of tabulations made at the national level, the original problems occur and the remedial actions take place at local and individual levels.

Although there is not inherent reason why communities and schools cannot carry out periodic assessment of their educational activities, to initiate such assessments most communities and schools need to be provided with an effective methodology and to be assisted and guided during the first applications. A detailed and comprehensive analysis of the education sector should therefore take into account the need for developing assessment procedures and for gradually making them available. The improvement of assessments, experiments, and evaluations on the part of all units responsible for educational activities should accompany the sector analysis established as a continuous process at the national level.

Chapter Three

SOME COMMON MISTAKES AND WIDESPREAD MISCONCEPTIONS IN CURRENT ANALYSES OF EDUCATION

A. Common Mistakes

1. The Use of Excessively Crude "Variables"

The title of this section refers to the current tendency to explain social events and phenomena by using terms or symbols that are too gross or inclusive with respect to the objects, activities or characteristics they symbolize. Perhaps the tendency is due to the insufficiency of adequate underlying theoretical structures which can be used in the analysis of specific problems and particular situations, combined with the availability of statistical techniques which can be applied, rightly or wrongly, to objects and activities that upon occasion seem to be taken almost at random, and then classified as "variables". For example, an average or aggregated national "production function" may correctly summarize highly diverse phenomena of a recent past, and not be of any use at all for analysis or planning in a local or regional or even national situation. Similarly, it is notorious that under general conditions of growth all kinds of "economic variables" correlate positively, and that very few, if any, of these correlations constitute explanations. Unfortunately, mathematical formulations are too often taken ipso facto as having explanatory force. If those formulations are merely descriptive or merely empirical, in the sense that they constitute a record of observations of events for which no reason or theory has been provided, they may constitute useful "data"

for judgment but cannot be viewed as guiding or conclusive.

In any case, a statistical association of the posited relationship will often fail to be a statistical association that holds up over any significant period of time, and, as we see it, a relationship that is not reliable for prediction and therefore for planning, is not a explanatory relationship. Since progress in the physical sciences has involved the development of theories that contain increasingly finer distinctions, the practice in the social sciences of establishing correlations among "variables" that are summaries or collections of a great number of things should receive, we believe, less unquestioning acceptance than it now seems to receive. For example, overaggregated statistical associations, such as education production functions" may lump together the truly significant factors and thus mask actual workings. Correlations between such things as years of schooling, socio-economic status, income and parents education may provide information about some associated characteristics during a recent past and at the same time leave those associations unexplained, with even slight changes in the society altering these associations. Although there are useful statistical checks to uncover "spurious" correlations and "intervening" or "proxy" variables, these checks cannot be expected to carry the whole load of analysis and to rectify errors due to indiscriminate use of objects, activities and characteristics as the explanatory variables and to the assumption that past quantitative relationships among such "variables" have explanatory status and predictive force.

2. Wrongly Characterizing Problems which are Particular in Nature or Specific to a Situation as Highly General Problems.

The above attempt to describe the first "common mistake" involves statements that are intentionally broad in their coverage. By initiating this section these statements may serve to highlight the fact that the need to make finer distinctions is probably implicit in most of the discussion that follows. The error we are considering here is certainly such an example. At its worst, it reflects the tendency to assume that because a question can be formulated in highly general terms thare must be a general answer for it. The error reflects a tendency to confuse language with existence, assuming, for instance, that because one can formulate the question: "What is the relationship between education and income?", there must be a general or universal answer to such a question.

Obviously, we are suggesting that the relationship of education and income is greatly qualified by time and space, by the society or nation concerned, and the historical moment or phase of that society. This is one of the reasons specific analyses in different countries and at different moments in time are needed, and one of the reasons that we must hesitate to assume that the research findings in one nation is likely to apply to another--even if the other appears to be in the same stage of "economic development". We might also try to express this point by putting forth the suggestion that certain kinds of relationships are highly variable and that others (perhaps much fewer in number) are fairly constant. Sector analyses should draw on theories that have established the more re-

liable set of relationships and they may at times make some contributions to work of a more theoretical nature; but the historical nature of social phenomena and the great variation and change they entail, creates the need to periodically identify and quantify the particular changing relationships that are important for policy or decision-making purposes at any given moment in time.

Research projects that focus on highly general questions--such as: What determines the amount of schooling that an individual receives?--often seem to assume that there is a stable, reliable underlying relationship among the identified and usually rather gross variables which will serve to answer the highly general question, and to preclude the possibility of answers which depend on and vary with the nation, the region, the family and the individual, among other things, and to the period and duration to which the data corresponds. Moreover, the probability of persistence or continuation of a past pattern into the future constitutes another, although not unrelated, issue. Of course, one can exaggerate the amount of variety and overestimate the rate of change that occurs in any given society and, as a result, ignore patterns which are comparatively firm and reliable and can be used in predicting and controlling events. If there were not stabilities as well as change in every society, social life would be closer to chaos than it is. In fact, detecting both sorts of relationships--the more stable and the less stable--constitutes a major purpose in carrying out periodic sector analyses aimed at the improvement of policy.

3. Errors in Measurements and in Interpreting Measurements

Since a sector analysis places considerable weight on the measurement of things, and on the relationships among these measurements, errors in carrying out and interpreting measurements can lead us to highly misleading conclusions. In an education sector analysis, such as the one that will appear in Chapter 4, "A Brief Description of an Education Sector Analysis Methodology", the errors in interpretation that are most likely to occur are those pertaining to educational outcomes or results, particularly as these measured outcomes or results relate to educational objectives.

There are phenomena which do not lend themselves to measurement, or for which measurement procedures are lacking. Such phenomena may nevertheless exist. This would appear to be obvious. And yet, expensive, large-scale analyses of education have tended to ignore or brush aside fundamental educational outcomes and objectives as if their resistance to what are considered to be precise and sophisticated measurement made these objectives and outcomes either non-existent or trivial.[1/] Another common mistake which, we suspect, has even

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1/ "Measurement" is a very complex subject which cannot be treated satisfactorily here. It may suffice to point out that homogeneities such as space, time, and the rates that combine these two, and other units or identities, such as monetary units, are required for those kind of measurements which are generally considered precise. But the things which these measurements measure can hardly be taken as the equivalent of the valuable or important. In a personal letter, Robert Darcy, Professor of Economics and Director of the Center for Economic Education of Colorado State University expresses the matter very well: "We value measurement itself as a hallmark of scientific inquiry, so we tend to value what can be measured in part because it can be measured. This may distort a society's educational value system".

graver consequences, is to utilize the realizable or more precise kind of measurements of one thing as a substitute or proxy for some other thing which cannot be measured or satisfactorily measured. This is a very common mistake in economics that has been introduced into the analysis of education.

One of the most comprehensive empirical analyses of family and schooling undertaken during the last decade is a study of U.S. phenomena that is summarized and interpreted in the book "Inequality: A re-assessment of the Effect of Family and Schooling in America".[1/] The study involved a compilation and tabulation of data on such a large scale that a number of years may pass before there is another one of its kind carried out.

Of course, it is impossible in a brief space to present the study's many findings, but perhaps the most important contention of Jencks can be presented with a direct quotation: "The egalitarian trend for education [2/]

1/ "Inequality: A Reassessment of the Effect of Family and Schooling in America", by Christopher Jencks, et. al. Basic Books, Inc., 1972. New York.

2/ Although full appreciation of the impressive trend in the U.S. towards greater equality of educational opportunity requires examination of much more data than can be presented here, the following 50 year change is indicative: in 1914 about 40% cf the youth were completing high school; in 1965 about 80% were finishing high school, 40% were entering college, 20% finishing college, and 10% doing some post-graduate work.

has not made the distribution of income [1] or status appreciably more equal over the past 25 years". Another line of inquiry comprehended by this study leads to a conclusion which is expressed by Jencks as follows: "The data examined in this book shows that neither genetic inequality nor disparities in family background dictate anything like the degree of inequality now found in American society". In our opinion, both these major conclusions are grounded in the information compiled and presented.

Had the Jencks analysis limited itself to these two lines of inquiry no major exceptions could be taken to it, although one might observe that the conclusions are mucn less startling than is suggested by the text. Jencks does show that "equality of educational opportunity", defined as equal amounts of schooling and family income levels for the children involved, had not led to equality of income [2] for these

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[1] Although everyone's income has risen in the U.S., the absolute gap between the families that represent the bottom and the top fifth of the population has increased. In 1946 the bottom fifth averaged $1,650 and the top fifth $15,300, making the absolute gap $13,650 (in 1968 dollars). In 1968 the bottom fifth average $2,650 and the top fifth $19,300, making the absolute gap $17,350. At present the top quintile of the population receives about 44.6% of all income and the bottom quintile about 5.6%.

[2] As one might expect, "status" is much less satisfactorily treated.

children when they became adults. But why is this so surprising? After all, it is the very essence of a predominantly competitive society that financial rewards are unequally distributed, and relatively few people, we suspect, are under the illusions that Jencks pretends to have shattered--the illusion that equality of educational opportunity will by itself bring about a financially egalitarian society.[1/]

There are more misleading aspects of the study, however, and we are concerned with them here because we think they are due to basic mistakes in the carrying out and interpretation of measurements. In the first place, there is a fundamental conceptual flaw in the book which helps distort measurement procedures and puts a false interpretation upon many of the statistical results. The distortion we are referring to here is the one mentioned previously: the tendency to take measurements that have been carried out with some accuracy as proxies for measurements that have not been carried out, and perhaps could not be carried out, with the same degree of accuracy. This flaw is illustrated by the fact that we are frequently under the impression that the analysis is following the theme of the rather broad sub-title "A Reassessment of the Effect of Family and Schooling in America", whereas it is focused almost exclusively upon an examination of <u>income</u> effects, and, still more narrowly, on comparative income effects.

1/ One of the unexpected findings (for this reader, at least) is the considerable amount of "social mobility", as measured by changes, both up and down, in the relative income standing of families over various decades.

Very often the text suggests that the findings are serving to answer the extremely broad question: "What do our families and schools do?" It could hardly be taken as a reproof to say that such a large question remains largely unanswered. Our complaint is another: the presentation of findings often gives the impression that such a question is being answered. And this is so because the author presents his measurements and relationships as if everything were included, reinforcing the false impression given in the subtitle and failing to call attention to the fact that most of the effects of family and schooling have been ignored, perhaps necessarily, in view of the difficulties of measurement. Precisely what is being measured is very often unclear and, as a result, we are frequently misled into believing that the scope of these measurements is larger and more significant than is actually the case. The overriding concern in this book is to gauge the effect of family and schooling on comparative incomes. All the other effects are disregarded--a fact that, unfortunately, is not made explicit, and which can lead the unsuspecting reader into imagining that he is being made thoroughly familiar with "the effect of family and schooling in America".

Our second major criticism regarding measurements in the Jencks study is the following. Despite an occasional qualification, the scores of national standardized tests are viewed and utilized as full and accurate measurements of the amount of knowledge obtained by students in the subject-matters concerned. This is a grave mistake. Although these tests are comparative indicators which provide an ordinal ranking

of students, throughout the book they are used as if they were measurements of cognitive growth or knowledge obtained. It is the differences among the students at a given moment in time on the basis of certain selected criteria, and not the knowledge of the subject matter in question that any one or all these students have, or if the reader prefers, the subject-matter-related-behaviors which the individual is capable of carrying out, which is revealed by these scores. Application of the tests can be viewed as a search for differences. In fact, these tests are designed to give normal distributions. Perhaps Jencks relies so heavily on these tests because they provide him with a tool which will prove his thesis a priori. There cannot be "cognitive equality" because the tests are designed to spread the student scores out by eight standard deviations. It is an easy step to show that these "cognitive" rankings (as if test scores were full measurement of the "cognitive") do not correspond, say, to income rankings.

To illustrate the significance of these misinterpretations of measurements let us consider the following statement: "Our research suggests...that the characteristics of a school output depends largely on a single input, namely the characteristics of entering children. Everything else--the school budget, its policies, the characteristics of the teachers--is either secondary or completely irrelevant."

This statement is false. To be true, it would have to be amended to "the differences in the scores of standardized tests" instead of "the characteristics of a school output". This output, the effects of the school--the changes in behavior, increments in learning,

transformations in attitude--are not measured with these tests, and their proper measurement, we assume, would require comparison between groups of children who attended school, with groups of children with similar family backgrounds who did not attend school.

We have tried to examine these issues with some care because we believe they have bearing upon the issue of tests in general, and standardized tests in particular in the developing countries. As we see it, there are two dangerously extreme positions to be avoided. Education authorities that recognize that tests are, at best, partial indicators of learning, might be tempted into the extreme position of abolishing tests altogether. Such a policy is an open door to rhetoric, and increases the possibility that fashion will dictate education planning and decisions. On the other hand, the education authorities might allow the desire for quantification to lead them into unduly extending the significance of these partial indicators and relying too heavily upon them for planning and decisions. Generally speaking, the developing countries need to improve their tests, and to do more testing, including testing both when the school year begins and when it ends, so that the progress realized by each student is more adequately measured. To take testing seriously and not lost sight of its limitations is, we believe, the desideratum. The Ivan Ilyich view that tests in the hands of pedants are anti-social instruments that serve to engender or to reinforce inferiority complexes does not lack foundation. Nor is there a lack of foundation to the view that tests can be useful diagnostic instruments for achieving learning

objectives and for helping individuals realize their potential.

A fair amount of attention has been given to the Jencks study because the magnitude of the statistical undertaking and the importance of some of the findings can lead us into taking national standardized test scores--rather crude and very limited indicators of learning--as if these scores were both accurate and exhaustive measurements of educational outcomes.

B. Widespread Misconceptions

1. Costs & Benefits, The Nature of Choice, Ends & Means, The Valued & The Valuable

Although "costs" and "benefits" are, at present, very extensively used concepts, a careful attempt to specify their meaning almost invariably runs into great difficulties. Despite growing appreciation of these difficulties, even as the terms apply to traditional "economic" issues, their application to issue of education is widespread and, very frequently, careless. To better understand what cannot be included under the concepts of "costs" and "benefits", what issues can and what issues cannot be resolved by the procedures that correspond to these concepts, it may be useful to consider the larger issue of choice, with particular emphasis on the distinction between the valued and the valuable.

First, what do we mean by "costs" [illegible] "benefits"? For a firm or individual concerned exclusively with receiving a greater amount of money than spent over a given period of time, the terms are perfectly clear and unambiguous, and their application to actions

and transactions presents no special conceptual problem. But taking procedures which may be appropriate for the individual or firm preoccupied exclusively with monetary returns and applying these procedures to society at large can involve us in a fallacy of composition under which we assume that what is true for the part is also true for the whole. Therein resides the first general problem in applying the concepts of costs and benefits to the larger issues of education. However, there is another fallacy that frequently underlies the attempt to calculate costs and benefits, and this second fallacy is much more pervasive and much more difficult to correct.

Expressed simply, this fallacy is constituted by the mistaken assumption that any problem of choice can be translated into a monetary problem or expressed in monetary terms. The individuals who take such a position usually recognize the difficulties inherent in assigning prices to certain things that are not commonly bought and sold, or to things that are bought and sold, but the prices of which are considered "distorted". Nevertheless, these individuals are inclined to take the position that the ascription of proper prices is the basic and major difficulty faced, and to cling to the notion that such pricing, totalling, and comparing constitutes the most complete and most satisfactory procedures for resolving problems of choice or for dissolving doubts concerning actions to be taken. The prices reflect the comparative "values",

and these "values" are sufficient for making decisions. In other words, they constitute the main, if not the only criteria required. One might refer to this position as a faith or belief in the universal applicability of economics, in general, and "cost/benefit analysis", in particular for solving social and, perhaps, personal problems. Under this movement, which seems to have been gathering momentum, financial techniques would appear willing and eager to replace a fair number of disciplines, eliminating not only ethics and religion, but sociology and political science as well.

To sort out the various issues involved we're obliged to give some consideration to the complex subject of choice. Of course, we do not pretend to look into this subject with any degree of thoroughness, but simply to highlight those aspect which will allow us to better appreciate both the functions and limitations of prices.

The first common belief we wish to question is the widespread erroneous notion that every action that men take is a reflection of choice. This is a serious mistake--serious because, as will be seen, it leads to other misconceptions. The major part of our behavior does not reflect either decision or choice. The great bulk of our actions proceeds habitually or unreflectively. But when habitual conduct is detained by uncertainties, when conventional actions are questioned (whether questioned by the acting party itself or another), when conduct is temporarily blocked, whether by fear, concern, a sense of responsibility, or loving

affection for the particular subject at hand, when it is brought up short by doubts or by conflict, inquiry of some sort is likely to emerge, and, specifically the problem of choice.

Obviously, the situation in which this occurs varies considerably. And though we cannot pretend here to sketch a theory of choice, we can suggest a variety of situations which range from vague malaise or discomfort, to fairly clear identification of problems, or, further yet, to a situation in which alternative feasible solutions have already been conceived and defined, and the questions then is restricted to a selection among them.

Although this latter kind of choice may be the kind to which economics, for instance, may more fruitfully apply its analytical tools, choice obviously cannot be limited to this kind, since the formulation of ends, as well as means, is an integral part of the problem of choice. It is also evident that in the attempt to adjust ends and means which men are constantly obliged to carry out, they draw on the knowledge and utilize the techniques of a wide variety of disciplines, from physics and engineering, to psychology and sociology, as well as common sense and personal experience. This is so, even when the problematic situation is one that has surpassed the great difficulty of fully defining the problem at hand (a great difficulty since full definition of a problem is frequently tantamount to solution) and has reached the stage, whether or not prematurely, of selecting among defined alternatives. To live here or there, make war or peace, propose marriage to Z or to Y,

become a poet or an engineer, expand the city in this or that direction, repeal or tighten the zoning restrictions, increase national credit for agriculture or for industry, highlight and attack an issue, or wait and see if events themselves resolve it, charge or not charge some official with malfeasance on the basis, say, of rather slight evidence--this random set of personal and social alternatives can serve to illustrate the varied nature of the factors which have bearing on any particular choice, and to suggest that a variety of disciplines will more often than not be required to fully define the issues.

Nonetheless, the general nature of the problem of choice is misrepresented by this or any other random list of alternative actions. To illustrate, let us take one that clearly appears to be "economic" in nature, since, as we mentioned before, economics is specially disposed to view choice as a problem of selection between existing alternatives, and is apparently so disposed because its techniques are more applicable to the resolutions of such a problematic situation.

Let us suppose that the government of a developing country has control of a certain amount of credit or a certain amount that is marginal or additional to that utilized in past years. Shall this credit be channeled to industry or to agriculture? Guns or butter? Agriculture or industry? This is the form in which we had presented this problem of choice.

Now those who have spent sometime dealing with issues of this sort will know that such a presentation is over-simplified to the point of falsity. They will know that there are a large number of prior questions that must be considered before such a choice arises, if indeed it will ever arise in the crude form here presented. What basic problems is the nation attempting to solve in its use of this credit? Let us assume they are two, for simplicity's sake, and in order to make very evident the limited applicability of cost/benefit analysis, let us make those two problems the two most frequently dealt with in economic policy--output and employment. If an increase of both is desired and a assessment of the best available data indicates that a trade-off between them at a certain level can be expected to take place, will cost-benefit analysis resolve the issue for us? It will not. The dual objective has, by definition, precluded the possibility of increased income constituting the determining objective. For employment is considered an end in its own right and not simply a means for increasing, say, GNP. Maintaining or increasing the amount of employment in the nation is also valued, and not simply looked upon as a means as increasing total income. (We leave not the highly complex and necessarily existential or empirical issue of the distribution of income and its relationship to employment and total income in order to focus more directly on the nature of choice).

The false simplicity of the example has made the alternative actions (invest in industry or agriculture) appear plausible, but in fact empirical analysis of this situation will reveal that certain specific activities within the industrial sector and certain specific activities within the agricultural sector are most employment creating and/or income producing. Since increasing total employment and production are the objectives, a distribution of the credit to the identified activities within each of the sectors, rather than simply choosing between the two sectors, will therefore be the appropriate policy to follow, or, if you will, choice to make. Indeed, as the problematic situation is more deeply explored the solution or response draws further and further away from that of selecting between alternatives, however chosen. The thought and energy of the analysts and policy makers appears to be drawn more and more into determining the set of present and future interrelationships that bear upon the problem at hand, and to formulating an approximation to a unique or optimum solution.

If the problem or objective of maintaining the family structure is, for example, added to that of increasing production and employment, the overall problem has become more complex, or, if you will, the existential situation has become more fully appreciated, and the corresponding solution required both more comprehensive and pinpointed or detailed. When the problems and objectives were increasing employment and production, mobility of labor was not a consideration, or, more precisely, a consideration only insofar as

limitations in mobility affected the feasibility of filling new jobs in this or that region or area. But if keeping the family intact, or assuring the presence of a father to more children, is now also one of the objectives, and if the mobility mentioned has the effect of breaking up family units, employment will need to be pinpointed on, or restricted to, those localities in which unemployment is high.

The point we wish to stress is that two of the three values [1/] here considered--increasing employment and maintaining or increasing the number of intact families--cannot be adequately handled in terms of prices and, a fortiori, cost-benefit analysis. And it is perhaps appropriate here to suggest that a large number, perhaps most, of the problems and goals of education, such as preparation for citizenship, cannot be illuminated in any sort of analysis which depends on prices as the basic unit of measurement. The fact that preparation for citizenship generally receives rhetorical treatment, with scant, if any, attention paid to the facts and the quantification of facts, should not tempt us into trying to apply cost-benefit analysis simply because this kind of analysis involves quantification. This is, no doubt, one of its strengths, but it is not applicable to the issue in question.

1/ "Value" is the substantive form of the verb "to value" which we define here quite simply as the attempt to bring something into existence or to maintain or increase something already in existence.

As we see it, a greater us of mathematics in economics than in most of the other social sciences has tempted economics into an undue expansion of its subject-matter. It appears to be moving into fields and dealinq with issues which have not pertained to it and for which it does not possess the appropriate concepts and procedures.

Economics has been generally looked upon as the methodological discipline and body of knowledge dealing with the interconnection and allocation of resources, viewed in terms of their scarcity. Nevertheless, in recent years it seems to have viewed itself--and on more than one occasion defined itself--as the science that deals with choice. True, this "choice" is often qualified as being the choices of consumers and producers, but since the economic viewpoint is one in which all human behavior is classed as either production or consumption (whether properly so, or not, is perhaps a fundamental issue economics and other social sciences should now begin to explore) it is clear that no human action has been left out.

What has been said so far may appear to be a petty form of quibbling. We hope to show that this is not the case. We recognize that if problems are solved it doesn't matter particularly which discipline is officially accredited. The issue here is not one of professional jurisdiction, but one of scientific distortion. Specifically, it is our contention that as economics moves beyond its central concern with the scarcity of resources and attempts to deal with the whole problem of choice, it introduces alteration in the

meanings of its basic concepts and these concepts are subsequently less useful in dealing with economics' own central concern, i.e., scarcity.

Let us take "cost" as the example. This section began with the suggestion that its meaning and the procedures for measuring it are by no means simple matters. What is meant by the cost of an undertaking? What do we mean by cost? Cost to whom? And does the meaning of cost vary with the party concerned? As laymen keenly aware of our lack of knowledge and competence in the subject, we are not going to try to answer this question on which past volumes have been written and future volumes will no doubt be written as well. We do wish to reaffirm our premise, however, and that is that measurement of cost-whoever's--not only traditionally, but logically, involves a measurement of scarcity. If this is so, both a positive and a negative judgment must be made, we believe, concerning recent developments in economics. We refer to such concepts and their accompanying methodologies and techniques as opportunity costs, externalities, and shadow prices. Insofar as these new developments represent attempts to more accurately measure scarcity, they are, we believe, steps in the right direction. The judgment, then, is positive. But insofar as the new developments represent an attempt to deal with the whole problem of choice, they are steps that lead to great confusion and weaken the concept of cost in its basic role of assisting us in the measurement and assessment of scarcities.

We have suggested that two basically antagonistic intellectual tendencies underlie the development and application of these new concepts: the first leading to more accurate measurements of scarcity, and the latter not. It is this latter emphasis we would like to consider.

What is the cost of an undertaking? What is its cost, for example, to "society"? The question is being asked with increasing frequency. Unfortunately, when this particular question is posed, the idea of cost tends to immediately expand far beyond that of measuring the scarcity of resources required by the undertaking, to a "measurement", as well, of all the undesirable consequences to society which the undertaking involves. "Costs" now stands for all the bad consequences or effects of a proposed course of action; and "benefits" now represents all the good consequences or effects. Perhaps the specious universality of cost-benefit analysis can now be better understood.

It is our main contention that cost has been expanded unduly as an idea or concept from its proper and traditional function as a set of procedures for measuring the feasibility or advisability of an activity in terms of the relative scarcity of the resources required, to a concept which includes the following: (1) the carrying out of the traditional measurement, now viewed as part of the total cost and in some way incorporated or aggregated in procedure (3); (2) the identification of all the antecedents or prior conditions and all the consequences or subsequent effects of the activity in question

which are considered undesirable; (3) a "quantification" and summation of these qualitatively distinct antecedents and consequences in terms of some homogenous unit (price), and their aggregation to traditional cost, (procedure (1)).

This new, improperly expanded view of the "cost" of an activity and its corresponding monetary appraisal or estimate must, of course, be complemented with a similar procedure for "benefits", since under exclusively monetary measurements knowledge of cost is only one-half of the knowledge required to decide whether an activity is to be undertaken. To maintain the balance, the concept of "benefits" must be similarly expanded beyond the monetary "returns" of the activity to an estimate (expressed in monetary terms) of the antecedents and consequences considered desirable of the activity in question--or, more precisely, to an estimate in monetary terms of the desirabilities of the desired antecedents and consequences. And, of course, use of the term "benefits" makes the universal applicability of the idea seem all the more plausible, for what positive impacts on human values could conceivably have been left out and remain unaccounted for after we have identified and "measured" (that is to say, "priced") all the future "benefits" of the proposed undertaking?

The bearing of these general conclusions on education issues might be considered in terms of the emphasis given during recent years to the estimation of "opportunity costs", or the related benefits foregone, of actual and proposed activities. Under this concept, the

procedure most frequently used in estimating education costs are the sacrificed monetary benefits, or the earnings foregone, by individuals who are enrolled in school and are therefore unable to work. In other non-education sectors the "opportunity cost" of labor, for example, is estimated in terms of the wage payment that labor would have received in other occupations (although precisely when and for how long is generally unclear) and is utilized as a substitute for, or allegedly more accurate measurement of, the true labor "cost" or scarcity. However, in education the earnings foregone are usually added to the costs of schooling and the sum is then considered to be the total cost to society.

As we see it, this is a fairly clear case in which cost is no longer simply a measurement of the scarcity of resources required for the undertaking at hand, but has been expanded into a measurement of other undesirable consequences to society involved in the undertaking. The cost measurement now includes more than a measurement of the scarcity of the required resources. Admittedly, schooling cannot proceed without students, but students are not generally looked upon as a resource or means, but, rather, as the recipients. If the earnings foregone while in school are part of the cost, similar calculations should be made for the theatre.

Part of the "cost" of a theatre performance is then the loss in production during performance incurred by the audience as measured by what it would have produced had it spent this time at its desks or machines. Unfortunately, a fairly large number of educated people with

cash register minds would probably respond by saying that, indeed, these losses should be included in estimating the cost of theatre performances. And that the same procedure should be applied in estimating the cost of all other "leisure" activities.

Our response to this would be that the attempt to convert the many different values of this world into one single value--"product"--is to increase the probability of slavery or its 20th century equivalent, the forced labor concentration camp.

In any case, that an activity cannot be appraised, or compared with another, by its cost alone, however estimated, but that its "benefits" must also be considered, is traditional doctrine. Whether or not the costs are warranted depends on the benefits, and the comparison of that cost/benefit relationship with "alternative" or "rival" activities.

We will not dwell here on the misconceptions involved in the attempt to price most of the "benefits" of education, if the term "benefits" is meant to refer to an activity's valuable effects, but assume for the moment that such pricing is both significant and possible, since this assumption is a sine qua non of the approach under which monetized costs and benefits become the comprehensive and decisive criteria for making education choices. An interesting issue can then be raised. If in estimating full costs we must consider "opportunity costs", that is to say the monetarily measured benefits foregone in carrying out the activity, are we not in good logic then obliged to include the "opportunity benefits", that is

to say, the monetarily measured costs foregone in carrying out the activity? For example, the opportunity "cost" to a child of attending primary school might be measured by the money he would have presumably made had he, say, worked the streets, begging, shining shoes, and acting as an intermediary for prostitutes. Similarly, the opportunity "benefit" would be constituted by an assessment, expressed in monetary terms, of the permanent emotional effect on his character and/or possible future delinquency that would have resulted from dedication to these occupations by a child of seven to thirteen years of age. The patent absurdity of all this should not require further comment.[1/]

The support for a monetary approach to choices is sometimes presented or, to be more precise, disguised, as an argument for quantification. Under such a rationale monetary estimates are declared to be the equivalent of a system of points or weights. To such an approach two objections must be made: (1) once such points are unrelated to prices or any other measure of scarcity their relationship to the discipline of economics has for all

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1/ We would not have this point interpreted as a Dickensian stand of blanket opposition to work for children. There are many possible kinds and intensities of work with a great variety of effects. Perhaps for any age and condition there are kinds of work which are pleasant, beneficial and educative. The day adults decide to remove much of the secrecy, pomp and general pretentiousness that surrounds their work, they will, we believe, be much more inclined to share their work experience with younger people. The example of the child working the streets was chosen simply to highlight the need to identify the bad, as well as the good, if and when activities foregone are taken into account.

practical purposes disappeared; (2) to propose a system of weights or points and to leave undetermined how to fix or determine those points is to leave specific problems of choice exactly where we found them.

Problems and objectives are correlates. The major difficulty in a particular problem of choice is not one of selecting among previously available alternatives but of formulating or shaping the new alternative that most fully solves the problems at issue and most completely attains the correlate qualitatively distinct ends or objectives. Once the issue of deliberate choice has been raised, inquiry of some kind arises. If the inquiry is to be relatively thorough determination of the inter-connection among a large number of events and actions will be required. We hope it does not seem unreasonable to suggest that such determination should draw on disciplines such as sociology, social psychology and political science, as well as on economics. Let us state the conclusion as simply and forcefully as we can. Economics is not the science of choice. It is one of the disciplines that contribute to solving problems of choice.

In short, the costs of alternative means constitute partial through relevant information, but not all the information we need for choosing between means. To express the matter slightly differently, "costs" are necessary but they are not sufficient criteria for choosing among means, even when the end is fixed, or has been pre-selected. The tendency to consider cost a sufficient criterion has its origin in a classic confusion that takes prices when these "reflect" scarcity

and makes these prices the practical equivalent of judgments that a specific action or choice is or is not valuable. Of course, we cannot attempt in this section to deal throughly with this issue of value as it impinges on the analysis of education. But we can at least point out that even within the more restricted concepts and limited concerns of traditional economics, prices which properly reflect scarcity, or relationships of "supply" and "demand", must be distinguished from full measurements of, or warranted judgments concerning, value.

For example, it would be clearly absurd to maintain that the high prices paid for heroin by addicts is a measure of its value. And, to take the other extreme, it is clearly contradictory to speak of prices as full measurement of value and to speak as well of "free goods" ("goods" that have 0 "value") when certain free goods, such as fresh air, are manifestly valuable to sustaining human life. Since the price conception of value is limiting, at best, and rather often distorting, the current effort to apply it to every problem of education is hardly an insignificant issue. As we see it, the confusions and misconceptions would be greatly reduced if the terms "market value" and "adjusted market value" were used when actual, estimated, projected or imputed prices were involved. This would serve as a reminder that prices are always highly limited indicators of value.

Both the high price of heroin and the low price of fresh air illustrate the need to distinguish between what is "valued" and what is "valuable". Speaking generally, the first refers to matters of

fact, the second to specific appraisals or judgments resulting from an inquiry. The addict "values" his heroin and is willing to make sacrifices to obtain it. It does not follow that the utilization of the heroin is "valuable"--least of all valuable for him.

In what way and to what extent is a certain thing valued? How valuable is it in this or that situation? Unless the distinction between these two questions is made, unless it is understood that most behavior does not represent choice--does not follow the hestation and reflection, analysis and comparison that precedes what can properly be called a selection--the confusion between the valued and the valuable will continue to take place.

Judgment or determination as to whether a particular use of morphine in a particular situation is or is not valuable requires examination by one or more inquirers into a set of inter-connected phenomena--an inquiry the results and procedures of which remain open to examination and revision by others. In brief, a valid decision or grounded judgment of value concerning a specific choice must be distinguished from unreflective behavior and routine. A judgment of value that is specific to a situation and therefore decisional in nature and oriented towards action will involve thought and the analytical use of empirical data. This will include traditional or generally accepted rules of behavior as well as data concerning current habits and preferences. Such rules and tradition will not necessarily be determining, for then inquiry would not be needed. But they will help identify facts and considerations which might otherwise be ignored.

Fresh air is not valued, although it is valuable--essential, in fact, to survival. If it ever does indeed become scarce, men will begin to value it. It will be valued, as well as valuable. "To value", something. What does that mean? To attempt to bring something into existence, or to maintain or increase something that is already existent. When we say X is valued, we're making a statement of fact. In terms of market value or price, fresh air is valued at 0 and morphine at so many dollars. When ask: how valuable is X or Y in situation L or P, we are suggesting movement beyond statement of fact, in the sense of a description of an isolated event in human behavior, to a judgment, to a determination of the relationship of X or Y in situation L or P to other events, objects, conditions, situations and actions which are valued as a matter of fact: fresh air to life, morphine usage to health, to social service and consideration for others, etc.

There is no blinking the fact that most social activities are unreflective or non-judgmental in the sense that they are not the logical outcome of a recent inquiry, not the verification of a prior conclusion. By and large this is no cause for lament, since questioning everything we do all the time would be an unproductive waste of human energy, and would make our lives unbearably, pedantically complex. But once we do subject an activity to question--once we do become involved in an appraisal of the end or means or both--we have, in effect, initiated inquiry. In such an event, there is seldom a good excuse for not making the inquiry as thorough as

possible and bringing all the relevant criteria to bear.

To sum up, estimates of monetary costs and returns provide relevant but insufficient information for analyzing alternative education activities. They cannot substitute for broader inquiries involving the selection and adjustment of ends and means; nor do they obviate the need in any particular situation for distinguishing between what is valued as a matter of fact and what as the result of an inquiry is determined to be the valuable.

2. Education Content, Objectives and the Equilibrium of Education's "Supply" and "Demand".

Although it is widely accepted that education has many different kinds of objectives, and that these objectives are not all "economic", during the last two or three decades education planning of a more analytical and quantitative nature has relied heavily, and at times almost exclusively, on concepts and techniques borrowed from economics. To many observers such reliance seemed logical in view of the one overall question which during these decades has been most frequently asked: how can education make the greatest possible contribution to development?

As we suggested in Chapter one, "What is Sector Analysis"? Such questions must themselves undergo rather careful prior analysis in view of the possible vagueness and ambiguity entailed by the term "development". We have seen that focusing exclusively on the maximum aggregate growth in "product" or income does not necessarily lead to the maximum growth in employment, that concentrating exclusively on obtaining a maximum growth in product and employment may lead to

considerable geographical mobility of labor and will not necessarily lead to the desired improvements in health, nutrition, social stability and conditions of work, nor to some broadly desired decrease in the rate of urbanization, pollution, nor, for example, alienation. We have maintained that social analyses in general and sector analyses in particular should therefore be carried out in terms of the largest possible number of significant problems and objectives which a nation faces or expects to face at the time it initiates an analysis. And this principle whould also be applied to analyses carried out at the regional, provincial and local levels.

Although analyses carried out during the recent decades have not followed the pattern just sketched, they have explored specific issues of importance and have provided a fund of useful experiences for the analysis and planning of education. In broad terms, the issues most frequently addressed could be formulated as follows: a) the total cost of the resources that should be allocated to education; b) the distribution of this cost among the three education "levels" and non-school education and training activities; c) the additional breakdown or distribution within secondary and higher education activities, as well as within non-school education and training activities, among the various specialized and professional programs.

The two broad approaches taken to date in attempting to come to grips with these issues have been cost-benefit or rate of return analysis and manpower projections and planning. Generally speaking, the proponents of one approach tend to be hightly skeptical of the utility of the other. Our view is that both approaches have limited

utility--a utility much more limited that is generally attributed by the proponents, and we shall try to present considerations in support of this contention.

In large part, our objections to the rate of return approach were set forth in the preceding section. Even if growth of product or total income were the only objective pursued by education, it seems to us that the assumptions that underlies this technique are of such questionable validity that the effectiveness of the procedure is very much in doubt. The relationships between monetary and non-monetary phenomena has been, and may always be, a major area of great difficulty in economics. As many observers have pointed out, the belief that present earnings reflect "marginal product", that the present market "value", i.e. price of this product, will also be the future "value", and that the elasticity of substitution of labor of different education levels is infinite, or close to infinite, are all highly questionable assumptions.[1/] Although some men may dream of a world in which

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1/ As suggested in the previous section, it is somewhat risky to draw very general conclusions from the wide-ranging Jencks study, but we believe the following statements can be made concerning the United States today: a) minimum amounts of schooling are usually required to enter into most technical and professional occupations which are, by and large, more remunerative (here the education system functions as a selecting, screening and certification system, as well as a training system); b) the considerable range of income within occupations has no apparent connection with years of schooling, i.e., getting more than minimum amounts of schooling does not tend to increase subsequent income: c) the considerable range of income within occupations reflects family background to a moderate extent, and test scores, including so-called IQ's, to almost no extent. Although there is no conceptual obstacle to determining the statistical association between specific amounts and kinds of education and the salaries of graduates for specific societies, this appears to contribute, at most, to posing the "problem" of explaining and quantitying the underlying relationship between education, salaries and product--if, indeed, there is such an underlying relationship. It certainly does not "solve" the problem.

each choice or decision to initiate, expand, contract, or eliminate an activity can be made on the basis of one single number--the calculated rate of return of that activity, so conveniently comparable to the rates of return, previously calculated and therefore available, of all other activities--we would, perhaps, be well advised to harbor a little skepticism.

The above remarks are not meant to terminate the practice of estimating rates of return to different kinds of education, but to foster caution in interpreting the meaning of these rates and in using them for formulating policy. For example, if the rate of return for a certain kind of middle-level technician, say a specialist in the use of herbicides, is low, it could mean any one, or combination, of a large number of things, such as: (1) technicians are underpaid as a result of "market imperfections", ill-conceived wage regulations, or some other reason: (2) the "employers", public and private, are not employing as many technicians as they need. (There may be a "cultural lag" in the demand for middle-level workers, the employers not yet having learned how to use such technicians. The problem would appear, then, to be one of educating employers); (3) there is an oversupply of these technicians.

The three possibilities are merely examples, and the point to be stressed is that despite common economic practice, there does not appear to be any a priori reason to select the third possibility as the explanation, or even the most likely explanation. It suggest that, rather than constituting a final criteria for education resource allocations, rates of return, when calculated on a disaggregate basis, both geographically and in terms of specialties, may upon occasion provide useful in-

formation about relationships between existing education or training programs and current employment. Once again, it is the relationship of the rate of return to other different kinds of information that may prove to be useful--not the rate of return, taken alone, as some sort of final signal for policy or as the single convenient number that tells us whether or not to proceed.

The manpower approach to education planning presents its own particular set of difficulties, even if we again limit our objective to growth in income or product. Manpower projections generally take as their point of departure estimates of the economy's size and composition, or sectoral distribution, 20 or 25 years hence, (estimates which are subject to question, of course) or, if long-range economic planning is carried out, a set of output targets which more often than not prove to be unrealistic. Assuming these conditions are satisfied, the validity of the projections depends on additional estimates of changes in a whole range of technologies in different sectors of the economy. These estimated future occupational patterns are then translated into present educational programs. A further difficulty inherent in this translation, as noted by a number of observers, lies in the fact that educational background varies considerably within those occupations for which there are not specific schooling or certification requirements. This seems to hold in both rich and poor countries.

Besides the generally recognized existence of various technological levels within occupations, it would appear that different training programs are often designed for persons unprepared to handle the installed technology, and, upon occasion, that adjustments, such as task simplification, are made in the installed technology for workers

with less than the needed education background or training. During wartime this apparently takes place rather frequently.

We think we can draw the implications for analysis and policy of these general statements only if they are examined in the context of considerations concerning the relationship of education activities to the other activities of the large society. We must avoid, on the one hand, the extreme and perhaps romantic view of some educators that over the long run all social activities are shaped and determined by education activities, and, on the other hand, the extreme view of certain economists who view the education system as nothing more than a supplier of specialized labor, or as a capital industry producing "intermediate" goods. Under this latter view, the goods of education are assumed to be wholly derived. They are those which are required for the elaboration of consumption products the composition and levels of which are allegedly fixed by "final demand"--the satisfaction of which constitutes the main purpose of our short stay here on earth.

Let us begin with the obvious fact that education and other social activities interact and affect one another. Even when focusing exclusively on the relationship between education and specific remunerated occupations we say that adjustments on both sides were not only possible, but, in fact, take place. This suggests that in a changing and "developing" nation a main function of education is to increase the flexibility of the labor force--the capability for learning and adaption on the part of individuals. If this is generally correct it would be difficult, we believe, to exaggerate its importance for education.

For the issue brings us back to the question of multiple objectives. For example, in a developing country the request for an inquiry as to how education affects our behavior, say, as citizens or parents is likely to be silenced with the observation that the pressing problems of development do not leave time or space for such considerations, that any attempt to inquire into what are the effects of the present education system on the behavior mentioned, and what changes, if any, are needed, must looked upon as luxuries which the nation cannot presently afford. The immediate and all-absorbing problem is that of "development". Education's task is to produce the trained specialized labor that is required for this development. Education sector analysis and planning should focus on getting as close as possible to a temporarily phased one-to-one correspondence between the occupational specialization required for maximum growth and the prior required composition and levels of educational specialization. From this point of view, the main task is making a rather detailed match between present specialization in education and future technology without which there will be a future imbalance between supply and demand and consequently lower rate of growth.

As we see it, this rather common view of the matter may involve basic misconceptions. Even when we take economic growth as an exclusive goal, we should consider the hypothesis that an education which develops critical thinking and the capability for continued learning will increase flexibility and adaption and therefore contribute

greatly to the achievement of future "equilibriums" or the prevention of future "disequilibriums" on which growth presumably depends. Were all the nations of the world to prepare in 1975 detailed and foolishly irrevocable or unrevisable 25-year education plans (rather than adjusting and revising them yearly, as they should, on the basis of new information and analyses) they would in 1975 be fixing the "supply" of education in the year 2000. Of this everyone would no doubt be cognizant. But what they might not be quite as fully aware of would be that they would also on this year be determining, or at least in great part determining, the "demand" for education in the year 2000, as well as the technology and related conditions of work. Can we deny that what determines the technologies employed depends, at least in part, on education--knowledge, values and attitudes--of the men that design technologies and the men that select them for use? The demand for technical or specialized labor is articulated in its last stages by "employers". Much of it is machine-related and will probably be "fixed" by the installed technology; but a continuously increasing amount is not machine-related and will be in part a function of the educated imagination or the trained intelligence of the employer in question. In part, a role must also be acknowledged and, to some extent, reserved, for the employee. For who, as well as what, defines the nature of a job, i.e. precisely what is done on a job? Is it determined exclusively by the employer? Clearly, that depends on a number of things and in part, at least, on the initiative, intelligence, imagination and responsibility of the employee. And do

not those characteristics of the employee depend, at least in part, on his prior and current "education"? It is so customary to place humanistic values in opposition to what is loosely referred to as efficiency, we might find it useful to postulate the contrary hypothesis, and to ask to what extent such an opposition is needless or false. Will an increase in employee initiative and an improvement in working conditions raise or lower employee productivity?

Obviously, there is not enough appropriate data at hand that can be used for answering such very broad questions. In fact, the questions themselves contain ambiguities and need to be further specified. Different kinds of problems would be identified in pursuing such an issue, the solutions depending on the particular conditions and factors involved. But formulating these questions does serve to cast doubt on the procedures which are more commonly proposed for determing the amounts and kinds of education that are to be provided.

Among the factors and conditions that need to be much more fully specified are those involving the relationships between national problems and objectives and the content of education programs. For instance, an increasing number of countries appear to have concluded that the internal migration from rural to urban areas needs to be decreased; and a question often posed in this connection is: does education promote or increase this migration?

Since some studies are apparently now under way, let us suppose that the data obtained in most countries indicates a positive corre-

lation between attained years of schooling and the migration from rural to urban areas. Would this finding be likely to lead a policy of limiting the years of schooling in the rural areas?

Obviously, such an inquiry and its findings would constitute a mere beginning, and we'd need to know, as well, the other effects of the education provided: its impacts on agricultural production, and on the kind and level of employment in the urban areas, to mention only two. But the more significant questions might focus on the issue of the content of the education in question, and the effects of that content on a whole range of behaviors, including the disposition to migrate.

Is the content of all rural education programs the same? How much do they vary and what are their differing effects? Could content more appropriate to certain rural areas be substituted for the present content? Indeed, the common fatal misconception or oversight is to take "education", as if it were a singe homogenous thing, both as actuality and as potentiality. After all, when education has some degree of success, when learning occurs, a certain amoung of imagination is awakened, and it will probably be accompanied by a certain amount of ambition--the desire to carry out or achieve those actions which can now be conceived, i.e., held in thought or in the imagination. What determines the actions conceived? Deliberate education is clearly not the only determinant. Perhaps it is not the main one in a world of unceasing, largely vulgar, television displays; but it would surely be premature to discount education as an actual or potential force.

One might then suggest that in the case of educated rural youth the disposition to migrate might depend in great part on whether the content of their educations has developed their ambition to carry out rural or non-rural activities. At the very least, this proposition should be looked upon as hypothesis to be tested. Mathematics, reading and writing, natural and social studies: there is not one of these subjects, in the earlier or in the later grades, which cannot be developed in terms, say, of farming activities, be it measuring land, counting cattle, calculating yields, estimating costs, planting, weeding, comparing growth of different plant varieties, organizing the family for the harvest, etc. Would not such treatment tend to make these school subjects more alive and exciting? Indeed, if it is sound education practice in the early grades to begin with the manipulation of known materials, to move from the concrete and the familiar very gradually to the more abstract and unfamiliar, the two objectives of maximizing learning and engaging interest in (or developing ambitions concerning) rural activities would appear to be basically complementary and reinforcing.

What proportion of primary programs in rural areas proceed in the fashion suggested? Do the social and economic opportunities provide scope for applying what has been learned, and for realizing the corresponding ambitions, for carrying out the actions awakened in imagination? These questions and the answers to them, duly qualified, as they would invariably be when translated into operations or procedures for obtaining, analyzing and interpreting the appropriate empirical observations,

would constitute but a part of the larger issue of education content and practice and its relationship to migration, production and employment. It would be unrealistic to suggest that such a complex problem or issue could be fully resolved in a short time; but there is no reason that inquiries could not commence.

Perhaps the relationship between the content of education programs and the behavior of graduates has been one of the most important areas neglected by analysis. We believe that our great ignorance concerning these relationships accounts partly for what seems to be a growing fear that education will be "over-supplied". Of course, everything depends, as usual, on what is meant by "education". In the previous chapter we have identified education with any kind of learning that is deliberately brought about, and above all with the development of capabilities for problem-solving--a development that can occur at various ages and outside of the schools, as well as in them. It is also important to note that in all societies known to date older people have discharged the responsibility of teaching younger people, and there appears to be a better basis in the earlier years for developing a basic capability for learning.

If education is taken in this very broad sense, it is difficult to conceive of it being in over-supply. If education is that which helps us identify and solve problems, what would be the conditions in which we would have too much education?

Of course, such questions, at best, merely approach the problem we are trying to locate and define. Their function is to suggest the

need for beginning by distinguishing between occupation and education. It is clear that the "supply" of men trained for particular occupations have exceeded and can again exceed the "demand". But even in such cases it may be advisable to inquire carefully into what constitutes "supply" and what constitutes "demand". When the supply is a certain kind of specially-trained machine operator and the demand is fixed, say, by the number of installed and ordered machines, the point of future equilibrium may be clear and fairly easy to specify. And whether these disequilibriums can be more easily righted by short-term training measures or long-term education programs in another questions that often needs to be asked. Nonetheless, in many cases involving long-term specialized professional training the nature of the "supply" and "demand" needs to be examined and then related to other national problems and their correlate objectives.

Let us assume that various observers claim that in a large, densely populated country there is an "over-supply" of economists. These observers base their assertion on such facts as the following: many economists are unemployed; many others are employed in clerical work; many others have migrated to other countries. Undoubtedly these are an important set of facts that must be taken into account when determining whether to increase, maintain or curtail unversity programs in economics. However, it is our contention that these facts are not sufficient for making the final decision.

Let us assume, as well, that the per capita income of this country is low, that the rate of growth during recent years is also low,

compared to other countries, that unemployment is high, that great amounts of food are imported, and that rate of increase in agricultural and industrial production, taken together or independently, is less than the rate in the population increase. Is it not possible that the unemployed economists are <u>needed</u>, i.e., that if they <u>were</u> employed in a variety of positions that have not been established, that if they were carrying out a variety of tasks aimed at increased efficiency in the utilization of resources--is it not at least possible that if they were so employed there would be greater success in solving the national problems mentioned? In such a case it might be desirable to carry out a close examination of both "supply" and "demand", instead of accepting them as final opaque determinants, the scrutiny of which is forbidden.

For example, close examination of "supply" could lead us to issues of program content and to specification of the knowledge and aspirations presumably imparted by this content. Are the graduates willing to work as "economists" only in the universities, the ministries, the national provincial planning offices? Is it possible that certain changes in curriculum and work experience or training could radically alter the expectations of graduates? The same sort of question can be directed to "demand"--to the education and related expectations of employers. Are economists being optimally used in private and public institutions? After all, the effects of education depend to a large extent on how "labor markets" operate. And how labor markets operate depends to some extent on the education that employers have received.

The education system of any nation does not merely select and train people for jobs. To a greater or lesser extent it creates employment, outside, as well as inside, the education system. It does so by developing capability for identifying and solving problems, for helping individuals view problems as opportunities--and not simply as worries or anxieties. Education--whether school or non-school--can help create employment by developing the ability for conceiving the task that needs to be done. It can do so by developing in men and women throughout the society the capability for thinking and acting constructively in the solution of problems and the attainment of goals. And it will do this more effectively if each education program deals with problems that are appropriate to the individuals that participate in such programs.

To sum up, we share the widely-held view that the analysis and planning of education should be related insofar as possible to social and economic planning. One of the purposes of this section has been convince the reader that increasing the effectiveness of such interrelated analysis and planning requires utilization of a considerably broader array of facts and considerations that are proposed under the rate of return analysis or the manpower approach. The other principal purpose has been to raise doubts that making the match between future "supply" and "demand" is the objective to pursue, particularly when supply is conceived primarily in terms of current educational specializations, with no attention paid to the content of programs and the behavior of graduates, and demand is conceived pri-

marily in terms of the current hiring practices of employers.

Since society, as well as education, has multiple objectives, it would appear likely that more than one criterion or procedure is needed for determining the pattern of educational specialization that is most appropriate for the country during the planning period in question, or for allowing that pattern to shape itself, so to speak. Recognizing the complexity of the conceptual and factual problems involved is obviously the first step needed for dealing effectively with these problems. And aside from the difficulties faced in determining the "optimum" composition and levels of education programs and specialization for a multi-purposes society, there is the added difficulty of reconciling such a pattern with individual choices.

Although, once again, we wish to cast doubt on the presupposition that there is any single permanent formula for effecting the reconciliation, we would like here to suggest that one possible approach to that problem involves assuring relevant experiences and pertinent information to the students or individuals who make these choices, when and if they're permitted to make them. We are not referring to "counseling" in the more traditional sense of presenting students with listings and brief descriptions of careers which are usually puzzling or devoid of meaning to these students. We are suggesting, rather, that getting students engaged in natural, social and cultural problems, and relating formal subject-matter and relevant work experiences to these problems, may provide these students with a better sense of vocational possibilities or the various possible kinds of life-work, that is to say, with a

broader view and more detailed understanding of potential occupations. And it is our contention that these students X years hence are going to play a major role in deciding what society's occupations will be.

In discussing primary and secondary education in the rural areas we suggested that a fuller and deeper acquaintance with rural and agricultural needs and possibilities might have the effect of developing relevant ambitions for learning and doing in the area of rural economic, social, political and cultural life. If such a principle were to prove valid for shaping education content in the rural areas, it might also be applicable technical and higher education. If ignorance of scientific, cultural and social problems and opportunities tends to be accompanied by uncertainty or irrationality with respect to vocational choice, a fuller exposure to such problems in the content of secondary and university programs may contribute to improving individual choices, diversifying the collection of choices, and harmonizing it with the diversity of interests and specializations required for "development".[1/]

It would be foolish, no doubt, to imagine that such alterations in education programs, both in terms of information content, problem-solving and work-experiences, if carried out, would constitute the

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1/ If the idea of focusing education on "problems" is disturbing to the reader that may be because "problems" are often thought of as being limited to what is immediate, bothersome and urgent, rather than involving, as well, what is eternal and recurrent on the one hand, and what is anticipatory, on the other. Any question or doubt about the past, or any future difficulty we can anticipate is, so to speak, a problem now. When this point is settled, we see that "learning" is indeed bound up with "problems".

the sole procedure needed. This proposed approach to a revision of education programs is no more likely to be a panacea than, say, rate of return analysis. There is no reason to expect that the approach can be relied upon for doing the whole job, substituting thereby for other current policies, such as limitations in admissions to certain faculties, minimum requirements for entry in specific schools and departments, etc. The proposed policy must be tested mainly through its implementation, and it is conceived as an addition to, and not as a replacement of, current policies and procedures. It takes a middle ground, avoiding exclusive reliance on what appears to be largely uninformed student choice, on the one hand, and exclusive reliance, on the other hand, on projections of future needs carried out by a small centralized staff utilizing estimating procedures that are subject to question. It assumes that fuller knowledge and understanding on the part of students of that great range of natural, social and cultural affairs that we generally refer to as past, present and future will stimulate interests in acquiring specific skills and in carrying out specific tasks when these are seen to be parts of broader endeavors.

Chapter Four

A BRIEF DESCRIPTION OF AN EDUCATION SECTOR ANALYSIS METHODOLOGY

I. Introduction

In chapter two a definition of education was provided and the education sector, or field of inquiry, was delimited accordingly. Chapter three was an effort to identify mistakes and misconceptions in current analyses of education. This chapter will be an attempt to describe a methodology for the analysis of the education sector.

Before proceeding with the description, however, it may be appropriate to briefly consider the way in which education plans and policies are very often developed. Such consideration may help highlight errors that are rather frequently made and help prevent the reappearance of such errors in the proposed methodology.

Very often education policy and planning are the outcomes of a review or enumeration process in which all the aspects or elements of the schooling system are identified as "problems" which require solution. For example, it is decided that there is a classroom shortage problem, a teacher shortage problem, a problem of inadequate teaching and the consequent need for an in-service training program, a shortage of texts, supervisors, a problem of "quality," etc., at each level of schooling or education. Quite frequently working committees are established in each one of these areas and charged with the responsibility of carrying out a study and making recommendations to be presented to an overall coordinating and review committee. The review committee generally finds

itself in the difficult position of having to select from all these recommendations which, by and large, have been made without clear and precise ideas concerning the availability of resources.

Inevitably, each working committee considers its proposals essential. And the difficulties faced by the coordinating and review committee do not arise solely from the fact that no satisfactory criteria concerning priorities have been established, but equally from the fact that the need for each proposed activity is more likely to have been assumed, rather than shown or demonstrated. The whole collection of recommendations probably does not constitute a feasible plan (i.e., a plan which is attainable physically or financially). And were it feasible, it would probably turn out to be unsound or poorly oriented, failing to solve major problems, treating the country's diverse education "system" as if it were a single homogenous thing, and at times applying remedies where no ills were to be found in the first place. Moreover, when estimates of "deficits" are made at the national or aggregate level only, the exact location of insufficiencies is not revealed. Finally, ignorance of the real relationships of ends and means at local or disaggregate levels (a special problem of education which makes the analysis of it more difficult than that of any other sector) increases the probability that certain measures which might involve considerable amounts of resources would not turn out to be solutions.

Developing nations, as well as so-called developed nations, have limited resources for programs and activities that have educational effects, and seek the policy that would best select, design and re-design

programs and activities that most efficiently utilize resources. Of course, in these general terms an education sector analysis is not different from other sector analyses; but, as has been pointed out, it faces various special difficulties. Educational problems and objectives are much more numerous than agricultural objectives, for instance, and they vary much more among individuals and communities. It is therefore necessary to postulate a very limited number of overall national problems and their correlate objectives which can serve as points of departure for the analysis.

Since the first task under the proposed methodology will be to take baseline measurements which will serve, among other things, to determine the overall magnitudes of the pre-selected problems and the consequent importance of the correlate objectives, the methodology provides a certain check on itself, specifically on the pre-selection of these aggregate problems. In this respect it is similar to other sector analyses which must begin with pre-selected national problems which, when analyzed on a disaggregate basis, both in terms of geography and activity, will help localize problems, re-define them, if needed, and uncover the factors that underlie them.

The national or aggregate deficiencies in the efficiency, access and relevance of education and training activities constitute the three general or overall problems in terms of which the analytical methodology is structured. To these problems correspond three correlate objectives: to obtain the greatest possible increases in efficiency and access, and. the greatest possible improvement in relevance. Clearly, such objectives

include a variety of more specific needs and objectives which are to be identified with greater precision during the process of an analysis which attempts to quantify the current relationships and possible future relationships among needs, resources, activities and objectives. This quantification should be carried out with a view towards the specification of alternative solutions that could be of use in the preparation of plans and programs.

In other words, the three overall objectives--increase the efficiency, increase the access and improve the relevance of education and training activities--are points of departure and principles of direction or orientation for the analysis. As will be seen, they serve to structure the analysis, but not to fragment it into independent and isolated areas.

Certain basic themes and assumptions underlie the parts that follow. In the first place, it is assumed that a government that initiates an analysis, such as the one proposed herein, will consider it Analysis-I of the education sector, and that Analysis-II, III . . . N that follow will be the outcomes of an analytical process reflecting a steady increase in precision with respect to measurements and a systematic expansion in coverage with respect to the school and non-school activities included in the analysis. If limitations of time and personnel obliges Analysis-I to focus less on alternative or non-school activities than is desirable, the gaps should be filled by Analysis-II, III, etc.

The quantification or measurement of problems called for by the analysis would involve the assortment of outcome indicators specified in Part II which could serve in future years to measure the progress attained in improving education at the local, provincial and national levels. In

this way the analyses would serve as a detailed national accounting of the education sector, as well as constituting instruments for the solution of problems through planning. As will be seen below, the solutions as well as the measurements of problems are to be given at a very disaggregate level--i.e., at the local level--and will therefore serve as information for the design of specific projects.

Another basic conception is that of approximation--a gradual approach to precision, both in the measurement of problems as well as in the identification of insufficiences and defects and proposed solutions. It is assumed that the objective of education is to enable people to solve problems of different kinds and related to different materials or subject matters. The acquisition of knowledge is considered to be a mere approximation to this objective, and graduation is considered a much cruder approximation that should be regularly tested for its worth or significance. Whenever we are obliged to use this last-mentioned result as a yardstick of efficiency, due to special circumstances or to the lack of information, its provisional and unsatisfactory character should be emphasized. In other words, an attempt should be made to avoid false pretensions with respect to precision, and to attain greater future precision through analytical continuity. Many countries appear to have established a yearly reporting system under which each school provides information concerning the human and physical resources utilized and the number of enrollments, dropouts and promoted for each grade. Such a data base makes it possible to start a process of this kind. The first analysis should attempt to obtain the maximum amount of useful conclusions from the available

information and to identify and fill data gaps for utilization in subsequent analyses.

The analytical methodology to be utilized under each objective will be presented in a condensed schematic fashion.

II. Objective: To Maximize the Efficiency of Education and Training Activities

Primary Education

In this section we will describe the various steps and procedures required for an analysis aimed at maximizing the efficiency of primary education. A similar methodology is proposed for the analysis aimed at increasing the efficiency of secondary education, higher education, and non-school education and training activities. Although a few comments concerning possible variations in methodology for dealing with these three other sets of activities will appear further on, the procedures outlined for primary education are considered to be generally applicable to all activities.

Although Analysis-I may not be able to include all of the non-school activities desired, non-school activities can be gradually added in subsequent analyses. This may also be the appropriate place to emphasize the importance of establishing a process for continuous improvement in the measurement of educational results or outcomes. Until a fairly large variety of educational consequences are fairly accurately measured, estimates of inefficiency will continue to be crude.

A. Baseline Measurements

Step 1 - Measurement of individual educational results or outcomes

a. The performance of each individual is measured for the largest possible number of relevant subjects and behavior patterns.

b. If possible, this will be a measurement of progress realized by the individual during the school year or program period. If not possible, it will be a measurement of his status at the end of the school year or program period.

c. If possible, the measurement instruments will account for local conditions, as well as national norms. If not possible, the measurement instruments will simply reflect national norms.

d. The measurements will be viewed as indicators of learning achieved and will not be taken for full or exhaustive measurements of learning. In order of preference the indicators will be:

1. The First or Best Indicator: The tests of performance in solving problems in specific subject-matters.

2. The Second Best Indicator: The achievement tests or measurement of knowledge acquired and retained.

If widespread testing does not prove feasible for, say, the first analysis, two other inferior indicators may be used.

3. The Third Best Indicator: This year, N, _____ first-grade students were promoted, representing _____% of first-grade enrollment in year N; _____ students of the second grade were promoted, representing _____% of the first-grade enrollment in the year N-1; etc., through the sixth grade.

4. The Fourth Best Indicator: The graduates of this year

represent _____% of the students that began their primary education six years ago.

Step 2 - Aggregation of educational results or outcomes to the level of section, grade and school.

a. Test results will be averaged for individuals to get individual average scores.

b. Means, modes and medians for each subject-matter and across subject-matters will be calculated for each section and grade.

c. The same averages will be calculated for each school, both in terms of grades (weighting each grade equally and ignoring the number of students in each) and in terms of students (in this case, scores of the first grade, which usually has more students, will have more effect on the school scores).

d. Calculations will be made of the standard deviation and other measures of range and variance.

Note: In view of sector analysis' emphasis on disaggregation, it could be argued that estimates of baseline efficiency would be best carried out on a grade by grade basis. However, the difficulty of allocating resources and costs to each grade will often require aggregation to the school level.

Step 3 - Calculate total and averages within and across subject-matters of school scores in terms of geographic and school-type aggregates.

a. School scores are aggregated and averaged to levels of: 1) locality; 2) municipality; 3) province; 4) region; 5) nation.

b. Within each of the five geographic levels, urban scores and rural scores are separately aggregated and averaged.

c. Within each of the five geographic levels, school scores are aggregated and averaged by schools which are classified in terms of every characteristic identifiable in the data requested by the school reporting forms.

(Examples of such characteristics are as follows: 1) half-day schools; 2) whole-day schools; 3) private schools; 4) public schools; 5) schools classified by the number of grades in the school (schools with grades 1-3, 1-2, 1-6, 1-9, 6-9, etc.); 6) schools classified by the percentage of repeaters in the school (less than 10%, 10-20%, 21-30%, etc.); 7) schools classified by percentage of overage students (students whose age is greater than the age prescribed for the grade they are in; 8) schools classified by the percentage of students failed during the previous school year; 9) schools classified by the number of students in the school (less than 50, 50-100, 100-150, etc.); 10) urban schools classified by the percentage of rural students in the school).

d. Calculations will be made of the standard deviation and other measures of range and variation.

Step 4 - <u>Rank and compare the mean, mode and median scores of schools and grades across and within subject matters in terms of:</u>

a. Geography (localities, municipalities, provinces, regions and nation).

b. Urban and rural areas.

c. Schools classified by features or characteristics, as described in step 3 (c) above.

Note: These measurements, aggregations, rankings and comparisons will be carried out in terms of each of the four types of indicators for which measurements are available. It should be noted that these rankings are not rankings of efficiency but of educational results as measured by one of the four indicators. Indeed, one of the useful procedures may be to see if rankings in terms of educational results correspond or correlate with rankings in terms of efficiency.

Step 5 - Estimate for each school (and, if possible, for each grade in each school) the quantity and cost of each resource or input available and utilized.

This step can be presented most clearly in the form of a table:

	Total Enrollment		Grade Enrollment (one column for each grade)	
	Initial Enrollment	Final Enrollment	Initial	Final
Number of available units	N.A.[1]	N.A.	N.A.	N.A.
Number of utilized units				
Number of unit/hours utilized	N.A.	N.A.	N.A.	N.A.
Total cost at current prices	N.A.	N.A.	N.A.	N.A.
Cost per unit at current prices	N.A.	N.A.	N.A.	N.A.
Cost per unit/hour at current prices	N.A.	N.A.	N.A.	N.A.

[1] "N.A." means "not applicable"

	Teachers	Classrooms	M^2 of Classrooms	Textbooks
Number of available units				
Number of utilized units				
Number of unit/hours utilized				
Total cost at current prices				
Cost per unit at current prices				

Other headings or columns:

Desks

M^2 of Library

M^2 of Gym

M^2 of Laboratory

M^2 of Shop

M^2 of Dining Hall

Tables

Chairs

Breakfasts Provided

Lunches Provided

TV Receivers

Principal

Assistant Principal

Administrative Personnel (Breakdown)

Specialized Teachers (Breakdown)

Teachers that Teach Two Grades

Teachers that Teach More than Two Grades

Other Instructional Materials (Breakdown)

Note 1: It should be noted that two basic kinds of information are derived from this process: a) the variations in the patterns of inputs or resources that are utilized by the schools; b) the variations in the costs of these inputs when aggregated in monetary terms. The latter information will be of most utility for calculation of baseline efficiences, whereas the former information will be of most utility for the subsequent analysis of factors.

Note 2: The "activity," the efficiency of which will be measured is probably the totality of inputs and outcomes of a primary school with its particular number of grades. As mentioned previously, if consumed resources could be accurately "charged" or distributed among grades it might be desirable to consider each grade the "activity." Unfortunately, such detailed attribution of utilized resources will seldom be feasible. As more than one establishment or school may operate in one physical plant, it is important in these cases to distribute the consumption or utilization of shared resources (classrooms for example) among the "shifts" or "establishments" involved. The conversion of classroom-hours into monetary terms should take the construction and/or replacement cost and estimated life of the classrooms into account.

Step 6 - Calculate totals and averages of school costs in terms of geographic and school-type aggregates.

a. School costs are aggregated and averaged to levels of:

   1) locality; a) municipality; 3) province; 4) region; 5) nation.

b. Within each of the five geographic levels, urban costs and rural costs are separately aggregated and averaged.

c. Within each of the five geographic levels, school costs are aggregated and averaged by schools classified in terms of every characteristic identifiable in the data requested by the school reporting form (see step 3.c.).

d. Calculations will be made of the standard deviation and other measures of range and variation.

Step 7 - Rank and compare mean, mode and median costs of schools in terms of:

a. Geography (localities, municipalities, provinces, regions and nation).

b. Urban and rural areas.

c. Schools classified by features or characteristics, as described in step 3 (c).

Step 8 - Calculate efficiencies, i.e., the relationships between education results as measured by the indicators, and the costs of inputs utilized.

a. The first kind of calculation of efficiencies will relate total costs and total test score points. By placing total points in the numerator and total costs in the denominator we can estimate score points obtained per monetary unit. A ranking of efficiencies should be carried out in terms of:

   1. Geography (localities, municipalities, provinces, regions)
   2. Urban and rural areas.
   3. Schools classified by characteristics, as described in step 3(c).

b. The second kind of calculation of efficiencies will be carried out by placing average school scores in the numerator and average or

per student cost in the denominator. The ranking procedure should be carried out in the same terms as step 8 (a) above.

Note: It should be noted that the efficiency which will be measured in terms of the relationships between results obtained and resources utilized is the primary school or establishment activity. When the third indicator is used to obtain an approximate measurement of results, it will be desirable to fix different weights or values to the graduates of different grades. If the last grade of each "cycle" is considered the most important, weighting of grades may be advisable even when reliable tests for all grades are being used. The application of achievement tests and tests of problem-solving performance in the different regions and localities will increase the precision with which such weighting or points can be fixed. The predominantly a priori character of this weighting in Analysis-I suggests the use of various weighting systems and the ranking of provinces, municipalities and localities in accordance with these different systems to see if they vary significantly. The rankings of localities by their degrees of efficiency should also be compared with rankings by average costs and average educational outcomes.

B. Analysis of Factors

After obtaining the disaggregate baseline measurements, ranges and variations of educational results and efficiencies, the attempt to account for these quantities begins. If successful, it should establish a basis for improving ongoing activities and for designing new kinds of activities aimed at maximizing efficiency.

Of course, the incremental aggregations by geographic level and the stratification or grouping of schools classified in terms of different characteristics can be looked upon as a preliminary step in the analysis of factors. These groupings of schools and rural-urban distinctions are attempts to establish homogeneities to which statistical techniques can be applied with greater confidence. For example, if certain "kinds" of schools consistently reveal poor educational performance, and there is sufficient evidence that all other factors are equal or nearly equal, a first step has been taken in the process of successive approximations to identify and quantify determining factors. Speaking generally, the analysis of efficiency should be focused on explaining the different levels of two so-called dependent variables: test results and efficiencies. This statement applies in a negative as well as a positive sense: resources or inputs which do not appear to affect the levels of these two factors may be considered prima facie dispensable or at least, candidates for reduction. We say "prima facie" because there is a danger of jumping prematurely to conclusions due to inadequate statistical controls, inadequate baseline measurements, and/or omission of other important values or objectives which were not accounted for in these baseline measurements. As we have repeatedly pointed out, this last-mentioned omission can be considered almost

inescapable. What has not been measured must therefore also be brought into consideration when preliminary statistical results indicate the advisability of reductions or changes in inputs.

Whether the statistical analysis will prove most fruitful as an analysis of variance (i.e. the attempt to account for all levels of educational results and efficiencies) or as a more pinpointed effort to explain the more inefficient activities is perhaps impossible to predict. Since we lack competenece in this area we will make no attempt to specify the appropriate statistical procedures, other than to mention the employment of correlation, cross tabulation and regression techniques as examples of procedures to be used. Consequently, the sets of computations described below are less detailed than those specified in the previous section dealing with baseline measurements, and are to be considered the general approach to be taken when adequate data concerning resources utilized and educational results obtained has been edited or checked for quality and ordered in computer files.

First Set of Computations - First Approximation to an Explanation of Inefficiencies Based on an Identification of Ineffective Patterns of Inputs.

At the different levels of geographic aggregation and for the different groupings or classifications of schools, broken down as rural and urban, measurements of educational results and efficiencies should be taken and related to all the factors for which information is available. The dependent variable can take one of three forms: 1) total results; 2) average or per-student results; 3) efficiency or results per monetary unit. For

case 1) the corresponding independent variables should be expressed in terms of the absolute or total quantities of the utilized resources of the schools in question. In case 2) and case 3), the average or per-student quantities of the resources would appear to be the appropriate way to represent the independent variables (teachers per student, texts per student, square meters per student, etc.). The following kinds of variables would appear to be of particular interest:

(1) Number of professors that teach more than one grade

(2) Number of classroom M^2 per student

(3) Classrooms in poor condition

(4) Percentage of students with age greater than the prescribed age for their class

(5) Student/teacher ratio

(6) Number of incomplete schools (Less than the prescribed number of grades)

(7) Lack of school lunch or school breakfast

(8) Number of students that change schools

(9) Number of teachers without certificates

(others)

It should be noted that with the exception of items four and eight, the factors or variables involved are resources. As it would be premature to conclude that positive correlations are proofs of inefficiencies that could be corrected with the provisions of these resources, two kinds of additional verifications are proposed: (1) Carry out similar correlations, cross tabulations and regressions for geographical entities and school classifications with high efficiency to see if the results are significantly different;

(2) in those cases in which these prove to be so, carry out empirical verification through visits, interviews and direct observation, when feasible. In other words, the statistical analyses will once again serve to locate and to suggest, but not necessarily to prove.

Even when the results of the regressions are considered reliable indicators of so-called policy variables or actions required, we must recognize that a confirmation that a resource is lacking, on the one hand, and is needed, on the other, does not necessarily imply that its provision will assure the desired consequences or outcomes. Educational results depend on the educational processes involved, as well as on the resources provided. An education analysis is distinguished from other sector analyses by the fact that frequency of successful process is considerably lower. In agriculture and in industry the analyst has to worry much less about the process that takes place in the farm, firm or manufacturing establishment. In these cases homogenous activities are largely defined on the basis of the homogeneity of the inputs and the product. The internal processes do not preoccupy the analyst. Whether or not these are homogenous, they are providing a tangible and homogeneous product. Consequently, the different input-output relationships are reliable and reiterable and one can therefore proceed to output maximization. In the problem area of relevance this matter will be considered further.

In carrying out these computations various unforeseen complications will undoubtedly present themselves. It should be remembered that there is probably a rather large number of ways of grouping the observations which are then subjected to regression analysis and which may increase the value

of this analysis. For example, the dead-end or incomplete schools should be studied separately, since their inclusion with complete schools would make more difficult the interpretation of results. A grouping and comparison of 20% of the localities which are most efficient, least efficient and average, for analytical purposes might provide valuable results. Independent analyses and comparisons of rural localities and urban localities are likely to be of fundamental importance. It might also be useful to take certain negative factors--students that fail, repeaters, dropouts and excessive years of schooling-- as the dependent variable in order to compare the results obtained when the dependent variable is the test score educational outcome or the degree of efficiency as measured in the previous step.

This step should also include a study of the phenomenon of poor timing or inopportunity--insufficiencies or total shortages that are not definite or year-round and are therefore not reflected in yearly school forms, but which do have other available sources of information. For example, the payrolls, records of appointments, transfers, and authorizations to take university courses, might serve as indications of temporary absences of teachers from their classrooms with negative effects on efficiency.

Second Set of Computations- Identification and Quantification of Inefficient Activities, the Inefficiencies of which are not Explainable in Terms of Improper Combinations of Inputs or Resources and which Presumably Reflect Individual or Familial Factors, or Defects in the Educational Process

This collection of inefficient activities is the remnant or residual of activities resulting from extraction of the prior set for which imbalance in the patterns and levels of inputs have been identified. Means, modes,

medians, standard deviations and other measures of range and variation should be calculated for each level of geographic aggregation and for each type in this residual, and comparisons made with corresponding averages and variations of the previously identified sets of inefficient activities within the same geographic and school-classification groupings. It is quite likely that this second set of inefficient activities will be considerably larger than the first set. The proposed computational process is intended to help locate the source of inefficiency. At this point we have eliminated resource patterns as the determining factors for what is most likely to be the larger set of activities.

Third Set of Computations- Identification and Quantification of Inefficient Activities, the Inefficiency of which Appears Attributable to Individual or Familial Factors

This third set of computations would be based on a socio-economic household survey of a sub-sample of the tested students. This survey would gather information such as the following: height, weight, age of student, marital status of parents, family stability (father or mother present or replaced by step-parent, etc.), size of the family, family mobility, total family income, family per capita income, parents' education, student's use of free time (work in the home, outside the home, time dedicated to study, etc.), nature and size of dwelling, availability of sanitary services, type of lighting employed, reading material in the home, number of people per room, number of non-family in dwelling, student changes in school, student's self-image, parents' interest in school, typical disciplinary actions taken by parents, etc.

The information obtained from this socio-economic household survey would be related to the scores of the students, taking averages of the student scores as the dependent variable. This could be done in various ways. Correlation with test scores could be calculated for every single variable for all the students in the sub-sample. Conceivably, certain individual variations would be identified as correlating both positively and significantly with test scores.

Another related procedure would involve taking variables as reflected in replies to survey questions and grouping them to form certain social, economic and cultural indicators which define some general characteristic of student or family life; grouping these indicators into compound indicators; and regressing both simple and compound indicators against the test scores. For example, in the case of a recent questionnaire of 86 questions, the following five indicators have been proposed: 1) stability of family structure; 2) family and student mobility; 3) quality and convenience of housing environment; 4) health status of the student; 5) student utilization of his time outside of school. Each one of these five indicators represents a grouping of four to seven variables, the selection for grouping based on some aspect of student or family life which is considered significant in its own right (obviously, determination as to whether an indicator or characteristic is significant with respect to test scores must await computation) and for which questionnaire replies allow measurement in terms of two or more levels. The degree of stability of the family structure, for instance, has been expressed in terms of four levels; measurement of the level depending on seven variables such as the presence of

father and mother at home, the replacement of a missing father or mother by a stepfather or a stepmother, the presence or non-presence of living brothers and sisters, and whether relatives outnumber non-relatives in the home or dwelling place. A similar procedure is followed for the other four indicators and the five indicators can be grouped, in turn, into a compound "Social Level" indicator. That no variable should be used twice, i.e. in more than one indicator, has been put forth as a rule to be followed. As a result, there is no overlapping, and each "economic" and each "cultural" characteristic or indicator will be constituted by a grouping of its own set of variables.

Another approach might be to take, say, ten percent of the students with the highest test scores and ten percent of the students with the lowest test scores and to determine the range and variations in the social, cultural, nutritional and economic characteristics of each group. If certain characteristics are pronounced, i.e. if there is a clear-cut pattern, in the low-scoring group, for example, a first approximation in the identification of specific personal and familial factors adversely affecting academic performance will have been successfully carried out.

To what extent the individual and family patterns associated with high and low performance can be statistically associated with different levels of geographic aggregation and different "kinds" of schools cannot be predicted here. Indeed, whether it will be possible to obtain significant statistical associations of certain variables and social, economic and cultural indicators with municipalities or provinces, and rural and urban school classifications, will depend largely on the size of the sub-sample of students utilized for the household survey. Conceivably, it will not

be possible to make generalizations about certain features of a more personal nature, whereas certain variations in the level of certain economic indicators may characterize the students in certain localities and municipalities.

Fourth Set of Computations - Identification and Quantification of Inefficient Activities, the Inefficiencies of which are not Explainable in Terms of Improper Combinations of Inputs, nor Individual or Familial Factors and which Presumably Reflect Defects in the Educational Process

Another step in the residual process can now be carried out. The present remnant is now identified as those inefficient education activities for which the evidence suggests that the main source of inefficiency lies in the instructive-learning process itself.

a) Analysis of test items, taken individually, and grouped in terms of learning categories (e.g. memory, application, comprehension, reasoning) to determine relationships with "curriculums" and appropriateness for identified socio-economic groups.

If this study leads to significant findings, three basic purposes may be furthered: 1) an evaluation or check on the measuring instruments (the tests); 2) the establishment of criteria for revision and adjustment of curricula in order to make them more relevant or appropriate; 3) the identification of weaknesses in specific learning categories (memory, comprehension, etc.) by region, classification of schools, and socio-economic group.

b) Structured Observations and Quantifications of the Teaching-Learning Process in Selected Classrooms and Schools

Surveys and measurements of teacher attitudes could be related to the prior studies for fuller insight. A gradual extension in the application

of achievement examinations, their correlations with other kinds of tests, and their systematic documentation in accumulating sector analyses would facilitate the identification of defects in the education process, particularly those pertaining to teacher behavior.

We should recognize that this kind of study will probably have a greater dependence on theoretical elements than others. The psychological or pedagogical theory that is considered best could be used to determine the degree of adjustment or correspondence between the prevailing theory and the behavior of the child in class, on the one hand, and the teacher, on the other. Although there may be significant differences of opinion concerning the adequacy of the theory, the degree of adjustment or correspondence could be determined with relative objectivity. Since the knowledge acquired would be measured by means of achievement tests, the relationships between these tests and the quantified observations of the process might give an approximate idea concerning the value of the latter. A careful documentation of results, comparisons of the processes of inefficient and successful schools, and an effort to equalize or establish controls over the effects of socio-economic factors, may facilitate a gradual approximation to reliable results.

The concept of adjustment or correspondence would play a major role in these studies. First, we could compare the psychological or pedagogical theory previously mentioned to the official curriculum. Second, we could compare the identified or tested and documented knowledge that is acquired in each grade to the curriculum. The result of these two studies, if the sample is sufficiently large, should contribute considerably to an evaluation of the current curriculum.

Should the program or curriculum be national in character? Another study that might be attempted would be to determine the extent to which teachers make changes in the curriculum or in the use of the curriculum, adjusting it to the special factors that are personal and local in character. This kind of study might help determine the extent to which teachers can be relied upon in making needed adjustments in content and instructional process.

Secondary Education

Speaking generally, the same eight steps comprising baseline measurements and the four sets of computations of interrelationships comprising the analysis of factors, will be carried out for secondary education. However, specializations within this level will need to be treated independently since the desired outcomes will vary more in character than in the case of primary education, and more kinds of measuring procedures will be needed. Cost and efficiency comparisons and rankings should be carried out within and between specializations. Were the comparisons between kinds of "specializations," for example, to reveal that both desired and actual outcomes were very similar and that the cost of one were significantly lower than the other (all other things, such as socio-economic characteristics, being equal) the finding would be of major significance.

Higher Education

Similar considerations apply to so-called higher education, although specialization will invariably go deeper and is much less likely to prove dispensable.

The need to exercise great care and caution in the use and interpretation of measurements of educational outcomes is a principle that needs to be constantly and forcefully applied at this level. Indeed, a whole chapter could be easily devoted to an elaboration of all the errors that may be made in attempting to "measure the efficiency of higher education," and the dangers in using or interpreting such measurements for policy purposes. Unfortunately, the possibility that measurements of social phenomena will be misinterpreted and/or misused is always a very real possibility. Individuals, such as ourselves, who are dedicated to "the idea of a university" and believe that a university can and should be more than a mere grouping or collection of specialized disciplines, will be inclined to raise issues that many observers would claim lie beyond the bounds of measurement. Is the "universality" of a university education-- the expansion of mind and the broadening of sympathies presumably sought by those who enter such an institution-- subject at any point in time to measurement?

One answer to such a question might be that unless the sought outcomes are, in some fashion or other, subject to measurement, their very existence is subject to doubt. Certain ends have been declared important. Unless their subsequent realization or non-realization, and the extent of the realization in the event that it takes place, can in some way be observed and appraised, the declaration of importance is a piece of empty rhetoric. If we wish to replace rhetoric[1] in social affairs generally, and in education

[1] By "rhetoric" we mean the emphatic declaration (usually by individuals in positions of authority or power) that such and such is the case (without any evidence that it <u>is</u> the case) or that such and such should be and will be the case (without having provided good evidence that the means chosen will in fact make it the case). We are most emphatically not referring to speculation, to the free play of ideas which can lead to new actions and fresh observations.

specifically, with genuine realizations or accomplishments, then we must accept a much larger role for measurements of all kinds in the conduct of human affairs. Negatively, it means that measurements cannot be restricted to the kinds of homogeneities utilized in the natural sciences, despite the advantages of such homogeneities for control. Positively, it means that systematic observations, recordings and comparisons (especially longitudinal comparisons) begin to play a much larger role in education than they have played to date.

Non-School Activities

These activities will be of two broad general kinds: 1) those which are intended to substitute for (or replace) traditional school activities and tend to retain the sequential "grade" structure; 2) those which do not have this substitutive function or structure.

We know that the phrase "non-school activities" will be met with objections. The phrase is not perfect for the purpose at hand, but it seems to be better than the other currently available phrases for referring to the remaining activities in question. Clearly, the worst of all is "non-formal education." The suggestion that an activity can be educative in intent and lack form or structure is a patent contradiction- one made manifest by the fact that activities often referred to as "non-formal" such as apprenticeships (which constituted such a large part of education and training in the middle ages and which probably should be playing a much larger role today than it does), on-the-job training, and correspondence courses are often much more structured or rigid and "formal" than activities that take place in the classroom.

Similarly, the use of the term "non-formal education" in an honorific sense, meaning "non-traditional," "cheaper," or more practical, or their felicitous combinations, is equally unacceptable, since many of the activities in question have an old and worthy tradition and the search for cheaper and more practical procedures of imparting education and training is not assisted by the misleading term "non-formal education."

III. Objective: To Maximize the Access of Education and Training Activities

Two kinds of access will be considered: 1) physical access or attendance; 2) educational access.

The term "physical access" will comprehend not only availability of facilities and services, but their utilization as well. In other words, the physical availability of services at reasonable distances is a necessary but not sufficient condition of physical access. Access is here equated to use, and as will be explained below, dislike or disinterest in education and training will be treated as attitudinal factors that constrain or impede physical access, the actual utilization of services.

Educational access is a broader concept that includes the attainment of educational outcomes or ends. In other words, if an individual participates in a program without realizing any learning progress, he has had physical but not educational access. Measurement of educational access would therefore be carried out by means of before-and-after tests, such as those described in the previous section on efficiency; and a national increase in educational access during any given period of time would be indicated by an increase in the totality of the nation's educational results.

Whether there is any value at all in measuring and analyzing physical access is an issue that has been occasionally raised. Since the ultimate objective is to increase educational results, why not focus exclusively on these? Increasing physical access, it has been argued, is not an objective in its own right, and to set it up as such will have the effect of distorting the analysis and ultimately contributing to a misallocation of resources.

The reasons for rejecting this argument are implicit in the preceding chapters. As has been pointed out, an educational sector analysis is in great part a search for attainable ends, as well as a search for the most effective means for realizing previously selected ends. The overall objectives that help structure the analysis and the data to be selected can be justified in terms of their organizing and heuristic effects, as well as in terms of their intrinsic desirability.

In the second place, awareness of the partiality or incompleteness in the measurement of educational outcomes militates against exclusive reliance on these. As we have pointed out, testing is a check on the effects of mere physical presence and the movement through grades, including "graduation," test scores providing fuller meaning to these events on an individual case-by-case basis. But the usual inadequacy of testing instruments, and the many years required for their improvement suggests that physical entry, average daily attendance, and the flow of students throughout the school grades, can be prematurely discarded as indicators of educational progress.

Finally, measurements and analysis of physical access on a disaggregate basis can serve useful purposes for examining various issues of equity. Such measurements and analysis can contribute to planning for a distribution of educational services which provides greater "equality of opportunity," i.e. which is more equal in terms of regions, rural and urban areas, and different socio-economic groups.

Clearly, physical access is primarily a means to an end, but it is a means of such importance that its treatment as an end-in-view is of considerable analytical value.

Primary Education

A. Baseline Measurements of Physical Access or Attendance

For each locality (the smallest political or administrative unit identifiable in population census data) the procedure will be as follows:

1. Add up the square meter (m^2) of primary education classrooms in the locality (Source: School Buildings Surveys)
2. Divide this total of m^2 by the amount of m^2 required by each pupil.
3. Multiply this result by 2 in order to estimate the number of available half-day spaces in the locality. (This estimate assumes that primary education schools will be used for children seven through fifteen years of age only, in the mornings and afternoons, not in the evening.)
4. Add up the morning enrollment of children within the prescribed age for their respective grade. (Source for steps (4) through (13): Ministry Enrollment information from school reporting forms)
5. Add up the morning enrollment of children who do not have the prescribed age for their respective grade.
6. Add up the afternoon enrollment of children within the prescribed age for their respective grade.
7. Add up the afternoon enrollment of children who do not have the prescribed age for their respective grade.
8. Add up the full-day enrollment of children who have the prescribed age for their respective grade.
9. Add up the full-day enrollment of children who do not have the prescribed age for their respective grade.

10. Add up the morning, afternoon and full-day enrollments of the children who have and do not have the age prescribed for their grade. This total corresponds to the half-day spaces that would be used if all schools in the locality were to go on a split shift.
11. Add up all the children who do not have the prescribed age for their grade.
12. Subtract the result of step (11) from the result of step (10) in order to estimate the total number of enrolled children who have the prescribed age for their grade.
13. Divide the result of step (11) by the result of step (10) in order to estimate the percentage of children enrolled in the locality that do not have the prescribed age for their grade.
14. Estimate the school population, i.e. the seven through fifteen-year-olds, taking the figures given by the last population census for the locality involved and adjusting it with the appropriate increase for the base year utilized in the sector analysis. This figure represents the required half-day spaces for the school population if all localitites were to go on a double shift, and if all children were enrolled in the grade prescribed for their age.
15. Multiply the percentage estimated in step (13) by the result of step (14), and add this result to the result of step (14) in order to obtain another estimate of the required half-day spaces. This estimate must be considered as a maximum temporary requirement, to be in effect or applied while the age groups are arranged in the proper order, so as to eliminate the enrollment of children older

than the age that corresponds to the grade in which they are enrolled.

16. Compare the result of step (14) (maximum number of half-day spaces required) with the result of step (3) (number of half-day spaces available) and subtract the smaller figure from the larger, in order to estimate the absolute deficit or surplus for the base year.
17. Compare the result of step (15) (maximum number of half-day spaces required) with the result of step (3) (number of half-day spaces available) and subtract the smaller figure from the larger, in order to estimate the temporary deficit or surplus for the base year.
18. Add up the deficits and surpluses of the localities corresponding to the same municipality and, for each municipality, estimate the total, average, median, minimum, and maximum deficit or surplus, with the results of step (16).
19. Repeat the above with the results of step (17).
20. Add up the results for the municipalities in order to estimate the total, average, median, maximum and minimum deficits or surpluses of the districts. Compare these results with prior estimates.
21. Repeat the above with the results of step (17).
22. Add up the results of the municipalities in order to estimate the totals, averages, medians, maximums and minimums for the provinces.
23. Repeat the above with the results of step (17).
24. Add up the results of the provinces in order to estimate the national total, average, median, maximum and minimum.

25. Repeat the above with the results of step (17).

B. Analysis of Factors

It should be pointed out that the magnitudes of deficits and surpluses of pupil-spaces at aggregate and disaggregate levels provided by the 25 steps specified above constitute themselves a first step in the analysis of factors. For example, it will not only locate areas in which pupil-spaces are in deficit, and areas in which they are in surplus, but will also identify the areas in which spaces are available and children of the specified ages are not enrolled. In this case the availability of facilities is not an impediment or constraint, and other factors or conditions must account for non-attendance.

There appears to be increasing evidence that reasons for non-attendance at primary school are to be found in parental characteristics and attitudes which can be inquired into by means of a national household survey. Family income, educational level of parents, family labor requirements for work on the farm in particular, and for family income in general, parent views concerning the amount of eduction that their children require, the relevance of the curriculum in the available schools, transportation time to the school, parental response to attitudes of rejection of school by the children, frustrations due to grade repetition, etc. constitute information which is germane to the analysis of factors impinging on non-attendance. This information can be obtained by means of a national household survey; and the results of the survey can be used to fashion policies aimed at eliminating the identified obstacles--policies to be applied in the areas in which school spaces are available and children of the specified school-ages are not enrolled.

C. Educational Access: Baseline Measurements and Analysis of Factors

As explained above, the concept of educational access is broader than that of presence or attendance and includes the attainment or non-attainment of the purposes or ends-in-view of education and training activities. Measurements of the extent of attainment requires the kinds of testing which have been briefly described under the efficiency section. In other words, measurement of educational results or outcomes for those individuals who take part in an educational activity constitute the best available indicators of the existing degree of educational access to that activity. Thus, the analysis of variance of educational access has been dealt with in the efficiency section. The reappearance of these measurements under "access" serves the purpose of focusing on educational results or outcomes from a different perspective. Leaving aside issues of equity or distribution, the differerce between "maximizing efficiency" and "maximizing access" can be compared to the difference between "maximizing productivity" and "maximizing product."

Assuming some given or fixed resource base, it could be argued that these two objectives are ultimately the same. Such a proposition, however, is valid only as an abstraction or conceptual point of departure. An attempt to define the two concepts operationally and to specify measurement procedures for application of the concept to existential affairs serves to highlight the need for maintaining the distinction. In the case of productivity or efficiency, emphasis is placed on resources or means, and the measurements of changes in these depends on which of the inputs or means is utilized in the denominator of the fraction in which output constitutes the

numerator. When we speak of "efficiency" or "productivity" in general, we are speaking ambiguously. We must specify the "productivity of what"? Of land? Labor? Capital? Or some more specific resource that falls under these broad categories? In short, efficiency or productivity can be measured in various ways. Expressing all the means that can be identified in monetary terms and totalling them in the denominator is simply one of the ways and, as is well known, a way that on occasion leads to serious misallocation of resources. Concentrating on the scarcest resource in maximizing productivity (i.e. placing the scarcest resources in the denominator) is probably a fairly good rule to follow, but application of that rule encounters new difficulties when output or results are defined in terms of multiple educational objectives, since different resources or inputs may have different effects on the different ends-in-view.

In conclusion, the maximization of "access" is proposed as an additional objective for structuring the first analysis of the education sector. This "access" is to be further decomposed into two objectives or sub-objectives, the maximization of physical access or attendance and maximization of educational access, i.e. the totality of educational results to be measured and recorded on a disaggregate and aggregate basis.

Secondary Education, Higher Education, and Non-School Education Activities

As the years of schooling increase, some alterations in procedures will be needed for carrying out base year measurements and for analyzing the factors that account for variations. In the case of primary education, procedures parted from the premise that all the children of the specified ages should be enrolled. In the case of secondary, higher and non-school

activities, we propose that "maximization of physical access" be viewed as the attainment of whichever of the following two targets is higher: a) independently measured need; b) demand.

Procedures for measuring or quantifying need are considered in the next section which is concerned with improving the relevance of education and training activities. This need is assessed on a geographically disaggregate basis, independently of the demand; and can be expected to vary from country to country and from region to region.

The concept of "demand" should be decomposed in terms of the following distinctions: 1) perceived need (need as perceived by potential participants and/or their families); 2) effective demand. The information required for the measurement and analysis of perceived need and effective demand (involving the cost of schooling to parents or students, whether direct or related costs, and the willingness of parents or students to meet those costs) can be obtained most effectively by means of the national household survey mentioned in the preceding section.

Determination of the gaps or quantitative differences between independently measured need, perceived need, and effective demand may turn out to be very useful for policy, particularly when these differences are treated on a regionally disaggregate basis. For example, if the independently measured need is much larger than the perceived need, informing or educating the target group concerning its "real" or independently measured need may be the appropriate policy to follow. If the independently measured and the perceived need are both considerably higher than effective demand, some material incentive or subsidy may be required to raise effective demand and thus "maximize" access.

IV. Objective: To Improve the Relevance of Education and Training Activities

We must begin by recognizing that this overall objective is not only the most difficult of all to achieve, but a difficult one to define. What do we mean when we propose improving the "relevance" of education and training activities?

It seems clear that the relevance of the activities in question refers to purposes of the society which are not primarily educational. As we have pointed out, these purposes are multiple, and concern the society, viewed as a whole, and the individuals that compose the society. Economic growth, the needed increases in employment, a more just distribution of income, increases in the production of food, improvements in the status of health and nutrition, improvements in working conditions, a reduction in the population growth rate, a reduction in the rate of rural to urban migration, increased satisfaction in work, and greater participation in cultural activities are some of the broad social objectives with respect to which education and training activities should become more relevent, i.e. more effective in contributing to the achievement of these objectives.

How relevant or effective are current education and training activities? Are the factors which can now be identified as major obstacles or impediments constituted by characteristics of education and training activities, by characteristics of the economic and social activities for which education is presumably preparatory, or by certain relations between the two sets of activities, so that only by making changes in both kinds of activities will the obstacles be removed?

We propose an exploratory and eclectic approach to the improvement of relevance. Such an approach is skeptical of the effectiveness of any single

formula, and it parts from the premise that a better understanding of how education and non-education activities presently relate, and a better understanding of what effects those relationships have on the broad social purposes previously mentioned, are prior logical requirements for improving relevance. It assumes that with a better understanding of the current situation, needed changes can be made.

The obvious first step to take is to conduct a careful review and appraisal of the data that is presently available. In many, if not most, countries such a review will reveal that there is a considerable amount of available data that has not been used for analytical purposes. Population censuses, economic censuses, and information on education and training gathered by or deposited in ministries such as education and labor, constitute three important data collections which, taken singly or all together, are generally neglected as sources of information that can be fruitfully analyzed. For example, the questionaires utilized for population censuses generally request information on fertility, employment, occupation, literacy and years of schooling, as well as age, sex, relationship to head of household, etc. The computerization of this information and the appropriate tabulations can therefore provide disaggregate and aggregate baseline measurements of literacy and years of schooling of the employed and unemployed, and the fertility of women of child-bearing age by literacy and education level. These tabulations will not only indicate whether or not there are statistical associations between literacy and education, on the one hand, and employment and a planning of the number of offspring that can be given sufficient food and care, on the other, but also will indicate

regional variations, and thus help locate areas in greatest need of national, provincial, or municipal attention. In the case of fertility, such attention may take the form of education or training programs, and such programs may be short or long-term in nature, focused on specific target groups, and/or made part of school curriculums.

It is not likely that information concerning educational characteristics of the employed and the unemployed at any given moment in time will, by itself, prove of great utility to employment-creating policy. When such information is regularly collected on a sample basis, its utility for this purpose will increase. This will be insufficient, however, and broader understanding of the specific and changing disaggregate relationships between education, production and employment will depend largely on the extent to which the systematic collection, tabulation and analysis of data becomes a continuous process which allows trends to be identified and significant comparisons to be made.

The generally available population and economic censuses can provide information such as the occupational composition of the labor force, labor force productivity rates, productivity of firms within specific industries and their statistical associations with the educational levels of the employees, that can be used for different kinds of manpower studies. Similarly, rate of return calculations for the different occupations at different moments can provide useful preliminary information concerning the supply and demand for services-- supply and demand which themselves should be subjected to further analysis along the lines proposed in chapter three. Obviously, regularly conducted sample surveys can contribute greatly to the updating and refining of such manpower and rate of return studies.

Tracer studies constitute another strand of the synthetic approach to improving relevance that we are proposing here. Underlying the manpower approach is the desire to establish criteria for determining the pattern of specializations-- the levels and contents of education required for achieving maximum growth. The manpower approach tends to assume precisely what is placed in question by the tracer studies herein proposed. Under these studies tests of knowledge and understanding of different subject matters and tests of specific skills would be given to employed graduates X and Y years after graduation. Widespread test results could then serve as indicators of the knowledge that is used and therefore retained in specific occupations. They would help sort out the learning obtained on the job from prior or preparatory learning, and thus contribute to the re-design of curriculum as well as to determinations concerning an optimum pattern of educational specializations. Such testing could be applied to a large range of occupations, including unskilled workers, and highly-schooled professionals, and thus provide insight into the relevance of primary education content as well as university professional training.

As pointed out previously, the "relevance" of education and training activities is defined by their effectiveness in contributing to the attainment of objectives which are primarily non-educational. Some of these objectives (such as increasing agricultural production and employment) are intra-sectoral, whereas others (such as increasing national income and employment) are intersectoral, and the attainment of both kinds of objectives is facilitated by the kind of disaggregate analysis described in chapter one. Such analysis attempts to identify and quantify all the obstacles and

constraints to the achievement of both the intersectoral and the intra-sectoral objectives in question, including defects and deficiencies in education and training. This is why fuller progress and greater precision in improving the relevance of education and training activities may depend in large part on the execution of disaggregate analysis in sectors such as agriculture, population, industry and health.

V. Alternative Programs and their Corresponding Combinations of Feasible Targets

The proposed procedures for making baseline measurements and analyzing the factors bearing upon the efficiency, access and relevance of education and training activities are aimed at providing a better understanding of the actual state of affairs. In other words, the analytical methodology described up to this point is largely cross-sectional in nature, focusing on present or recent levels of performance and the different conditions and factors that account for these levels. The identification and quantification of factors has included the resources which are presently or were recently available, and those which are presently or were recently utilized.

The present resources are scarce or limited, and it is clear that future resources will be limited as well. Since the analysis is meant to provide a better basis for planning, a major purpose of the cross-sectional analysis of efficiency, access and relevance is to determine the different ways in which future resources can be utilized for achieving educational objectives. Any activity requires the utilization of resources, and this utilization has the effect of denying the resources for other, perhaps rival, activities. For example, measurement and analysis of the present range of efficiencies is expected to provide indications as to how future efficiencies can be increased. Since some of these increases will involve additional costs, they may serve to draw resources away from activities to increase physical access. On the other hand, an increase in efficiency would have the effect of increasing educational access. In this case, actions focused on one objective are also supportive of another objective.

The feasibility of quantified objectives or targets, and combinations of targets, depends on the quantities of resources that will be made available during the years of the planning period in question. This means that future resources must be projected or estimated and used as basis for estimating different combinations of feasible targets.

The feasible combination of targets will constitute a range. This range will be determined by the different alternative uses to which the future available resources can be put in furtherance of efficiency, access and relevance objectives within the four categories of education activities proposed, viz. primary, secondary, higher and non-school education and training activities. Clearly, there will be different possibilities or options for distributing resources among these four broad sets of activities, as well as different options within them. We have rejected the formulas more commonly proposed for determining an alleged optimum distribution among them, and do not propose any alternative formula or fixed set of criteria, contending that a regionally disaggregate analysis of problems and objectives will help us arrive at more specific estimates of disaggregate needs and to limit options accordingly, with subsequent disaggregate analysis of other appropriate sectors such as agriculture and health furthering the process of approaching an "optimum."

First Set of Computations- Cost of Future Analyses to be Carried out During the Plan Period

These computations or estimates are proposed as the first set for two obvious reasons. In the first place, completion of the first sector analysis should provide the information with which a fairly reliable estimate of the

cost of future analyses can be made. This estimate will require a preliminary appraisal of the completed analysis, an identification of data gaps to be filled, and an estimation of the costs entailed. A prompt estimation of these matters is more likely to be reliable than one that takes place sometime after the first analysis is completed. Secondly, an early estimate of the costs of future analyses can serve both to initiate the planning of these analyses and to reserve funds for the purpose, contributing thereby to making analysis for improved planning and policy a continuous and self-correcting process.

Second Set of Computations- Future Costs of Increases in the Efficiency of Ongoing Education and Training Activities during the Plan Period

To the extent that the analysis of efficiency is successful, needed changes in the patterns of inputs and in the education process will have been identified and quantified on a disaggregate basis. Some of those changes will lead to monetary savings, but perhaps more will lead to increased costs, such as those involved in the production and distribution of texts, school lunches, and the in-service training of teachers. It is important to note that these are costs exclusively involved in improving ongoing activities. As in the case of future analyses, independent computation of costs may contribute to the reservation of funds, if needed, for those improvements which so often tend to be sacrificed on behalf of expansion programs. Obviously, the findings that emerge from the analysis of efficiency will also affect the design of new programs. But unless programs are designed, costs are calculated, and funds are reserved for increasing the efficiency of ongoing activities, measures needed for bringing about this increase are more likely to be overlooked or neglected.

Third Set of Computations- Future Costs of Improving Relevance during the Plan Period

These costs will be incurred on behalf of ongoing programs and new programs. In the case of ongoing activities, the costs will be involved in those changes in curriculum and related teacher-training which appear to be advisable in the light of relevance studies such as the tracer studies mentioned in the previous section. The new programs are more likely to arise from the study of obstacles and constraints to the attainment of objectives in sectors such as agriculture, population, health, and industry, and to take the form of short-term training programs.

Fourth Set of Computations - Costs during the Plan Period of new Experimental Programs Aimed at Sharp Reductions in Learning Costs

These programs have not been previously discussed and will be described in chapter six. Since they constitute a separate set of activities which are focused on experimentation, and are subject therefore to termination, they are not to be viewed as an expansion, nor as an improvement of ongoing activities. Consequently, their cost over the plan period should be calculated independently.

Fifth Set of Computations- Calculation of Geographically Disaggregate and Aggregate Costs of Physical Access or Attendance of Primary Education Calculated in Terms of Different Enrollment Targets.

(a)	(b)	(c)
Year	School-Age and/or "Demanding" Population	Estimated Population the Enrollment of which is "needed" for the Attainment of the Specified Development Goals
1960		
1965		
1970		
1975		
1980		
1990		
2000		

(d)	(e)	(f)
Historical (Past) Enrollments and Various Hypothetical (Future) Enrollment Targets	Past Enrollments and Future Enrollment Targets as Percentages of School-Age and "Demanding" Population	Past Enrollments and Future Enrollment Targets as Percentages of Enrollment "Needed"

(g)	(h)	(i)
Additional Investment Resources (in units) Required by Target	Additional Operational Resources (in units and unit/hours) Required by Target	Calculation of Costs at Current Prices of Additional Investment and Operational Resources Required by each Target

Although the above table constitues a summary, and is not a full specification of the procedures to be followed, a brief explanation of the headings can serve to explain these procedures. Moreover, since these procedures are also to be applied to the other three categories of education and training activities, references to these will be included in the explanation.

Column (a) includes 15 years of the past as well as 25 years of the future, on the assumption that the display and examination of past trends will contribute to realism in the selection of targets. Column (b) ref refers to "Demanding" as well as to school-age population. In the previous section, it was pointed out that certain localities may have available school-spaces and school-age individuals who are not enrolled. In such cases, there will be a quantitative discrepancy between school-age and "demanding" population. It was also suggested that this demand could be further decomposed by means of a household survey in terms of "perceived need" and "effective demand." Were this carried out for the base-year, for example, the single column would expand to three columns. Clearly, the quantitative differences between school-age and "demanding" population will be larger in the case of secondary and higher education. For many countries the number of people "demanding" higher education will be a more significant coefficient than the school-age population. In the case of non-school education and training activities, distinguishing felt need from effective demand, and distinguishing both of these from "real need" (column (c)) as estimated independently, should be useful for planning.

It is probable that the first calculations of estimated need, perceived need and effective demand,as well as school-age population, will be made for the base year of analysis (1975) and that estimations will be made later for subsequent base years of executed sector analyses. This suggests that until at least two analyses have been carried out, there is very slight basis for projecting these coefficients. On the other hand, the projection of school-age populations can and should be carried out on a geographically disaggregate basis, using national or regional birth rates, school-age populations by locality, and rural-to-urban and inter-provincial migration rates, as recorded in and calculated from the last two population censuses.

It should be noted that when column (d) moves past the base or analytical year to future years,it divides or breaks out into various columns. In other words, various options or different enrollment targets are tentatively proposed or hypothetically set forth. Future school-age population (column (b)) will place an upper limit on the range of selected targets, and recent past percentages of population enrolled (column (e)) can be used to place a lower limit.

Columns (e) and (f) serve simply to highlight the indicated implications of the hypothetical targets, the former calculated by dividing column (d) by (c), the latter by dividing column (d) by (b).

Columns (g) and (h) are highly summary in character. For example, the investment resources include, inter alia, the construction of the new classrooms and the preparation of the new teachers that are needed to meet the target. This estimate must take into account the deficits and

surpluses of rooms and teachers that have been calculated as base year measurements of physical access for each locality by means of the procedures described in the previous section. Similarly, estimation of the additional operational resources required will depend partly on the findings that emerge from the analysis of efficiency with respect to the optimum pattern of inputs. These inputs should be specified in terms of kinds and amounts, i.e., the number of additional teacher-hours, school lunches, textbooks, etc.

In column (i) the additional investment and operating resources needed to meet the target in question are converted into monetary terms and aggregated. This column will reappear along with columns (a) and (d) in the ninth set of computations. Finally, it should be pointed out that the resource and financial implications of hypothetical enrollment targets for each locality have been estimated, but that the issue of feasibility has not been dealt with as yet. The resource and monetary outlay requirements of the lowest and the highest target for each locality should be aggregated to the levels of municipality, province and nation. The last aggregation will constitute provisional upper and lower limits of national resources and expenditures for primary education during the years of the plan period.

Sixth Set of Computations - Calculation of Geographically Disaggregate and Aggregate Costs of Physical Access or Attendance of Secondary Education Calculated in Terms of Different Enrollment Targets

(a)	(b)	(c)
Year	School-Age and/or "Demanding" Population	Estimated Population the Enrollment of which is "needed" for the Attainment of the Specified Development Goals
1960		
1965		
1970		
1975		
1980		
1990		
2000		

(d)	(e)	(f)
Historical (Past) Enrollments and Various Hypothetical (Future) Enrollment Targets	Past Enrollments and Future Enrollment Targets as Percentages of School-Age and "Demanding" Population	Past Enrollments and Future Enrollment Targets as Percentages of Enrollment "Needed"

(g)	(h)	(i)
Additional Investment Resources (in units) Required by Target	Additional Operational Resources (in units and unit/hours) Required by Target	Calculation of Costs at Current Prices of Additional Investment and Operational Resources Required by each Target

Seventh Set of Computations - Calculation of Geographically Disaggregate and Aggregate Costs of Physical Access or Attendance of Higher Education Calculated in Terms of Different Enrollment Targets

(a)	(b)	(c)
Year	School-Age and/or "Demanding" Population	Estimated Population the Enrollment of which is "needed" for the Attainment of the Specified Development Goals
1960		
1965		
1970		
1975		
1980		
1990		
2000		

(d)	(e)	(f)
Historical (Past) Enrollments and Various Hypothetical (Future) Enrollment Targets	Past Enrollments and Future Enrollment Targets as Percentages of School-Age and "Demanding" Population	Past Enrollments and Future Enrollment Targets as Percentages of Enrollment "Needed"

(g)	(h)	(i)
Additional Investment Resources (in units) Required by Target	Additional Operational Resources (in units and unit/hours) Required by Target	Calculation of Costs at Current Prices of Additional Investment and Operational Resources Required by each Target

Eighth Set of Computations - Calculation of Geographically Disaggregate And Aggregate Costs of Physical Access or Attendance of Non-School Education and Training Activities Calculated in Terms of Different Enrollment Targets

(a)	(b)	(c)
Year	School-Age and/or "Demanding" Population	Estimated Population the Enrollment of which is "needed" for the Attainment of the Specified Development Goals
1960		
1965		
1970		
1975		
1980		
1990		
2000		

(d)	(e)	(f)
Historical (Past) Enrollments and Various Hypothetical (Future) Enrollment Targets	Past Enrollments and Future Enrollment Targets as Percentages of School-Age and "Demanding" Population	Past Enrollments and Future Enrollment Targets as Percentages of Enrollment "Needed"

(g)	(h)	(i)
Additional Investment Resources (in units) Required by Target	Additional Operational Resources (in units and unit/hours) Required by Target	Calculation of Costs at Current Prices of Additional Investment and Operational Resources Required by each Target

Ninth Set of Computations - Estimation of Feasible Combinations of Targets for the Four Kinds of Education and Training Activities

(a) Year	(b) Various Hypothetical Enrollment Targets				(c) Calculation of Costs of Additional Investment and Operational Resources
	(1) Primary Education	(2) Secondary Education	(3) Higher Education	(4) Non-School Education & Training	
1960					
1965					
1970					
1975					
1980					
1990					
2000					

(d) Base Year Operational Costs of Education	(e) Future Costs of Analysis, Efficiency Increases, Relevance Improvements and Experimentation as Estimated in First Four Sets of Calculations	(f) Total Costs

(g) Estimate of Total Product or Income	(h) Estimate of Funds Made Available for Education		(i) Total Costs as Percentage of Total Product
	(1) Amount	(2) Amount as Percentage of Total Income	

(j) Total Costs as Percentage of Education Funds

The sequence to be followed in this ninth set of computations is in reverse order of the sequence followed in the fifth, sixth, seventh and eighth sets. For each one of these sets, i.e., for primary, secondary, higher and non-school education and training activities, the process of selecting hypothetical targets, estimating their resource and monetary requirements and the upper and lower limits of these was initiated at the most disaggregate geographic level, the locality; then aggregated from locality to municipality to province and nation.

The procedure to be followed in this set of computations will begin with national aggregates,making the necessary adjustments at this level and then distributing the adjusted targets and the corresponding resource and monetary outlays at the lower levels of geographic aggregation.

As can be observed, column (a) includes the same past or historical years, the base year, or year of the cross-sectional analysis, and selected years of the 25-year plan period. Column (b) is a summarized column which break down into four columns - the composite of column (d) of the prior tables for the four kinds of education and training activities. This is where previously selected hypothetical targets are combined in order to test the feasibility of the various combinations. For example, we could begin by taking the upper target limits for all four kinds of activities, since this upper limit represents the most desirable combination of targets, were resources not limited. Since the resource requirements of this combination will amost surely be much greater than the estimated availabilities, the process of national target adjustment will thus begin with necessary reductions that can be apportioned or balanced among the four kinds of education and training activities.

Under such a procedure the first entry in column (c) will be the additional investment and operating cost(s) of a combination of all the uppermost targets. This must be added to the base year operating costs (column (d)) and the future additional costs of analysis, increases in efficiency and improvements in relevance of ongoing activities, and new experimental activities (column (e)) as estimated previously under the first four sets of calculations in order to arrive at column (f) , an

estimate of the total future cost entailed by these programs and the combination of the uppermost physical access or attendance targets.

Since the estimates mentioned up to this point are national estimates, the entry in column (i) will be based on an estimate of the future GNP in the selected target years. The estimate in column (h) of future funds available for education will include, of course, private as well as public funds. In column (i) the percentage of the estimated GNP required for the continued operation and for the planned improvement of the present system, and for an expansion of the system to attain the four uppermost targets, will constitute the first entry. In column (j) that uppermost cost will appear as a percentage of the future funds available for education which have been estimated independently and without reference to costs. The first entry in column (j) is therefore likely to be considerably greater than 100%. Indeed, the percentage excess transformed into monetary units will probably represent the size of the cut in expansion that must be taken and distributed among the four kinds of activities.

Our explanation deliberately skipped over columns (g) and (h), the estimates of future product and the future funds available for education training. Their juxtaposition serves to highlight the value of including past or historical data in these two columns. Entries corresponding to past years in sub-column (2) of column (h) will indicate the percentages of GNP dedicated in the past to education and training. For example, if we assume that this percentage will not be less than the average of a recent period we will have a lower limit for estimating the funds to be

made available to education. Again, this is simply an example, since the judgment as to whether the percentages of the total income dedicated to education should be maintained, increased or decreased will vary from nation to nation and depend at least partly on the magnitude of the disparity or gap between the total costs of a maximum desirable program and the funds that would be available if they are set at historical GNP percentage levels.

In other words, under the procedures followed in this set of computations, future GNP is treated as an "exogenous variable" and calculated independently, or, more likely, taken from calculations made elsewhere. On the other hand, the level of future funds made available to education is treated as a policy issue or variable. Indeed, the mutual adjustment of targets and education funds becomes the central policy issue to be dealt with by the national authorities when the analysis arrives at this stage.

Obviously, the extent to which future education funds can be adjusted or varied will be limited or constrained by various factors that do not appear in the table. For example, the portion constituted by private funds will have to be treated exogenously and estimated as an extrapolation of past trends. Estimates of government funds for education must be based, inter alia, on the following: a) estimates of total future government revenues; b) percentages of this revenue to be set aside for education in view of the historical percentages and estimated future needs.

In sum, the proposed methodology of analysis and planning bases its design of programs for improving the system and its distribution of funds

among the four kinds of education and training activities on a cross-sectional disaggregate analysis of efficiency, access and relevance. Determination of the total amount of funds for education and training to be set aside is then carried out by a process of adjustments under which a desired maximum is constrained or reduced in terms of various estimates of future availabilities. After the amount of total funds is fixed at the national level, the process of geographical disaggregation begins with the required provincial, municipal and local adjustments carried out on a case-by-case basis. The same tables that have been prepared for the nation should be prepared for the provinces, municipalities, and localities.

Tenth Set of Computations - Transformation of Physical Access or Enrollment Targets into Magnitudes or Levels of Educational Access

Educational access which includes performance or measured educational outcomes has been distinguished from physical access or attendance. Since indicators of the efficiency of ongoing education and training activities are to be established by means of the base year analysis in terms of average test scores per monetary unit, tentative estimates of educational access can be made. It is therefore possible to make projections of educational access for the different target years on the basis of different assumptions concerning the overall future efficiency for each of the four kinds of education and training activities. The present levels of efficiency can be reduced and increased by different percentage amounts and multiplied by the amounts of funds that have been

fixed for the different target years in order to compare the different totalities of educational results due to these hypothesized changes in efficiency. These estimates of the "sensitivity" of total educational results to changes in efficiency will help highlight the importance of improving efficiency and will help establish educational outcome targets to which measured results can be compared during the target years in question.

Chapter Five

QUESTIONS AND ANSWERS CONCERNING THE METHODOLOGY

Part I. Objective: To Maximize the Efficiency of Education and Training Activities

Question 1: In step 1 of this Part, indicators of results or outcomes are proposed for every grade of primary education--the example utilized. Under step 2, however, it is acknowledged that the quantification of resources utilized will probably have to be carried out in terms of the whole school, i.e. for all the grades. It would therefore appear necessary to aggregate the results of the different grades in order to calculate school efficiencies. How can this be done?

Answer 1: Let us assume that the only results that are available are the outcomes of arithmetic achievement tests in a primary school. Speaking generally, two approaches can be taken: (1) the average test result for every grade can be added and divided by the number of grades (for example, 80 points for the first grade, 60 for the second, 85 for the third, 90 for the fourth, and 70 for the fifth would be added and divided by 5 to give us an average of 77 points for the school);

(2) different values or weights can be assigned to each grade ard the school average calculated accordingly (Example 1: A value or weight of one be assigned to grades 1, 2, and 3 and one and one-half to grades 4 and 5. In this case, the total points for the school is 460 which divided by the total weight of 6 again gives us an average of 77½ points. Example 2: Grades 1 and 2 could be weighted by one, as before, and grades 3, 4, and 5 by two. In this case, the total points would be 630 which divided by the total weights of 8 gives us an average of 79 points.)

The first general approach considers every grade equally important. Under the second approach more weight or importance is given to results in the last grades of primary education. Greater weights to the latter grades might be based on the opinion that successful mathematical performance in these latter grades is more likely to be permanent, or on the more solid basis of empirical findings that this is indeed the case.

Question 2: The answer to Question 1 implicitly recognizes the possibility that it may be necessary to fix weights with respect to grades, and that difficulties may arise in determining what these weights should be. If the results of each school vary significantly on the basis of

different formulas or patterns of weights, each of which seems reasonable, how should we proceed?

Answer 2: This question cannot be answered a priori. In the comparisons provided above, the school average calculated on the basis of the weights of example 1 did not differ significantly from the average calculated without weights. The result or average calculated with the weights of example 2 does vary significantly from the result of example 1 and the unweighted result. The study of efficiency should include a "sensitivity analysis" in this area, carried out along the following lines. When considering, say, 4 or 5 possible weighting systems, the sensitivity of each result to the different weighting systems should be determined for all of the localities or municipalities. In other words, the extent to which these different weighting systems alter the ranking of schools and municipalities should be determined. If ranking is not greatly altered, it will not matter particularly which system of weights is used. If it is altered, other considerations should be brought into play.

Question 3: The above outlines a procedure for aggregating the results of arithmetic achievement tests for the five grades that constitute a primary school activity.

The problem of aggregating the results of various academic subject matters has not been considered. Is this feasible and desirable?

Answer 3: It is both feasible and desirable. Although the planners and analysts involved will have to resist the temptation of exaggerating the importance of these aggregations or of drawing improper conclusions from them, such aggregations are useful for initial selection of schools and localities in which efforts to increase efficiency are to be concentrated. In subsequent analyses, review and selection in terms of each major subject may prove manageable.

The same two general approaches taken with respect to grades can be taken with respect to academic subjects: test results can be added and divided by the number of subjects, or the subjects can be weighted in accordance with some criteria of importance. For example, reading, writing and arithmetic may be given greater weight than civics. In other words, the subject matters, the mastery of which have greater implication for subsequent learning, might be given greater weight. Once again, the sensitivity of results to the different weighting systems should be determined.

Question 4: What about the learning, or changes in behavior, that are not measured by test results for academic

subject matters? We are referring to such things as learning to cooperate with others, developing good study habits , developing skill in the use of reference materials, the enjoyment of games, etc. Would not it be a serious mistake to ignore these important "results"?

Answer 4: This would undoubtedly be a most serious mistake. However, this matter cannot be treated adequately without consideration of various related issues. One of these issues is whether or not these results are likely to be measured in any way that is sufficiently reliable to merit aggregation with what would appear to be more reliable kinds of measurements. We are inclined to believe that an attempt to measure these factors would prove cumbersome and perhaps contribute to pedantic and artificial ways of dealing with them. In any case, it would appear reasonable to expect countries that are doing very little of the first kinds of measurement to master the techniques of these and to apply them on a widespread basis before entering into more complex terraines. Sector analysts and planners at the national level working with the test results of academic subjects in ways that are discriminating and sensitive, will have their hands full for many years. In this connection, it is extremely important to realize that more and more of the detail concerning processes and outcomes are lost from view as the data is aggregated to the levels of province and nation. In other words,

the analysis of information and the making of policy at the national level does not relieve any community nor any school from the responsibility of attempting to understand its own situation and making the best possible decisions. On the other hand, a fuller understanding on the part of the national authorities will put these authorities in a better position to assist the local units in improving their decision-making processes.

Question 5: Will measuring the results for each school and municipality cause needless rivalry and unrest? And will it lead to mistaken policies on the part of the national government, such as the establishment of national minimum standards which many localities will be unable to meet?

Answer 5: The entire subject of measurement is extremely complex, and the sub-category of education measurement may be among the more complex. Many educators realize that test results can be misused, as well as properly utilized. We have already referred to important educational results and outcomes which are not now, and may never be, subject to accurate measurement. It is not test results themselves but how they are viewed; and, on many occasions, publicized, which can cause the kind of problem suggested. Test results should be used to help measure learning status and progress,

and to guide the learning process. They are used best as diagnostic instruments. Their use to determine so-called competitive standing is more often than not a misuse or abuse.

The purpose of the efficiency analysis is not to establish minimum standards, but to obtain fuller and more detailed information concerning the results or achievements presently realized with the utilized resources, and the actions that must therefore be taken to increase efficiencies. We should not forget that the learning progress achieved by any individual enrolled in a program or school is measured most accurately by what he knew or could do when he started the program and what he knew or could do when he finished it. Before-and-after measurements will therefore be necessary, and the education results for each school and locality will depend on progress achieved during the time period involved, and not simply on the learning status at the end of that period.

Question 6: Four different possible indicators are specified in step 1. What is the difference between the first or best indicator and the second best indicator?

Answer 6: A highly summarized and therefore somewhat inaccurate answer must be given to this question. For many decades educators had been looking for ways to distinguish

between learning behavior which is simply imitative or iterative, and learning behavior which is adaptive or problem-solving. At the lowest level, this is a distinction between memorizing and understanding. However, the subject involves problems of psychology, the theory of learning, and epistemology, or the theory of knowledge, and cannot be profitably pursued here. It is likely that the first or best kind of indicator will not be available for most subject matters in most countries. Nevertheless, the importance of developing such tests or indicators should be kept in mind in view of the fact that they would provide the best available measurement of basic educational objectives. Finally, the better achievement tests will contain problem-solving questions which may partially qualify them as the first or best indicator.

Question 7: Even assuming that we accept the achievement test as a partial measurement of educational results, the fact is that in most countries the best available indicator will be the third indicator, i.e., grade promotion: Are these to be considered satisfactory indicators? If not, how should the analysis proceed?

Answer 7: Obviously, promotion is not a satisfactory measurement of outcome or progress in view of the great variation among educational authorities, particularly teachers, with respect to their testing procedures, the

amount of attention they are able or willing to give to each student, their understanding of his or her potential, and the procedure they apply for passing or failing. Moreover, we have already rejected the idea of rigidly applying a national standard rigidly to every locality, school, and student. Obviously, individual educational processes are extremely complex, vary considerably from one another, and require imagination, perceptiveness and adaptability on the part of all concerned, if they are to be carried out properly. It is therefore extremely important to avoid taking these partial indicators or measurements to be final judgments or determinations of acceptability. The first step is to decide what is happening. The second step is to decide what, if anything, needs to be done.

With the above warning in mind, we can now consider the way to proceed when grade promotion is the best available indicator. After preparing achievement examinations on the more important subjects, these should be applied to stratified samples of students for each grade in the different localities. In this way correlations between promotion and achievement can be established by locality. In other words, the meaning of promotion, say, from the third grade can be determined in terms of an achievement for each locality.

The sampling process for all grades and all localities might take some time. This is one more reason why educational sector analysis should be established as a continuous process leading to a systematic expansion in coverage, and to a steady increase in precision. In Sector Analysis I, which may take from 18 to 36 months, it may be desirable to rank localities according to the third indicator, and limit the achievement test sampling to, say, 30 percent of the lowest-ranking localities.

Question 8: Are not the resources utilized by each school likely to be pretty much the same? What is the purpose of this detailed quantification at the local and provincial level?

Answer 8: It should not be forgotten that an attempt is being made to obtain a detailed X-ray, as it were, of educational activities. The data provided in national budgets and expenditure reports represent national totals and averages which can mask a considerable amount of variety, and mislead authorities involved in the analysis and planning of education. Whether or not there is great variety in the level of utilized resources among schools, or among other activities which may have similar educational objectives, cannot be determined a priori. In short, this detailed accounting will help to determine the degree of homogeneity,

or heterogeneity of existing activites with respect to resource utilization, and is a prior requirement for improving that utilization. Finally, it is a necessary precedent for the step which provides a clear-cut procedure for measuring efficiency.

Question 9: What about the availability of information needed to carry out the quantification of resources? Which resources are most likely to be difficult to quantify?

Answer 9: A clear distinction must be made here between school and non-school activities. With respect to the former, forms prepared by primary and secondary schools will usually provide the information needed concerning the number of resource units utilized by the school activity. In some cases difficulties may arise in translating units into unit hours. For example, some countries will have information concerning the number of teachers that teach at each secondary school, but not the number of hours these part-time teachers work in the school. In such cases it will obviously be impossible to proceed in a simple straight-forward manner to a quantification of utilized resources for this level of schooling. However, a major data gap will have been identified and some sort of sampling procedure might be utilized prior to the establishment of fuller reporting procedures. The probability that even greater data gaps will appear in the case of universities will also serve to highlight the need for establishing improved reporting procedures at this level. Most large national and

state universities can be used to illustrate the urgent need for careful disaggregation. There is invariably great variation in the resources utilized among faculties or departments. Determining the cost per student and per graduate for each department or faculty is simply a first step in the analysis of university expenditures, which is needed, in turn, to design alternative cost-effective programs. Without such accounting, it is clear that universities will continue to be institutions that may be wasting appreciable amounts of resources.

Another complication that will present itself under this step is the measurement of capital expenses. Both classrooms and teacher preparation should be looked upon as capital expenditures necessary for the school activity in question. The initial expenditure on the resource, the total life of this resource, and the portion of that life consumed during the school year in question should be taken into account when converting unit hours utilized into current prices. This will require construction data in the case of classrooms, and teacher preparation cost for teachers.

Question 10: Precisely how can the relationship between the educational results and the resources utilized be expressed as an estimate of efficiency?

Answer 10: The answer has been partly provided in the previous chapter. Specifically, this efficiency estimate would be expressed as a fraction with the numerator constituted by the total points as measured by the best available indicator and the denominator constituted by the cost estimate of total utilized resources. It may be useful to point out, once again, that in the case of achievement tests the best estimate of points to appear in the numerators would be calculated in terms of the progress achieved during the school year. Such measurement takes into account the status of the student at the beginning of the year and the progress realized, and does not limit itself to end-of-year status. If beginning-of-the-year examinations are not given, it may be necessary to substitute this measurement with the results of the end-of-the-previous-year examinations for the preceding grades. In other words, the difference between a school's last year's final achievement examination for the second grade, and this year's final achievement examination for the third grade would be taken as a measure of the progress realized this year in the third grade.

Issues can be raised concerning the proper estimation of cost of the utilized resources that are aggregated into a single monetary figure for the denominator. For example, it could be argured that these should be estimated as shadow prices

or opportunity costs, rather than as market prices. Since one of the purposes in establishing continuous analytical process is to increase the precision of measurements over time, it would be desirable to make these estimates in subsequent analyses if limitations of time or lack of information or unresolved theoretical issues make it impossible or inadvisable to do so in the first analysis.

Question 11: A ranking of localities and provinces according to results per student has been referred to. Would it be useful to rank localities and provinces, and even schools within some selected localities, according to efficiency? If so, how could this be done?

Answer 11: Answer 10 explained how points could be aggregated into one number for the numerator, and resource costs into one monetary figure for the denominator. In order to make these fractions comparative, all fractions should be reduced so that one monetary unit appears in the denominator. In other words, the new numerator will consist of the number of educational points obtained from the expenditure of one national monetary unit for each school locality and province, with the ranking proceeding accordingly. A similar calculation and ranking should be carried out with the cruder indicator of graduates in the numerator and another for enrollments. It should be interesting to observe the extent to which these

rankings of efficiency vary from one another, and from the ranking in terms of results.

Question 12: What is the purpose of these rankings?

Answer 12: These rankings constitute means for grouping or arranging localities with estimated costs and benefits that may vary considerably. Such groupings will contribute to determinations concerning the allocation of limited time and resources in improving the existing system. For example, the Ministry of Education might decide that national efforts to increase the efficiency of existing primary schools during the next two years should be concentrated on 25 percent of the municipalities that rank lowest in efficiency. By helping locate geographically the most inefficient parts of the system, the ranking provides criteria for the allocation of time and resources. Determining which, if any, resources are needed is the issue dealt with in the first set of computations under the "Analysis of Factors".

Question 13: This set of computations is defined as follows: "First Approximation to an Explanation of Inefficiencies Based on an Identification of Ineffective Patterns of Inputs or Resources." Why is it assumed in this analytical methodology that these "ineffective patterns" (which will be, in large part, resource deficiencies) are the main cause of the inefficiencies?

Answer 13: The above question reveals a fairly common misinterpretation of the proposed methodology. It is not assumed that ineffective input patterns or its sub-category of resource shortages constitute the principle underlying factors of inefficiency. Implicit in the methodology is the grouping of a very large number of factors that may bring about inefficiency into four classes or groups: (1) resource shortages; (2) individual and/or familial factors; (3) inappropriate content or curriculum; (4) defects in the educational process. No a priori judgment concerning the importance or impact of each of these four groups or collections of factors is implicit in the methodology.

Question 14: Why then are resources examined first in the attempt to explain existing inefficiencies?

Answer 14: Resources are examined first because their detailed identification and quantification have been carried out in a previous step. A substantial amount of data concerning both resources and outcomes has been tabulated in such a way that it is possible to carry out a regression analysis with different resource factors appearing as independent variables. The fact that this regression analysis is carried out first should not in any way skew or distort the analysis towards an undue emphasis on resources. As well as identifying the cases in which resource deficiencies may account for

inefficiency, this step also has the extremely important effect of identifying inefficiencies which are not due to resource shortages.

Let us assume that as a result of the regression analysis two of the independent variables have high coefficients: students per classroom and lack of school lunch or breakfast. In other words, there is an indication that crowded classrooms and lack of school meals have a negative impact on efficiency. Let us assume that there are 1200 localities, and that the lowest ranking 25 percent (300 localities) are being given preferential attention for the next two years. Examination of the school resource endowments of these 300 localities indicates that 75 of these have crowded classrooms, or do not serve meals, or both. This leaves a residual of 225 localities the inefficienceis of which are not explainable in terms of resource deficienceis. The continued analysis of inefficiency will now concentrate on this residual.

Question 15: What is the measure of performance, the dependent variable, in the regression analysis?

Answer 15: There are different possibilities here and we recommend that as many as possible be tried. One variable that can be tested as the dependent variable is the efficiency index. It may be desirable to also use the average result per student (mean, mode, or median) as the dependent variable. A

comparison of a regression analysis in which the dependent variable is a promotion average and a regression analysis in which the dependent variable is an achievement test result average may provide information of significance concerning the relationship of these two indicators. There are probably other comparisons which would increase understanding of the system.

Question 16: What would be the next step in the analysis of inefficiency of the 225 localities that constitute the residual at this stage?

Answer 16: As indicated above, the proposed methodology assumes that four groups or collections of factors determine efficiency: (1) input patterns; (2) personal and familial factors; (3) content or curriculum; (4) the education process. The 225 low ranking localities that remain can now be examined from the standpoint of personal or familial factors likely to have a negative impact on learning. In the case of primary education, for example, it would be advisable to determine the number of children that are obliged to work in their off-hours or during part of the school year, the number of children that come from homes of extreme poverty, or from broken or unstable homes, the number of children that are not receiving an adequate diet, etc. Although special surveys may be required in many countries the schools appear to have consider-

abl information concerning the background of their students, including judgments concerning the economic condition of the family, the number of absences due to illness, and other relevant factors. Different procedures could be used for quantifying these factors and for determining which have significant effects on efficiency. Correlations, cross tabulations, regressions, interviews, and direct observations, are procedures for consideration.

Question 17: What would be the next step in this approach to explain inefficiencies?

Answer 17: Let us assume that, as a result of the step described above, it is determined that 80 of the 225 low ranking localities have a high incidence of personal/familial factors that impact negatively on efficiency. We are then left with a residual of 145 low ranking localities which can be characterized as follows: (a) they do not have an ineffective pattern of inputs or resources which the regression analysis has demonstrated to have a significant relationship with efficiency; (b) they do not have a high incidence of the personal/familial factors that have a negative impact on efficiency. Having eliminated resource patterns and social or family backgrounds as factors, it would then appear appropriate to concentrate on the appropriateness of content

and the education process.

Question 18: Skipping over the analysis of content or curriculum, since it is described in some detail in the previous chapter, how should the study of possible defects in the education process be carried out?

Answer 18: It would appear to be necessary to carry out a series of direct observations of the education processes in question. The major difficulty here will consist in the specification of a detailed procedure for carrying out and recording such observations. A questionnaire should be prepared and taken to the classrooms in the case of primary schools, for example. Preparation of an adequate questionnaire will not be easy. On the other hand, the difficulty can be exaggerated. Admittedly, the concepts underlying such a questionnaire can vary from a highly sophisticated theory of learning to a fairly simple listing of, say, nine principles of "good teaching." Even if the latter were used as a basis for the questionnaire, it is likely that the articulation of these principles, and the observation, quantification and interpretation or assessment of teacher behavior in the classroom in terms of such principles, would constitute a step forward for many ministries of education, and provide these ministries with information and insight concerning current education activities which they do not now

possess. Once again, it is necessary to point out that such a study is most likely to be misleading if it is carried out only once. The assumptions underlying the questionnaire, and the conclusions to which the tabulated information leads, should be periodically re-examined and, if necessary, revised.

Question 19: Is it assumed by the methodology that in the 145 remaining localities there are defects in the education processes which are more extensive and significant than in all of the other localities, and which must therefore account for the low efficiency?

Answer 19: There is no such an assumption embedded in methodology, and until the study is carried out there is no telling what it will reveal. Prior to empirical analysis, we can only speculate about different possible outcomes or results. At one extreme, and the most encouraging result from the point of view of increasing efficiency, would be a determination that student and teacher behavior in the classroom for the 145 localities depart significantly from what such behavior should be in terms of learning and teaching theory, and that a study of all of the other localities reveals a close correspondence between theory and practice. At the other extreme, such a study might show no significant departure from theory, or departures which are no greater than those of all the other localities. It may be safe to

predict that most outcomes will fall somewhere between these two extremes.

Question 20: Does the proposed procedure assume that inefficiency is brought about either because of ineffective input patterns or family background problems or inappropriate curriculums or difficulties in the education process? Is not it possible--even likely--that many, if not most, cases of inefficiency are due to factors from all four groups, reinforcing one another?

Answer 20: Indeed, it is quite likely that factors from the different groups will often come together and reinforce one another to impact negatively on efficiency. Different points must be made in relation to this objection. First, the process by which the residual of 145 localities is identified has the advantage of selecting out three major groups or categories of factors. (We have assumed that inappropriateness of curriculum has been identified in 0 localities.) The study of the education process can then be carried out with greater security than is normally the case. In the second place, the provisional character of the conclusions and the need for continuing analysis must once again be stressed. For example, it is obvious that the 75 localities which have been identified as having resource shortages may also have family background

and education process problems. There would appear to be alternative ways of dealing with this possibility: (a) those localities could also be analyzed in terms of family background and education process; (b) some of those localities could be so studied; (c) instead of consuming more time in further study, a more experimental approach could be taken under which: (1) missing or deficient resources, say, would be provided to all 75 localities and the effects of this provision on future efficiency carefully observed and recorded; (2) such resources could be provided to 37 of the 75 localities and future efficiencies could be compared with the remaining 38; (d) a program combining (b) and (c), (2) could be carried out.

Question 21: Does the proposed methodology necessarily involve ranking, concentration of corrective measures on the lowest ranking, and the above-described residual procedure to determine and quantify the most important factors?

Answer 21: In conducting an analysis, the "is" and the "ought" should be clearly distinguished. This is more difficult in education where the lack of adequate information and the constant need to make decisions so often leads to a misinterpretation under which a proposed

procedure for examination or study is mistaken for a prescription.

We must remember that the proposed methodology is to be used by national authorities. These authorities are faced with a problem of understanding a very large system in which very different things are happening as a result of a wide assortment of causes. The ranking procedure is primarily an attempt to classify an educational activity, such as the primary school activity, which may vary widely in different parts of the nation. The assumption of homogeneity that is so often made by education planning officers, who may have been dealing with misleading national averages, can be partly dispelled by a procedure which measures results or efficiency on a locality-by-locality basis. In short, the ranking is a form of classification which facilitates analytical treatment of the educational activity in question. If test results were to reveal considerable variance within localities, it will be necessary to rank, select and prescribe treatment on the more disaggregated basis of schools.

Initial concentration on a certain percentage of the lowest ranking localities is a possibility which has been presented for consideration. It is not an essential part

of the methodology. Since resource and time are invariably limited, some principles of selection with respect to the first analysis would appear to be desirable. In Analysis-2 or Analysis-3, etc., the authorities may wish to concentrate attention on the middle or higher ranking localities. If the authorities believe that they can study all of the localities during the 18 to 24 months that Analysis-1 might take, it might be desirable to do so.

The residual procedure is not integral to the proposed methodology, although we are partial to it. Conceivably, a regression analysis which includes all possible factors, such as resources, family background and education process, could be attempted. We are skeptical of such calculations involving so many variables, and believe that the residual process is more manageable, and that in the long run it would provide a fuller understanding of education activities in all their rich variety.

Question 22: What about the appropriateness of content or curriculum as a general class of factors which may have a negative impact on efficiency? It has not been discussed in this chapter.

Answer 22: Certain considerations must be kept in mind. The nature of these factors will vary for different educational activities and, for some of these activities, will also vary

geographically. In the case of primary education, for example, issues of appropriateness or relevance of content may center mainly around discontinuities between the pre-school and out-of-school experiences of the child and the content of the curriculum. (A first-grade "reader" which refers to objects, people, and situations which are totally unfamiliar to the child, obviously places obstacles in the way of his learning.)

Question 23: The above questions and answers suggest a way of attempting to explain efficiency. Having completed the explanation, what are the steps that need to be taken to increase efficiency? How are we to estimate both the cost and the feasibility of the actions required?

Answer 23: The second set of computations under section V of the preceding chapter constitutes a very broad suggestion as to how to proceed. It may be useful to consider the matter in a little more detail. In the illustrations provided above, 75 of the 300 most inefficient localities were identified as having resource deficiencies with negative impacts on efficiency, 80 localities were identified as inefficient due to family background or social economic factors, 145 localities were identified as a residual the inefficiency of which is apparently due to defects in the education process. It is expected that the corrective actions will vary in accordance

with the explanations, provisionally arrived at. In the case of the first 45 localities mentioned, it is expected that one corrective action might be to alter the resource patterns in these localities. However, the education authorities might decide to provide these resources only to, say, 20 localities and make no significant changes in the others for a certain period of time. This would set the stage for subsequent comparisions. A third alternative policy that might be pursued would be to take, say, 10 localities and establish a different kind of program, such as a non-school activity, with similar or identical objectives to the school activity. Such an activity might have already been tried in that locality, or another locality, or it might constitute the kind of experimentation to be discussed in chapter six.

As will be explained, these alternative kinds of activities aimed at lowering the cost per unit of learning achievement can be so designed so as to assure cost reduction if such activities achieve their educational objectives. It must be recognized that there is no way to give pure or controlled laboratory pre-tests in education, and that all education activities are to some extent experimental. It would therefore seem highly desirable to include in the array of corrective actions new kinds of experimental activities aimed at lowering the cost per unit

of learning achievement.

Question 24: What about secondary and higher education? Can the same general methodology be applied?

Answer 24: We believe the same general methodology is applicable, although differences in institutions, purposes, instructional processes, and the ages of students will obviously lead to differences in emphasis. For example, if there are only one or two universities in the country, geographical disaggregation will not be a major consideration in the analysis of the efficiency of university activities. Disaggregation at this level should be carried out mainly in terms of the different specialities or professions. Criteria for student admission, and reasons for student choice of career should be examined carefully on a disaggregate department-by-department or faculty-by-faculty basis. (Recent studies that aggregate all the specialized studies and calculate "rates of return" for "higher education", lumping together past studies and future careers that vary from one another enormously in terms of their intellectual content, their correspondence to social needs, or, for that matter, their present or future remuneration, should be subjected to much more critical questioning than they usually receive.) In the case of secondary education, it seems likely that there will be substantial exchange between the analysis of efficiency and the analysis of relevance. Were

it to turn out that a lack of relevance at this level accounts for much of the inefficiency, on-the-job training and work-study programs might be included among the corrective actions carried out on an experimental basis.

Question 25: What about D. "Non-School Education and Training Activities"? Do the procedures apply to them?

Answer 25: The same general procedures apply to these activities, whether adult literacy programs, on-the-job lathe training, or medical internships in hospitals. In every case the before and after behavioral outcomes should be measured to determine the progress attained. The measurement of inputs and costs incurred may be more difficult, but there is no reason estimates cannot be made. Activities which substitute, or could substitute, for school activities are of particular interest, have higher priority than other activities in this category, and should be given preferential attention.

Part II. Objective: To Maximize the Access and to Improve the Relevance of Education and Training Activities

Question 26: Are non-school activities excluded from consideration?

Answer 26: As pointed out in "The Nature of the Sector: Problems of Delimitation", Part II of Chapter two, there is

no social activity which can be excluded a priori from the "education sector". In fact, many non-school activities may prove to be more efficient educationally than corresponding activities in schools. In such cases it would seem desirable to expand the former at the expense of the latter.

This is why the interpretation of access is not limited to mere physical presence. In the case of schooling, physical access is a necessary, but insufficient, condition of access to education. A somewhat crude parallel with agriculture might help clarify the matter. If we had put an apple seed that did not take in the ground, we would not be likely to point to the bare space a year later and say: "See? Here is where I am growing apples." Johnny may be in the school, just as the seed's in the ground; but we should not say he is"getting an education" until we have some kind of measurement that supports the assertion.

Question 27: Part I focuses questions and answers primarily on efficiency or productivity and Part II on production or total educational outcome, but the relationship between these two parts is not made clear. What is that relationship?

Answer 27: The previous chapter does not carry out a full examination of the relationship between these two

subjects. The example of primary education, utilized throughout, may serve to illustrate the relationship.

Let us assume that the planning period in question is 1970-1990. Let us assume that 10 percent of government revenues and 2 percent of the GNP is dedicated to primary education. The money available for primary education in 1980 and 1990, if these percentages are maintained, can be estimated on the basis of high and low estimates of economic growth rates. What production or total educational results can be achieved in 1980 and 1990 with this estimated revenue? Obviously the answer depends on the future productivity of those resources--the efficiency with which they are utilized.

Question 28: Is it possible to make accurate calculations of future efficiency?

Answer 28: Obviously, this is not possible. However, it is possible to make approximations and estimates which have immediate bearing on the planning of education--that is to say, on present decisions.

The prior analysis of the efficiency of the existing primary education system has made it possible to carry out projections, to compare alternative actions and programs, and to tentatively select a more appropriate mix of actions

and policies. As a first approximation, three overall projections could be made. Projections A would be constituted by calculations of total future outcomes on the basis of the estimated resources if the efficiency of the existing system is not increased. These projections could be made in a highly aggregate fashion by simply using the national averages, or they could be made along more precise or disaggregate lines by assuming the existing efficiency for each locality, while taking into account rural to urban and inter-provincial population flows in order to estimate "demanding" or school-age population. In both cases we would have an estimate of the total primary education outcomes for 1980 and 1990, if the existing system is expanded, and if the efficiency does not increase.

Projections B would be constituted by the estimate of future outcomes if the efficiency of the existing system is increased through the application of corrective measures arising from the explanation of inefficiency described in Part I. Here a kind of sensitivity analysis would probably be useful. At the very least more precise notions could be had of outer limits, or maximum increases, that might be achieved by an improvement of the existing system. The rankings of Part I might prove useful in this

connection. For example the increase in total educational outcomes, if the 30 precent of lowest ranking localities had their efficiency raised to the highest 30 precent, could be estimated. The amount by which efficiency could be increased will invariably be a very rough estimate, but it would certainly be useful to know what differences in outcomes or results would be brought about with a given amount of resources and a given increase in efficiency. Since these outcomes include mere physical access or entry into each one of the primary grades, provisions which reflect optimistic and pessimistic extremes concerning increases in the existing system's efficiencies would shed considerable light on issues of equity and the possibilities of providing primary education to the entire school-age population in future years. (On the cost side, Projections B will include the incremental costs of the corrective actions aimed at increasing efficiency.)

Projections C would be the most hypothetical of the three projections. These would be projections of the total educational outcome for primary education that would be obtained in 1980 and 1990 if radically different and much more efficient systems were to replace the existing system. Although such estimates may seem at first glance confined to a purely speculative realm, this does not need to be the case. Let us assume that the national efficiency

index in 1970 was 40 primary education points per monetary unit. One might ask what would be the total primary educational outcomes in 1980 if the national efficiency index increased to 50 units; and in 1990 if it increased to 60 units. Of course, if the inquiry were left at that, it would be no more than daydreaming or ideal speculation. However, such an index of efficiency is simply the relationship between the cost of resources utilized and a set of identified educational outcomes. There would appear to be no intrinsic reason that an attempt to realize such a relationship in actual practice could not be carried out in the form of experiments at the school or micro level.

In principle, experimentation to lower the unit costs of educational outcomes should be initiated now for all activities, whether of a school or non-school nature. In practice, the difficulties and inevitable delays in getting experimentation underway suggests that it should begin with those activities that consume the largest amount of resources. In primary education, for example, the extension of education to populations that had not previously received it may provide opportunities for carrying out new procedures designed to achieve the same or better educational outcomes at substantially lower costs.

This effort should be distinguished from efforts to improve the quality or process, or increase the efficiency, of existing primary education activities. Clearly, both kinds of efforts are necessary and should proceed concurrently. Although the controlled experiments may be at first necessarily few, it is clear that a success in this area could in the long run "change all the numbers." For instance, were some carefully designed activity that combined programmed learning, team teaching, and voluntary assistance from the community (for non-pedagogical tasks) to assure the desired outcomes with one-half the average salaried staff, it might be possible to bring about radical increases in access and efficiency, and to liberate resources needed for other school and non-school activities.

To sum up, Projections A and B may indicate that targets or expectations of the future years in question are not likely to be met by means of the expansion and improvement of the existing system. Projections C will indicate what future outcomes would be with more efficient activities; and they might serve to initiate the experimentation which should now be undertaken by countries with limited resources and fast-growing populations.

Question 29: In what terms should estimates of access be made? In terms of enrollment? Graduation? Or in terms of learning outcomes?

Answer 29: Estimates should be made in terms of each one of these indicators. Under the proposed procedures enrollment or mere physical presence targets are set first, and these are used as the basis for the estimates of graduation and learning outcomes. In this connection, it is useful to remember that efficiency estimates in terms of each one of these indicators is to be calculated under Part I for the existing system. (In the case of non-school training activities that last as long as it takes the individual to master the skill in question, there appears to be a simpler or more straight-forward relation between cost, or resources utilized, and the learning outcome, although this relation will vary for individuals. A similar situation might prevail in the case of non-graded schools.)

Question 30: In chapter four, are the methodological procedures proposed under the title "To Maximize Access" the appropriate analytical procedures to be followed for attaining that objective? Are not the procedures for maximizing access presented under the section entitled "Alternative Programs and their Corresponding Combination of Targets"?

Answer 30: The methodology distinguishes between ongoing activities, which are subjected to a cross-sectional analysis, and future activities which represent an expansion of the

existing system. Base line measurements of the current use of facilities and services, i.e. current physical access or attendance, and the analysis of factors that affect this use, are meant to provide the criteria needed for maximizing the use of existing facilities and services and to provide criteria for distributing access and selecting school sites. The procedures described under the section "Alternative Programs and their corresponding Combinations of Targets" are focused on a maximum of efficiency and access and the greatest possible improvement in relevance when the availabilities of future resources are taken into account.

Question 31: The possibility of changes in curriculum appears under the efficiency objective and under the relevance objective as well. Is there a contradiction here?

Answer 31: As we see it, there is no contradiction involved. Insofar as efficiency is concerned, changes in curriculum focus on the appropriateness of the curriculum with respect to learning achievements. Insofar as relevance is concerned, changes in curriculum focus on the appropriateness of that curriculum to subsequent activities of the involved learners or students.

Question 32: Estimates of educational costs have focused exclusively on direct costs. What about earnings foregone?

Answer 32: Estimates of the earnings foregone by attending school do not reflect government outlays. The proposed procedure for estimating the feasible combinations of future access to education is based on estimates of future available revenue. Estimates of future private expenditures should be added to the public expenditures to arrive at totals. Such estimates may be based on extrapolations of trends or other similar procedures.

Question 33: Estimates of public and private monetary outlays may provide a fairly good basis for determining feasible levels of future education activities. But what about estimating the total cost (direct and indirect) to society? What is the objection to that?

Answer 33: There is no objection to making such an estimate, so long as it is clear what is meant here by "cost" and its calculation is clearly distinguished as a separate and additional step. However, such an estimate is usually made in order to compare it to some estimate of the total "benefit", and we do not believe such an estimate can be made.

Question 34: Can not such an estimate be made by means of rate of return analysis?

Answer 34: No. It cannot. The "benefits" of "education" are extremely complex and various. When we speak of the

"benefits" of "education", we are, in effect, referring to the "values" of "life". There is no satisfactory way of pricing these, much less determining appropriate rates of return.

Question 35: Even assuming that the above answer is correct, societies need to determine the total amount of resources to dedicate to education and to provide for a distribution of this total among the different educational levels. By focusing on economic growth as an exclusive objective, cannot rate of return analysis be used to determine the level and distribution of resource allocations to education?

Answer 35: Rate of return calculations may provide useful information concerning existing relationships between skills, schooling attainments, formal certificates and current wages and salaries. Economic growth is certainly a primary consideration for the majority of countries, but we believe rate of return calculations often serve to mislead the analysts and planners that estimate them. What they measure is not entirely clear. And they are certainly not sufficient criteria for making resource allocations. Such calculations are estimates of the present market values of

future discounted lifetime earnings. [1/] Their use as criteria for resource allocations requires the untenable assumption that wages measure "marginal product" and that this "marginal product" is a measure of "social value". They focus attention on existing education activities and thus contribute to a general over-emphasis on schooling. In short, they identify "education" with the existing system of schools, treat education as necessarily divorced from "production", or, in conventional economic terms, as an intermediate, purely preparatory good. The relationship of education to economic growth is much more complex than is recognized by approaches based on rates of return. The amount of education needed is, in part, a function of the extent to which education represents, among other things, an increase in the intelligent practice or execution of a society's affairs. One might go so far as to declare that such "education" will invariably increase "production" and "productivity". We do not mean to suggest that the opportunity costs of the resources utilized in every activity identified as educational is not a paramount consideration. We do mean to suggest that in order to increase education's contribution to economic growth much more attention must be given to the connections between the content and purposes of

1/ The fact that these values are market values is also significant. The limitations of these as guides or indicators for social analysis and policy is explained in section B.1 of chapter three.

education activities and the observed or inferred effects that these activities have on the behavior involved in major social and economic activities.

Question 36: Is it correct to say that in the approach taken to relevance there is implicit opposition to procedures involving measurement of the market demand for different kinds of education and labor?

Answer 36: This is not correct. The proposed approach recognizes the concept of market demand as valuable, and measurements of it as useful. It differs from other approaches in refusing to accept market demand as a sufficient and reliable criterion for resource allocations and calls for the analysis and interpretation of this demand on a case-by-case basis. In other words, it assumes that the need for educated labor cannot be measured exclusively in terms of market demand. There is probably considerable divergence between independently measured need, perceived need and effective demand in any society, and those differences are likely to be particularly great in developing countries. It is useful to measure the differences, and a mistake to uncritically accept effective demand as "right", and to assume that all adjustment must be made in terms of "supply". Examination of the content and the relationships of the specific demand and supply in question

may provide valuable information. Is the comparatively small "return" to middle-level technical personnel in many of the less developed countries an accurate reflection of their contribution, or is it an indication that such personnel are underpaid for traditional or institutional reasons? In certain circumstances does it indicate that they are badly utilized? When this is so, changes in the use and payment of technicians would appear to be the more appropriate step. In any case, a tracer study of graduates can provide useful information concerning both occupations and the prior education activity. They should help the authorities determine to what extent more general education should replace occupational training in schools, leaving the more specialized knowledge and skills to be acquired subsequently at work. [2/] Once again, such

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2/ In studying these activities perhaps it would be inappropriate to consider if the schism between the narrowly occupational and the cultural or humanistic is a necessary split. Empirical findings, as well as theoretical considerations, might help illuminate the extent to which a humanism that does not connect with social life is empty or sterile, and the extent to which vocations and professions isolated from larger concerns and values are unnecessarily narrow, unsatisfying, and, in many ways, harmful. Some thought might be given to the design of experimental programs which attempt to relate larger considerations and practical activities, with education benefiting from the practical experiences provided by other occupations, and these occupations benefiting from the larger range of considerations provided by education. Parenthetically, such programs, including work study programs, might also serve to make the "aspirations" of students more realistic, both in the negative sense of removing false illusions and in the positive sense of providing students with the opportunity to introduce broadening considerations into daily occupations.

studies should be viewed as complementary to other kinds of inquires such as rate of return calculations and estimates of future manpower requirements.

Chapter Six

SOME OF THE POLICY ISSUES NOT ADDRESSED BY THE METHODOLOGY

I. Introduction

If the nature or content of education activities depends on the decisions that are taken by individuals, teachers, schools, local communities, provincial and national governments, and if we look upon the sum or aggregate of these decisions as education policy in its widest sense, it seems clear that no single study nor analysis, nor, perhaps, collection thereof, can examine, much less resolve, all the issues with which education policy deals. Education policy at any level will be dealing, explicity or implicity, with many different kinds of problems and objectives, and is therefore likely to be outstripping and outpacing the analysis of education. In other words, empirically substantiated findings are limited in the sense that they almost surely fail to serve as the grounds for policies in effect at any given moment in time. As analytical results are obtained they can be expected to initiate new policies, as well as to change or reinforce policies previously in effect; but it is not likely that these policies could be based entirely and exclusively on empirical findings.

Since education policies will invariably be broader than education analyses, education policy should encourage inquiries that will provide information of relevance to previously prepared policies, as well as information leading to new policies. This means that education policies which are formulated on the basis of more abstract or hypothetical ideas and reasoning should be open to empirical correction, and that a constant exchange between policy and analysis would in certain respects correspond

to the interplay that takes place between the formulation of ideas or theoretical speculation and the experimentation or observation of facts in other fields of scientific endeavor. Ideas concerning education have their origins in different intellectual disciplines and fields of practical endeavor, and they should be looked upon as untested hypotheses which may or may not be applicable to particular existential circumstances, and the detailed content of which, if applicable, will invariably require testing and specification.

II. The Kinds of Findings Likely to Emerge from an Application of the Proposed Methodology

Before attempting to identify some of the pending policy issues it may be useful to get a sense of the issues addressed by enumerating the kinds of findings likely to merge from an application of the proposed methodology.

The procedures described in Chapter Four focus on three very broad problems: the inefficiency of, lacks of access to, and irrelevancies of the national education and training system. It is structured in terms of the correlate objectives of realizing a maximum increase in efficiency and access, and improving relevance to the greatest possible extent. It concentrates heavily on obtaining base year data for measuring on a disaggregate basis (disaggregate in terms of the education and training activities themselves and in terms of geography) the current variations and overall or aggregate extent of efficiency and inefficiency, of access and the lack thereof, and the relevance or irrelevance of education and training programs with respect to development objectives. Chapter four describes how key interrelationships are to be identified and quantified through the processing, analysis and interpretation of data or measure-

ments of the results or outcomes of education and training programs, the pattern of inputs and cost of the resources utilized by these programs, nutritional factors and socio-economic characteristics obtained by means of household surveys, the geographical distribution of the population, the fertility of women and the educational attainment of both sexes, drawn from the population census, as well as production and labor force data obtained by means of economic censuses. The objective is to measure the extent and variations of current efficiency, access and relevance, to provide explanations of the variations, and above all, poor performance; and drawing on these explanations, to provide criteria for improvements, reductions and expansions.

Various kinds of policies for the maximizing of efficiency can be expected to emerge. The disaggregate quantification of education and training program inputs and their relationship to results our outcomes will provide information concerning the range and variation in costs and the different quantitative patterns of inputs (for example, the relative amounts of textbooks and other materials) and the relationship of these quantitative patterns of inputs to outcomes. This should make it possible, on the positive side, to identify inputs which appears to have positive effects on efficiency and which, as policy, should be increased (the measured increments in results outweighing the additional costs involved) and on the negative side, to decrease or eliminate those inputs which do not have a favorable effect on efficiency.

Admittedly, until the first analysis of this sort is completed it will not be possible to say how conclusively such issues can be settled by a first analysis, but it will have the minimum effect of quantifying present

use of resources on a disaggregate basis and both eliminating and reinforcing hypotheses concerning education and training programs which can be further explored and tested. In addition, the observation and quantifications of behavior taking place in selected programs, whether in the classroom or shop, should contribute to an understanding of the process of education and training activities, i.e., the different ways in which the activity is carried out or different procedures by means of which the inputs are used and combined, along with measures of effectiveness. Such a study would also have implications for the re-design of teacher preparation and in-service training programs.

A number of different studies should provide criteria for the possible redesign of curricula. For example, a study of the reasons for non-attendance and, possibly, low test scores of certain socio-economic groups may lead to the conclusion that curricula for these groups is failing to engage interest and needs to be modified. A detailed item analysis of test results, particularly if carried out in terms of contrasted skills, such as memory, comprehension and application, should also provide criteria for a redesign of curricula.

Giving specially designed tests to individuals who have never been enrolled in education or training programs would allow measurement of the learning effects of activities which are not educative in intent, and some idea concerning the extent to which certain kinds of work are effective substitutes for programs designed to educate or train. Giving tests to individuals who have dropped out of programs or who have graduated from programs X years ago should also serve to determine the extent to which

the knowledge and skills attained in these programs have been utilized and retained as a result of their utilization. The outcomes of these specially designed tests, and the determination of their relationships to other social and economic factors, could conceivably provide criteria for the design of non-school education and training programs which may or may not employ new teaching-learning technologies. If poor nutrition were identified and shown to significantly reduce the amount of learning measured, appropriate remedial feeding measures could follow.

Under the proposed methodology, maximization of access is focused from different perspectives. A regionally disaggregate comparison of enrollment, school pupil-spaces and school-age populations, utilizing the population census, a school building survey and school reporting data, makes it possible to identify baseline pupil-space deficits and surpluses on a county by county basis. This information, together with census information on rural-urban and inter-provincial migration, can be used in developing criteria for the selection of school sities.

The analysis of factors that account for poor performance with respect to the access objective would focus on those localities in which facilities and service are not fully utilized by the appropriate target groups. The study would utilize a national household survey which gathers information concerning reasons for non-attendance and which could be applied later to certain localities selected on the basis of the disaggregate baseline measurements.

A broad array of criteria and large assortment of data are specified under the procedures aimed at improving relevance. These include tracer studies, manpower studies and rate of return calculations. These rate of

return results are to be further analyzed in terms of the independently measured, needs for the specific education and training programs in question, the needs for such programs as perceived by the target group, and the effective demand for these programs.[1/]

In sum, a geographically disaggregate need and demand analysis of the rates of return of the different specialized programs at the secondary and higher levels, tracer studies that reveal the subsequent utilization or employees to productivity in certain selected industries, and the relationship of educational attainment to fertility and to migration, all constitute studies aimed at providing criteria for the improvement of relevance. Such studies would aim at obtaining information concerning current education and training specialization and content, the extent to which the corresponding knowledge and skills are subsequently employed or applied, the kinds of skills usually acquired on-the-job, the extent to which private and public employers are hiring and utilizing this knowledge and skill, and the remuneration provided. Conceivably, the new policies arising from such findings will affect not only education and training content and specialization, but the formulation of policies aimed at influencing the remuneration and hiring practices of private and public employers.

The results of the cross-sectional analyses are to be utilized in designing the appropriate policies for increasing efficiency and access

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1/ As has been pointed out previously, fully reliable measurements of real need will depend in large part of the execution of successful disaggregate analyses of sectors such as agriculture, industry and health.

and for improving relevance, and for estimating the cost of these increases and improvements during the plan period selected. The cross-sectional results are also to be utilized in estimating maximum expansions of the education and training system on a geographically disaggregate and aggregate basis. These estimates of future need would be carried out not only in monetary terms, but in terms of the more important kinds of resources involved, such as trained teachers, classrooms and textbooks. The national or aggregated estimates of upper limits would then be adjusted or constrained in terms of estimates of future availabilities. In other words, the measurement of ranges in present efficiencies, as well as related estimates of reasonable improvements in this efficiency over, say, a 20 to 30-year plan period, together with estimates of the future resources to be made available for education and training (based on future GNP estimates and projections of government revenue and private expenditure on education) should facilitate both the setting of more realistic attendance targets and the fashioning of policies which would increase the probability that these targets will be attained.

III. Experimentation in Instructional Processes to Lower Education Unit Outcome Cost

As was suggested in Chapter four, the difference between the maximum desirable program and the feasible program is likely to be large. For many countries the magnitude of this gap will serve to highlight the need to find ways of lowering unit outcome cost for those education and training programs that consume large portions of current resources, and would consume large portions of future resources at present or moderately improved levels of efficiency.

The proposed experimentation is concerned with reducing the gap, but it must be distinguished from new policies aimed at increasing efficiency. Speaking generally, these policies are based on the analysis of factors that account for the existing efficiency levels. They arise from the attempt to sort out and explain the more successful patterns in current education and training activities and would constitute, in the main, an effort to replicate the more successful patterns.

The kinds of actions proposed here, and for which cost estimates are to be made by means of the fourth set of computations under "V. Alternative programs and their Corresponding Combinations of Feasible Targets" of the methodology described in Chapter four, would be constituted by relatively few, very carefully controlled experiments carried out on a micro-scale and involving new educational technologies aimed at a lowering of unit outcome costs.

It is necessary to emphasize that we are referring to a special pinpointed kind of experimentation focused exclusively on cost reduction. By concentrating solely on this objective it should be possible to provide the experiments with a rather unusual feature.

Specifically, the lowering of unit outcome is made or becomes a "specification" to which the experimental design must conform. In the design of the experiment the lowering of unit cost is built-in, so to speak. Of course, the experiment may succeed or fail. That is the nature of experiments. But if it succeeds, the unit outcome costs will have been lowered--since the experiment was designed in terms of this basic objective.

If this is clearly understood and acted upon, it will be impossible for the educational experiment to realize the desired learning achievements in

the anticipated time without lowering educational cost. Once again, the experiment may fail to achieve its educational objectives, and therefore fail entirely. But if it attains its educational objectives, it will have the effect of lowering unit outcome cost.

In principle, experimentation to lower the unit costs of educational outcomes should be initiated now for all activities, whether of a school or non-school nature. In practice, the difficulties and inevitable delays in getting experimentation underway suggests that it should begin with those activities that consume the largest amount of resources. In primary education, for example, the extension of education to populations that had not previously received it may provide opportunities for carrying out new procedures designed to achieve the same or better educational outcomes at substantially lower costs.

As mentioned, this effort should be clearly distinguished from efforts to increase the efficiency, of existing primary education activities. Clearly, both kinds of efforts are necessary and should proceed concurrently. Although the controlled experiments may be at first necessarily few, it is clear that a success in this area could in the long run "change all the numbers." For instance, were some carefully designed activity that combined programmed learning, team teaching, and voluntary assistance from the community (for non-pedagogical tasks) to assure the desired outcomes with one-half the average salaried staff, it might be possible to bring about radical increases in access and efficiency, and to liberate resources needed for other school and non-school activities.

IV. Some Other Policy Issues Not Yet Addressed

To what extent and in what ways should national problems be dealt with in education and training curriculums? Just as there can never be a final formula for education, there can never be a single final answer to such a general question. Answers will vary with the nation and the locality, the moment in history, and the specializations, interests and ages of the individuals concerned. And yet, accepting this as a central question is desirable. For it helps highlight the need for constant critical inquiry concerning the relationship between education activities and other social activities, and the responsibility for increasing the knowledge and understanding of these problems on the part of all the persons involved in education and training programs. Periodic examination of the relationship between fundamental current problems and the content of education and training activities will force attention to be focused on determining the extent to which current knowledge and understanding obtained by means of studies and analyses, including other sector analyses, have been incorporated into the existing programs. The access of teachers and professors to such information, and their use of this information in the classroom, field or shop would then appear to be an issue of importance.

How can the national government most effectively assist the local authorities in carrying out their responsibilities? A major purpose of a national education sector analysis is to obtain the information which will enable the national government to provide this assistance. Since learning is an individual process, it is the local authority, the teacher, director or manager of the education or training process (whatever the technology in use may be) who must take the last actions in reconciling individual, local and national needs. Obviously, this fact should be taken into

account when determining the content of education programs, when designing procedures for adjusting content to individual needs, and when designing pre-service and in-service teacher training programs.

To what extent and in what ways can the understanding of natural and social phenomena, including social problems and needs, the vocational aspirations of students, and cultural values, become complementary pursuits? Perhaps the deep-seated tendency to consider them necessarily competitive, if not antithetical or mutually exclusive, can be challenged without further ado. If our vocations have something to do with our needs, a policy to include descriptions and examinations of broad national social problems in the curricula of education and training programs would not, prima facie, appear to be at odds with a policy aimed at developing the required vocational specialties. If culture has something to do with the past and man's accumulated knowledge and enjoyment of it, this acquaintance would not prima facie appear likely to reduce our abilities for dealing with present difficulties and for estimating the future effects of actions considered or proposed. So long as dedication to cultural matters is looked upon as an inevitable sacrifice in subsequent vocational performance, so long as humanistic issues and subject-matters are looked upon as mere adornments or desired embellishments, as additional time-consuming interests which cannot contribute to technical and professional pursuits, the constantly needed integration of these in our education programs will continue to be postponed.

From the point of view of development, the issue, as it has been expressed here, may appear remote and unimportant. But if men and women in all walks of life are "better off" if they have learned how to perform certain tasks and also how to think, not only about the tasks they have been taught to perform, but about other things that affect their lives, then the issue may

have something to do with development.

Perhaps the example of work-study programs will serve to provide more meaning to the issue under consideration. In principle, such programs are hard to impugn. Prima facie they appear likely to strengthen a belief in the value and dignity of work--a belief or attitude obviously supportive of the development process. Prima facie work-study programs appear designed to reduce the possibility of excessive bookishness in academic programs and to familiarize students with practical tasks and ongoing operations. Although such goals may be partly attained, the possibilities inherent in a work-study program are rather seldom fully exploited; and precisely what is usually left unexploited is pertinent to the issue at hand. Much too often the academic work--the reading, writing, discussing and thinking about the subject-matter in question--and the practical or physical work are mechanically juxtaposed or alternated with no genuine transactions taking place between one and the other. In such cases the work-study program does not contribute to the imaginative critical thinking about activities which is generally needed in order to broaden their import and to increase their efficiency. Much too often the underlying intent in familiarizing a student with the real work situation seems to be limited to helping him shed his illusions or, at least, lower his expectations concerning the possibility of applying humanistic and scientific considerations in the future pursuit of his vocation.

It may be appropriate at this point to attempt to state the assumptions that underlie the above considerations. The approach to education and training implicit in these considerations is one that associates production and productivity to scientific understanding, to the creative design and redesign of technology, and to its continuous adaption and adjustment, as

well as to the iterative or repetitious. It entails the assumption that farmers who have some understanding of the chemistry of their soils and who can read instructions and understand explanations concerning the use of fertilizers and herbicides are in a better position to increase their yields. It even entails the assumption that industrial workers who have some understanding of the scientific principles involved in the machines they operate, although more likely to argue with the front office, are also more likely to bring about constructive improvements in plant operations. Such an approach suggests that increases in productivity and improvement in working conditions--both of which are the result of creative thinking that changes situations--are not only brought about by the relatively small segment of the population constituted by university graduates. It entails the assumption that all working men and women--including those who operate lathes and walk behind plows--are better off reflecting on what they do and thinking about how what they do could be better done. It entails the assumption that the communities in question will be better off if these men and women have been educated, and not simply trained.

To what extent could a greater understanding of young people, their desires, fears and aspirations, strengthen an education program actively striving for development? In many countries today young men and women appear to be at loose ends. What shall I do? What shall I cling to? What am I good for? What contribution can I make? Where does my future honor lie? If these are inevitable questions--a natural part of the human condition--their implicit challenge to education is also permanent, and should be reviewed at fairly regular intervals. Too often young men and women do not dare become attached to ideals, in part because they suspect that ideals are

largely or wholly powerless. If their aspirations are to be broad and generous they must believe they can help make a better world--help solve the problems of welfare, survival, freedom, meaning and fraternity. And if their aspirations are to make any difference they must have both the grounded knowledge and the disposition for continuous inquiry that are required to assure the attainment of values.

It is clear, moreover, that education alone cannot accomplish the multifarious tasks involved. Education and training activities are parts of a larger and broader society. If the habits, knowledge, attitudes and aspirations that emerge from education are not put to use in other social activities, the education system will ineluctably provide its quota of frustration, and then contract and trim its broader values and objectives to fit the more narrow values and objectives of the larger society. On the other hand, if the education system is to concern itself with feasible values and objectives, it should be informed as possible about the nation's antecedents, problems, resources and possibilities.

Although the above considerations may serve as examples of policy issues that are not addressed by the proposed methodology, we believe they also highlight the desirability of establishing a process of sector analysis that is continuously improving. After all, the policy issues that have been presented here are issues that have been discussed in some way or other by each generation that concerns itself with education. Since such issues reappear, it should be one of the functions of a sector analysis process to obtain and arrange the facts and relate them to the issues in ways that will help prevent such issues from being treated rhetorically. Only then will we know fully and precisely what is meant by these issues, or, for that matter, which issues are genuine and which issues are specious.

V. Education and Inquiry: Increasing their Mutual Support

Under the "Development" section of the first chapter "What is Sector Analysis?", reference was made to the desirability of applying the knowledge and techniques of various disciplines to this particular type of inquiry. Perhaps some of the points made in the discussion of the complex problems involved in sector analysis in general, and education sector analysis in particular, can be looked upon as supporting the claim of superiority for a multi-disciplinary approach--for a sector analysis process that involves cooperation among specialists in the different social sciences.

Although we will not attempt here to specify the arrangements and procedures which such collaboration involves (other than to suggest that the majority of these must be perforce worked out in practice) we shall take the ocassion to point out that the division of labor invariably involved in a cooperative endeavor does not serve to diminish or obscure specialization but, on the contrarty, to intensify and heighten it. A multi-disciplinary approach is not an inter-disciplinary approach. A multi-disciplinary approach does not involve a forced merging of specialized disciplines. Indeed, active cooperation among disciplines will contribute to increasing each discipline's awareness of its own distinctive features and functions.[1/]

1/ If this view is correct, some of the misconceptions in recent economic thought, reviewed in Chapter three, may have been avoided had economics been more widely employed in multi-disciplinary endeavors. It seems reasonable to presume that under such endeavors specialists become more familiar with other disciplines and less inclined to apply the concepts of their own specialty to explain events which can be better explained with the concepts of other specialties.

In Chapter one it was suggested that sector analyses provided comparatively good opportunities for realizing progress in determining how the different social sciences can be related to one another and employed for a broader and deeper attainment of a society's values. This is so, we contend, because the multiple problems and objectives in terms of which sector analysis is structured and which are, so to speak, both its point of departure and its point of return, provide a setting or context which facilitates multi-disciplinary cooperation. The successful pursuit of very different kinds of goals that include, say, increasing product and reducing alienation, and attempts to remove or reduce a wide variety of constraints that include, say, resource limitations, institutional impediments, and individual disincentives, clearly calls for concepts and procedures provided by a variety of specialized disciplines.[1/]

If better formulation of policies for the education sector depends partly on bringing different social sciences to bear upon its analysis, the theoretical development of these disciplines and the preparation or training of the corresponding specialists constitutes an educational service which over the long run will benefit education itself, as well as other social activities. Of course, it is widely accepted that the universities and other related institutions have a responsibility for continuing theoretical work and research in the various social sciences and for training

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1/ Clearly, any other type of inquiry or analysis concerned with means-end relationships would benefit equally from the insights of various social sciences cooperating in the solution of major problems and the attainment of their correlate objectives.

new specialists in these fields. But if improvement of analysis and policy requires greater cooperation among the specialties than is currently taking place, the universities should be exploring new ways to provide specialists with knowledge of other disciplines and to foster a spirit of cooperation among the different kinds of practitioners. In short, this is another policy issue that needs to be thoroughly analyzed and resolved.

Throughout this report we have stressed the importance of establishing a continuous process of analysis at the national level. And at various points we have referred to the importance of gradually establishing analytical processes at the regional, provincial and local levels. To conclude, we wish to point out once again that analysis is but the first of six steps in the "development cycle". Analysis provides a ground for the design of education and training programs, but the adequacy of these programs cannot be fully determined until they are carried out and evaluated in terms of their existential results.