PROJECT AND SECTOR INTERRELATIONSHIPS IN DEVELOPMENT PLANNING: A PRELIMINARY ANALYSIS

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By

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ABSTRACT

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The purpose of this study was to do a preliminary analysis of investment criteria and project evaluation techniques in the framework of overall planning, which would enable the author to develop ideas for use, in his doctoral dissertation on the evaluation of projects in the mixed economy of less developed countries.

To achieve this objective a critical review of the theory and application of investment criteria in the United States and in less Developed Countries was made.

The review identified three main problems that less Developed Countries face in the application of investment criteria. First, the dynamic character of development and the structural effects of development projects raises the problem of how to handle in the analysis the effects of projects among themselves and on the very variables considered for their identification and appraisal. Second, development, defined as a multiple objective process, raises the problem of how to include in the criteria of public investment the attainment of changing and sometimes contradictory policy goals. Finally, the existence of project benefits which do not have market values and which sometimes are not even quantifiable raises the problem of how to evaluate benefits, especially when multiple objectives are present.

In the light of these problems, justification was given to direct the efforts of evaluating projects toward a more comprehensive analysis that would integrate both planning and project appraisal. Theoretically at least, it is believed in this thesis that the interactions among projects through time and the multiplicity of objectives can be handled better and in a more rigorous manner if groups of projects are analysed within sectors of the economy and in the framework of the existing development plan of the country.

With this central theme in mind, the analysis expanded on the interactions among constraints and decisions in both the public and the private sectors at the three levels of planning: macro, sector and project levels.

This analysis showed the need for a reconciliation in complementary programs of public investment, the need for a parallel analysis of the private sector and the need for an analysis of the effects of projects on sectoral and macroeconomic variables, such as input-output technical coefficients, the balance of payments, the distribution of income, unemployment, etc.

Those objectives of the analysis would be handled through the link of sector programs.

An illustrative case study in Spain analysed the possible reconciliation between an irrigation project appraisal and an indicative sector program made for the Agricultural Sector using linear programming techniques.

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The conclusions of this study, that is, the basis from which the author's doctoral dissertation will start, are of two kinds. In theory, the reconciliation of project evaluation and sector programming is possible to the degree that the interactions among variables in development are under stood. A precondition for this enterprise is therefore the building of a satisfactory theory of development. It is believed that the most important issue in the methodology lies on the trade-off between disaggregating variables for realistic analysis and aggregating them for the sake of consistency and comprehensiveness. In practice, and as means of constructing and testing theory, besides the inmediate problem solving goal, the Spanish case suggests that linear programming can substitute for ad hoc methods of reconciling investments in complementary projects. Recursive linear programming can handle changes over time. The process of reconciliation should be started at the project level as a mean for accumulating changing data on technical coefficients. And finally, succesive approximations are necessary to reach consistency within and between sectors.

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The author assumes full responsability for all opinions and for any-- error in this thesis.

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CHAPTER I

OBJECTIVES AND METHODOLOGY

1. Statement of the problem

Benefit-Cost analysis is an economic criterion for public decision-making. In its most simplified formulation the criterion consists in undertaking a project whenever the benefits "to whomever they accrue" exceed the costs of carrying it out and maintaining it. The most important features that have most occupied the experts in the past have been the problem of the discount rate, the evaluation of benefits (including shadow prices and secondary effects) and the form of the maximizing B/C ratio. Benefit-cost analysis has been used under the usual assumptions of classical economic theory; namely, perfect competition, unchanging institutional framework (especially given distribution of income) and "rational" behavior under perfect knowledge.

Modern writings, especially those concerned with less developed countries, taking into account the nature of the development process, and questioning the relevance of conventional economic analysis to these countries have emphasized the following points:

- secondary effects as the central and main reason of implementing development projects.
- structural changes rather than marginal adjustments which point to dynamic treatment.[1]

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[1] In this thesis, it will be shown dynamic effects are considered part of secondary effects: in other words they are secondary effects through time.

- redefinition of the concept of development which sets multiple-- objectives rather than growth per capita income alone.
- the policy counterpart of the preceding points; namely, the integration of decision-making in a comprehensive planning context.

Several difficulties have hindered progress in implementing these -- concepts. These difficulties have been lack of data, lack of coordination among planning agencies, and particularly lack of understanding of the development process itself accompanied by the failure to predict changes.

This thesis is an attempt to take a further step in assessing development planning and the interrelationships among objectives and methods.

2. Justification of the problem

Chapter II of this thesis will accomplish the task of justifying and specifying the problem in detail. Here, a few statements will help to focus on the specific concern of the thesis:

Development economists (for instance, Myrdal[1]), emphasize the institutional character of development. Since economics has been reflecting this aspect[2], some economists ask whether economics can say anything significant on matters of development policy and conclude that economic researchers "must be concerned with both ends and means as variables of the inquiry"[3]. Three main aspects stem from this thinking:

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[1] G. Myrdal. Asian Drama. Pantheon Books N.Y. 1967. vol 1.

[2] M. Shubik, "A Curmudgeon's Guide to Microeconomics". Journal of Economic Literature. June 1970.

[3] P. Dorner. "Needed Redirections in Economic Analysis for Agricultural Development". American Journal of Agricultural Economics. February, 1971.

i. Development is not merely to accelerate economic growth. The role of economists includes defining the nature of development. Dudley Seers[1] proposes considering diminishing poverty, increasing employment and increasing equality as the major goals and thereby indicators of progress.

ii. Economic theory has been questioned in its relevance to less developed countries: market imperfections are great and a "laissez-faire" doctrine results in a formalization of the existing flaws rather than in a readjustment in resource allocation. For some problems the theory must and can be developed to handle the dynamic problems implied in the structural changes of development. The marginal changes brought about by the market should be handled with an extended and adapted static optimum theory.[2]

iii. The inability of the market to promote development has induced all less-developed countries to implement development plans. Planning has become the principal tool for policy. The concern of economists must therefore extend to planning techniques. This calls for coordination of efforts since the interactions of sectors and subsectors in the economy is what builds up progress in terms of satisfying demands and supplies.

Benefit-cost analysis must be reexamined in the light of these considerations. Until the present, it has -in general- not dealt with these issues. (This will be shown in Chapter II).

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[1] D. Seers, The Meaning of Development. International Development Review. December 1969.

[2] Hla Myint, "Economic Theory and The Underdeveloped Countries." Journal of Political Economy. October 1965.

3. Objectives and methodology

The purpose of this thesis is to investigate the problem of investment decisions and criteria in less-developed countries, as defined in the two sections above. There is no specific objective of ending up with a set of answers and solutions because the problem is considered so vast and complex in the present state of knowledge, that the task would be too ambitious and much too long. Rather, this thesis aims to review the present theory and practice used to develop investment criteria and to derive from there the logical implications that would eventually yield a framework of analysis for further research. The author considers this research as a first step in a broader enterprise: that of deriving a method for evaluating projects in less-developed countries which would take account of the special circumstances embedded in the development process. This process of inquiry will be carried on by the author in his doctoral research.

Here the objective is to deduce possible suggestions from the analysis in order to open the path towards the mentioned longer run objective.

Therefore the methodology followed is reduced to a part of any complete process of inquiry.

1. To define the problem and justify its importance.
2. To formulate hypotheses and to specify the constraints in which the research has to take place.
3. To start the process of method selection for handling the empirical work that should eventually be done.

The final selection of method, the empirical work and the testing of the method eventually proposed are left for later research.

Point 1 will be carried out in chapters II and III. These chapters in-

clude a review of theory and practice respectively for developing investment criteria.

Point 2 will be done in chapter IV, in which the framework of reference for project planning will be presented. And point 3 will be done with the help of a case study of a project whitin the Spanish Agricultural sector in chapter V.

CHAPTER II

INVESTMENT CRITERIA AND ECONOMIC DEVELOPMENT: A REVIEW OF THE THEORY

1. Public Goods, Government Action, Goals and Criteria.

The nature of some goods is such that they have to be provided jointly by government action. The reasons for this are technical, political or financial. These "public goods" can be classified as follows:[1]

a. Those arising from intrinsic (perhaps technical) characteristics of specific goods that result in externalities that are not effectively marketed.
b. Those arising from imperfections in the market mechanism.
c. Those arising not from specific goods or services but from aspects concerning the quality of the environment.

Publicly provided goods imply that individuals and social groups -- reach an agreement through the political process. Therefore, the criteria used to make the decisions concerning the supply of public goods must be defined within the political framework itself. Goals and criteria are closely related. The general goal of a society is to maximize social welfare. For most societies this would mean to maximize income per capita -- subject to some previous requirements of justice, freedom, security, etc. Given the prevailing situation in the country, these high level goals are translated into more specific and concrete goals, such as reducing unemployment, distributing income, conserving or creating foreign exchange

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[1] P.O. Steiner. "The Public Sector and the Public Interest", in (42) pp. 13-43.

or becoming self-sufficient in basic goods, to name a few.

In any case, the society chooses a consistent set of goals which will be the set of assumptions on which the "maximization" will take place. - Maximizing the attainment of these goals can be called efficiency in public investment and constitutes also the set of criteria that will govern — decision-making. If separate goals are adverse to each other as could be the case for distributing income and increasing income per capita, the-- set of criteria should include the relative weight of each of them.

2. Basis for the review of literature.

Unfortunately, quantifying all these variables is not an easy matter. Much economic analysis avoids the problem by putting that which is not-quantified under the the ceteris paribus assumption. A review of the several methods or criteria proposed gives a useful insight into the problem,-- helping to understand the consequences of different assumptions, or dif-- ferent goals. To assess these criteria, a few basic points, on which this-analysis will concentrate, need to be made:

(1) Dynamics versus statics: development is a long term process and therefore subject to non-marginal changes. From the policy side, to induce development is to produce non-marginal changes. Small projects in an advanced economy do not much affect the-important variables of the economy and therefore can be analyzed in a static framework. But development projects by definition seek multiplier effects and therefore should be treated in a dynamic framework.

(2) Micro versus macro: efficiency at the micro level can be rea-- ched under circumstances that do not yield the maximum effi-— ciency at the macro level, because different goals at those le--

vels define different concepts of efficiency. This is the distinction that is often made between financial and economic analysis in the evaluation of projects.

(3) Economic versus non-economic: development is more than a material process. It implies social and cultural improvement. It implies changes in attitudes for which market signals may not provide the necessary incentives.

3. The Literature: A Critique

A perfectly competitive economy with no externalities would allocate resources efficiently to satisfy consumer wants. Given that (1) perfect competition does not exist and (2), that externalities do exist, public goods appear in the economy and therefore government action is required. Thus, part of the allocation of resources and the responsibility for efficiency in that enterprise are shifted to the government. This task varies depending on the objectives sought, the kind of market imperfections and the kind of externalities. Two types of decisions are to be made: what commodities to produce and what factor combinations to use in their production. The first type depends on the objectives of the country and its comparative advantage. The second type depends on the relative scarcity of resources.

Most of the investment allocation criteria proposed for developing countries have assumed the objectives and have concentrated on this second type of decision. This section will discuss first how the latter has been handled. Second, a discussion of the problem of dynamics incorporating both types of decisions will be included and finally we will concentrate on the first type of decisions, particularly the problem of multiplicity of objectives.

(a) Investment allocation criteria.

Under the assumption that capital is the only limitation the logical - proposal by Buchanan[1] was to select those projects which yield the highest product value relative to the total investment. This is the capital/output ratio criterion. Its first limitation is that it does not take account of operating, maintainance and associated costs which may also be scarce resources. This is solved by using the ratio of capital to value added or including the associated costs in the capital account. Another limitation is -- that time is not considered and therefore slowly maturing projects may have in the short run a high capital/output ratio. This is Kahn's criticism[2], - that capital intensive projects rejected due their high C/O ratio, may - be important in breaking bottlenecks (such as social overhead capital projects) and also that the criterion does not "indicate at what point to stop substituting the plentiful factor for the scarce"[3], that is, capital is considered always the only constraint. Kahn proposes the use of the Social -- Marginal Productivity criterion (SMP) which "takes into account the total net contribution of the marginal unit to the National Product, and not merely that portion of the contribution (or of its costs) which may accrue to the private investor"[4].

The SMP criterion is also proposed by Chenery[5] who argues that the- capital/output criterion is only helpful in comparing projects within a given sector because they use similar capital intensities and that "perfect -

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[1] N.S. Buchanan, International Investment and Domestic Welfare,-- New York 1945. pp. 24, 72, 106-108.

[2] A.E. Kahn, "Investment Criteria in Development Programs". Quarterly Journal of Economics, February, 1951, v.65, pp. 38-61.

[3] Ibid. p. 40.

[4] Ibid. p. 39.

[5] H. Chenery "The Application of Investment Criteria", Quarterly -- Journal of Economics, February 1953, v. 67, p. 76-96.

competition cannot ever be used as a standard for many sectors of the economies" on which is based the C/O ratio. SMP and C/O are not correlated unless the social opportunity cost of labor is very close to zero. Chenery defines the SMP as the average annual increment in national income, and balance of payments effect, resulting from the marginal unit of investment in the project:

$$SMP = Y = \frac{V}{K} - \frac{C}{K} + r\frac{B}{K}$$

where V is the annual value of output, C is the total annual cost including interest and amortization, K is the increment to total investment, r the marginal rate of substitution between Y and B (a measure of the overvaluation of the national currency at existing rates of exchange), B is the total net effect on the balance of payments. The increment of national income is measured using "accounting" prices which affect the social cost[1] and not the private cost (or benefit) reflected in market prices, and which therefore do not take taxes and subsidies under consideration. The use of accounting prices solves the problem of the distinction between micro and macro pointed out above.

The main criticism to this approach arises from the static-dynamic distinction. Kahn and Chenery do not use future prices in computing costs and benefits. This implies that the project does not affect the equilibrium of the economy or, in other words, that policy decisions do not affect the economy. This static framework is inconsistent with development, again, an essentially dynamic process.

Galenson and Leibenstein point out that "the difficulty arises because of the ceteris paribus assumption necessary in comparative statics, e.g., we do not know of what value these capital goods are to generations yet-

[1] Ibid. p. 82, 93. See also J. Tinbergen, The Design of Development, The Johns Hopkins Press, 1958, p. 39.

unborn[1]!" In more specific terms,"it does not take account of what happens to the final products nor does it take account of changes in the nature and quality of the factors of production that may in part be an indirect consequence of the current investment allocation"[2]. This will be dealt with below when analyzing dynamic implications.

In an effort to incorporate dynamic analysis, Galenson and Leibenstein argue that the appropriate goal of development should be to maximize output per capita at some future date. This maximization depends on several factors among which capital per worker (the capital/labor ratio) is the most important but also the quality of the labor force. They call the suggested criterion the "marginal per capita reinvestment quotient" MRQ. The capital/labor ratio "depends on the amount of investment year by year stemming from the product of the initial investment and the increase in the rise of the labor force"[3] Therefore the goal is to maximize savings per worker which is tantamount to maximizing output per worker i.e. labor productivity. To achieve the optimum allocation of resources the MRQ of the different projects should be equated. Capital intensive projects are favored by this criterion since labor productivity is higher when capital per worker is high.

The authors assume that only profit earners save, but not wage earners. The question is then to maximize profits. If other objectives are considered, such as employment or income distribution the criterion obviously worsens both in any case. Income distribution is worsened if to maximize profits, wages have to be minimized. If alternatively the criterion is

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[1] Galenson and H. Leibenstein "Investment Criteria, Productivity and Economic Development" Quarterly Journal of Economics, Aug. 1955 p. 343, 370.

[2] E.C.A.F.E.,"Criteria for Allocating Investment Resources among various Fields of Development in Less developed Countries" Economic Bulletin for Asia and the Far East, June, p. 33.

[3] Galenson and Leibenstein, op. cit. p. 351

understood as increasing the capital/labor ratio and this is done by inducing capital intensive projects through high wages, then employment will be reduced.

The problem of dynamics is not yet solved by the MRQ criterion despite the consideration of time. It is not so because no interaction among variables is considered as time passes, and new situations arise due to new projects being implemented.

A generalization of both the Kahn-Chenery and the Galenson-Leibenstein approaches is that presented by Eckstein who makes three main points: (1) Maximizing savings may be better reached by fiscal means. "It will never make sense to devote all effort at all stages of a long investment plan to the accumulation of capital"[1] i.e., it may be that inmediate consumption is much more important.

(2) There is a time preference in consumption. And (3), maximization of employment may also be a non-economic but social development objective. Eckstein proposes the use of the "marginal growth contribution" (MGC) criterion which comprises the present value of consumption resulting to the investment stream fostered by the project. The (social) interest rate is determined by the social time preference, the growth rate and the population growth, which are functions of the marginal utility of consumption. The use of the same discount rate for the whole life of the project implies that the reinvestment funds fostered by the project are used in projects of the same profitability and under the same conditions and objectives of the country. Alternatively, it implies that time preference remains the same during the life span of the project. These assumptions may not be true under changing conditions, such as higher incomes, new techniques of production, population increase, etc. In other words Eckstein's criterion is static also.

(b) The problem of dynamics.

An evaluation of what has been exposed so far is needed to carry on this review. It is rather clear that each criterion is a consequence of a different understanding of the development process. In other words, the objective sought by the nation determines the criteria to use in project evaluation. As a corollary, each country, given its goals, should use its own specific criterion for investment allocation.

As we have seen, the main constraints considered by the authors were:

- capital inavailability (low level of savings)
- balance of payments problems
- unemployment

Most of the analysis is directed toward increased growth with the main constraint being capital. Even if capital is the only constraint, the three problems of dynamics, micro versus macro and economic versus non economic, appear in the analysis. Some suggestions have already been mentioned with respect to the latter two and we will come back to them later. Let us confine ourselves here to the static-dynamic problem.

The question is what is needed to assess dynamic effects. In a very simplified manner the goal is to predict future changes in important economic variables as a result of the project effects. If capital is considered to be the only constraint, this could be put in the following terms: what is the effect of the project on the current Keynesian investment multiplier? or in other words, what part of the output generated will be reinvested and again what will happen to the output of the reinvested output? In Eckstein's framework, the social evaluation lies on the importance given to consumption over time, that is on the discount rate. Taking this into

account, the dynamic concept arises: given that valuation of consumption changes with income and that income will increase over time, we should include in the present valuation of future consumption some correction due to expected income in that future. Social benefit is total output generated by the project at its social price. It is the same as total income generated by the project. If capital is scarce, there is a social benefit from greater reinvestment. This is likely to occur when income per capita rises, if marginal propensity to save is greater than zero. This phenomenon would be included in the analysis by introducing a declining discount rate for discounting future benefits and costs. Several assumptions underlie this thinking; namely that the marginal efficiency of capital remains constant under two opposing forces, that technology constantly provides cheaper ways to produce and that only less favorable alternatives remain to be exploited as time goes on. Also income distribution is assumed given and balance of payments effects, taxes, etc. are the same.

Of course, the rate of decline of the discount rate, consistent with the above concepts has to be measured. It depends, under the ceteris-paribus assumption, solely on the marginal propensity to consume which is a declining function of income. Therefore, the discount rate could be determined by the level of income. The empirical work necessary to determine this relationship could be aproximately done with cross-sectional data.

Under conditions of unemployment, as was pointed out when criticizing Galenson's and Leibenstein's proposal, there may not be an increase in income per worker if the project only employes more people at a given level of wages. A situation in between is most likely to happen: There is increase in employment but also an average positive change in inco-

me per capita.

The dynamic problem has best been handled by S.A. Marglin[1] His approach is the maximization of income by means of a series of projects in a given period of years. These projects interact each other either as prerequisites or as a simple chain in development. Each year has its different budget constraint and shadow prices affecting output vary because of the project's implementation. "The optimal design-construction schedule for each project depends not only on the benefits and costs of the project itself, but also on the time pattern of its comparative advantage with respect to other projects, and the levels of budgetary constraints in all years as well"[2] The analysis has to be made with a comprehensive planning view including all the projects proposed for the given period. Thus it assumes that all investment opportunities are known in year zero and the question to answer is: when to construct each project and what size should each be? A further limiting assumption is that costs are independent among projects which fails to reflect possible external economies of scale created because of interaction, among other less important features.

The shadow prices reflect the changes in demand and supply over ti-

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[1] S.A. Marglin. Approaches to Dynamic Investment Planning, Amsterdam: North Holland, 1963. pp. 98, 172, 177 and ff.

[2] Maass, Hufschmidt, et. al. Design of Water Resource Systems: New Techniques for Relating Economic Objectives, Engineering Analysis and Government Planning. Cambridge: Harvard University Press, 1962, p. 191.

me and are centrally determined by a "central office" which receives project data from decentralized "field-offices." Applying those shadow prices is simple enough to be applicable but the real problem is their computation.[1] This complication could be the subject for another study.

(c) The multiple purpose problem

One step further is to pose the question whether all the beneficial effects of a project can be put together in a single criterion. Two main difficulties arise here:

- in a dynamic analysis interaction among variables through time has to be explicitly considered.
- there has to be defined a specific weight for each effect in terms of government goals. In other words what is to be preferred: The employment of an additional worker or the saving of X dollars of foreign exchange, etc?

An attempt to take care of the second point has been made by the Philippines National Economic Council,[2] by taking under one single formula the different objectives of a project:

1 - highest contribution to national income per unit of scarce resources.

2 - highest measure of improvement in the country's balance of payments per unit of scarce resources.

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[1] Marglin proposes an iterative approach of successive approximations. See Maass, Hufschmidt, et. al. op. cit. p. 174.

[2] Quoted by B. Higgins in Economic Development, Principles, Problems and Policies W. N. Norton and Co. Inc., New York, 1st ed. 1959 pp. 653 ff.

3 - greatest use of domestically produces raw materials and operating supplies.

4 - greatest use of domestic labor (measured by the annual value of that labor per unit of scarce resources).

5 - production of goods that would meet the more basic needs of the people and produce the greater effect on the external economies. This last factor is known as the "essentiality" factor (e).

The essentiality factor is a weight given to the benefits depending on the economic importance of the product, the source of raw materials and supplies used, the source of capital equipment and the source and nationality of financing. What this factor does, apart from improving the balance of payments, is to give more importance to projects which have the most of both "forward" and "backward" linkages to domestic production processes. Therefore, it somehow takes account of secondary benefits. Of course, the essentiality factor provides only an approximate measure, since it only has terms for "products largely for use by other industries", but it reflects roughly the economics of inter-related activities.

This method has several defects not quite relevant to this discussion but it constitutes an interesting attemp to list factors and highlight the need for weights to achieve a comprehensive criterion. No information is available on the results of its application.

A similar idea has been used by Stanford Research Institute[1] giving different weights to six different criteria (net return, integrated development, ... balance of payments, experience and competition, ...). They-

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[1] Stanford Research Institute, "Manual of Industrial Development -- Projects with Sepecial Application to Latin America" Stanford, October - 1954.

propose that each government give its own judgment and that priorities be given qualitatively whithout assigning arithmetic weights.

And also K.A. Bohr[1] proposes a very similar combined criterion of four different factors (capital requirements, skilled labor, location and size of the industry).

This approach of weighted objectives has been more rigorously de-- fended and justified by Maass, Freeman, Eckstein[2] and a similar one by McKean and Marglin.[3] Haveman[4] and Weisbrod[5] have attempted to make operational the idea by looking for techniques which reveal in quantifiable measures the policy philosophy of decision-makers.

The essence of the justification is as follows: The purpose of govern- ment expenditures is not merely to increase income with maximum effi--

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[1] K.A. Bohr "Investment criteria for Manufacturing Industries in Under-developed Countries." The Review of Economics and Statistics. Vol. 36. no. 2. May 1954. These last two references are quoted in U.N. "Manual on Economic Development Projects" April 1957. (There exists a revised version).

[2] A. Maass, "B-C Analysis: Its Relevance to Public Investment Decisions" QJE May 1966; Myrick Freeman "Income Redistribution and Planning for Public Expenditures" AER June 1967 pp. 495-508; O. Eckstein "A Survey of Public Expenditure Criteria" Public Finance: Needs Sources and Utilization. Universities National Bureau Committee on Economic Research (Princeton: Princeton University Press 1961) pp. 439-504.

[3] A. Maass, Hufschmidt, et. al. op. cit. pp. 62-86; McKean, Roland N. Efficiency in Government Through Analysis, With Emphasis on Water Resources Development. New York, Wiley, 1958 pp. 127, 206-208, 24-242.

[4] Haveman, R.H. Water Resources Investment and the Public Investment Vanderbilt University Press, 1965.

[5] B.A. Weisbrod, "Income Redistribution Effects and Benefit-Cost Analysis" S.B. Chase ed. Problems in Public Expenditure Analysis. Washington. The Brookings Institutions, 1968.

ciency. As a matter of fact efficient income redistribution is often far-- more important. Therefore, benefit-cost analysis should include an estimation or measure of attainment of such objectives. The reason why it has- not been made so far is that the techniques in welfare economics do not- provide adequate tools, so that "secondary benefits" of this kind were relegated to a paragraph of "other benefits" in a very vague evaluation. - The quoted authors believe that the legislative weights can be assigned - to each objective in order to avoid piecemeal decisions by individual -- and group interests in the political process. In other words the trade-offs among increasing income by a certain amount and redistributing it follo-- wing a certain pattern can be established by legislation and used sistematically for all projects.

Economists should find a way of evaluating such trade-offs or weights in terms of their consequences.

Several proposals have already been made[1], such as to analyse the- consequences of past decisions on the attainment of objectives or analyse welfare policies such as taxation, subsidies, etc.

An appraisal of the validity of these techniques is given by Freeman.[2] Let us point out here the most relevant issues. First the underlying assumption of the whole analysis is that the government is a perfect representative of the wills of society.

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[1] See footnotes 4 and 5, p. 18.

[2] M. Freeman, Project Design and Evaluation with Multiple Objectives. pp. 573 ff. Reference (42) pp. 565-578.

Second, there is no guarantee that the past decisions actually made have the consequences that they were expected to promote. In other words, it may be that the knowledge of the decision-makers about the consequences was not perfect. Finally, one can wonder why all this trouble in "institutionalizing" a past trend of decisions in policy if it means introducing rigidity. Quantifying a consistent trend will not change much the results.

To obviate this last point it would be necessary to analyse the policies that were formulated, regardless of their results. For empirical analysis if a development plan exists with clear goals and clear budget allocations among sectors and subsectors, and if the situation to be changed is defined, then an analysis of the plan can indicate the economic and welfare philosophy of the government.

Three main points have been made in reviewing the literature on investment criteria for less developed countries. First, the objectives of development are multiple and require weights from policy makers. Some objectives have market values and others not. Secondly, the concepts of efficiency are different between the firm and society as a whole, due to the different goals involved at each level. And third, projects are implemented with the purpose of generating dynamic effects and structural changes.

As a consequence, investment criteria should be adapted to these constraints. Given that some projects are better suited to fulfill specific objectives than others, consideration of individual projects to attain all goals simultaneously is less efficient than considering each project in its best use. But for this, all the projects should be assessed together in order to eventually reach the optimum combination of goals as dictated by society.

Similarly, given the interactions between projects and the dynamic-effects generated among them, it is also necessary to analyse investments within the overall planning framework.

These issues will be taken over again when analysing planning in -- chapter IV and when studying a specific case in chapter V.

CHAPTER III

CURRENTLY USED TECHNIQUES OF PROJECT APPRAISAL IN THE UNITED STATES

Since the United States present the widest and most experienced -- application of investment criteria, the present chapter will review the- related applied techniques used in that country. The purpose is to evaluate their validity in the problem-solving context and eventually to lay out- a frame of reference which would permit analysis, mutatis mutandis, of the problems of planning in less developed countries.

The Documents in use.

A landmark guide for the evaluation of River Basin Projects is the- "Green Book"[1] prepared in May 1950 by a Federal Inter-Agency Commi ttee. It defines the objectives of economic analysis, concepts of bene- fits and costs, and provides specific guidelines for the identification of benefits and their measurement. Particular agencies have their own re- gulations which depend mainly on the specific ways of measuring the - effects of the product that they provide (For instance, flood control for the S.C.S. Economics Guide). The Green Book is written in general - terms and is an attempt to homogeinize the practices of river basin project evaluations, but was never adopted officially by the Congress or the Exe cutive.

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[1] U.S. Interangency Committee on Water Resources. Proposed Prac tices for Economic Analysis of River Basin Projects (rev. ed.) Washing-- ton, D.C., 1958.

Senate Document 97[1] provides a review of evaluation standards and establishes "executive policies for uniform application in the formulation, evaluation and review of comprhensive river basin plans and individual-projects..." The objectives of plans as well as the methods to measure -- them are specified.

Several specific laws[2] have added or specified the objectives of -- plans such as opportunities for recreation and fish and wildlife enhance-ment, employment, water quality, water supply, water pollution, etc.

All these documents are primarily concerned with tying together planning and evaluation procedures under the idea that projects are the means for attaining the defined social objectives and that therefore the evaluation of costs and benefits is a basic tool in planning water resource development.

In 1965. the U.S. Water Resources Council was established to develop guidelines for project evaluation to be used by all water agencies.

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[1] U.S. Interagency Committee on Water Resources. Proposed Practices for Economic Analysis of River Basin Projects (rev. ed.) Washington D.C., 1958.

[2] See, Water Resources Council, Washington D.C. Report to the -- WCR by the Special Task Force. Procedures for Evaluation of Water and Related Land Resources Projects. June 1969. pp. 7-10

A Report to the WRC by a Special Task Force[1] is the latest document with that purpose, which specifically deals with improvement in evaluation techniques. In this report the concepts of primary and secondary benefits are dropped and replaced by the concept of "contributions to the national objective."

> "It would be better for primary benefits to be considered as the water supply, flood damage, etc., accruing directly to the inmediate users. For secondary benefits it would be preferable to classify these in terms of their real effect on the income objective.
>
> "... secondary benefits would either be classified as follows: (1) unemployed resource benefits, or (2) external production benefits".[2]

The objectives

The basis for an evaluation is the performance related to certain objectives. In the U.S. the President's WRC has defined them as follows:

> "The basic objective in the formulation of plans is to provide the best use, or combination of uses, of water and related land resources to meet all foreseeable short and long-term needs. In pursuit of this basic conservation objective, full consideration shall be given to each of the following objectives and reasoned choices made between them when they conflict:"[3]

These are: Development, Preservation and Well-being of the people. "Development" refers to "achievement of satisfactory levels of living" and can be translated into increasing the National Product. The

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[1] WRC Washington D.C. Report to the WRC by the Special Task Force. Procedures for Evaluation of Water and Related Land Resources Projects. June 1969.

[2] Ibid., p. 53.

[3] Senate Document 97, op. cit. p. 1.

new Task Force[1] has further classified them under "national income" and "regional development". The first one is GNP, the latter includes increased regional income and employment, improved income distribution and improved services within the region. In specific cases national and regional objectives may conflict. "Preservation" refers to conservation of natural beauty, recreational and educational potencial and resources for future use. The Task Force has broadened these concepts to "environmental" including in addition pollution control.

"Well-being of the People" refers to "security of life and healthe, national defense, personal income distribution and interregional employment and population distribution".[2]

Thus, whenever a project increases the level of either of the above it must be submitted for consideration. But, the documents do not provide the basis for weighting one objective against the other when a single project provides increases for one but decreases for the other, or when comparing projects with different kinds ob outputs.

P.O. Steiner[3] explains the weighting of alternatives as follows:

"If objectives are genuinely multidimensional and not inmediately comparable some solution to the weighting problem is implicit or explicit in any choice, and that solution reflects someone's value judgement..."

"This choice is sometimes treated as a prior decision which controls public expenditure decisions (or at least should), and sometimes as a concurrent or joint decision as an inseparable part of the process of choice."

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[1] WRC Washington, D.C. op. cit., pp. 20-23.

[2] Ibid., p. 24.

[3] P.O. Steiner, The Public Sector and The Public Interest, in reference (42) pp. 13-45.

This "prior decision" or value judgment is made within the political-process, presumably in Congress with recommendations by the Executive. It would not be possible here to evaluate to what extent voters consider the social benefit rather than their own and how well they are represented at the decision making level. But it is necessary to ask how well informed are the congressmen in order to make the decision. Senator William Proxmire said in a speech to the Agency Program Planning Offices Group:[1]

> " In the Congress, with its appropriations committees and subcommittees there is very little explicit consideration of program objectives or trade-offs, of alternative means of attaining objectives or of the benefits and costs of budget proposals this year and in the future."

Senator Proxmire believes that an improvement is necessary in "the decision making in the legislative branch as well as in the executive".[2] In other words, the "prior decision" quoted above should be somehow explicitly stated if not legislated.

The Criteria.

The statement of the objectives should determine the criterion to use, in B/C analysis. Probably one reason why there have been different criteria in the U.S. is that there has not been a clear statement of the objectives, leaving each agency working on independent grounds. The reason for this is that development has not been planned centrally. A clear attempt to unify objectives and therefore criteria is the purpose of planning programming and budgeting system. (PPBS).

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[1] Joint Economic Committee, 91 st Congress The Analysis and Evaluation of Public Expenditures: The PPB System. V.1 P(VI).

[2] Ibid. p. (vi).

A criterion is defined here as the translation into system analysis -- techniques of a particular set of objectives. As an example if there is a simple objective say, maximizing profits of farms, market prices will be used in evaluating benefits. If the objective is to minimize imports, a shadow price of the world price will be used. The choice of what price to use is a criterion in response to the objective. Similarly, the choice and use of a discount rate is considered to be a criterion.

Two major controversial issues have dominated the U.S. literature in this respect. They are not independent. These are the algorithm to use in the decision and the discount rate.

The algorithm.

In general, in the U.S., projects have been constructed when they were "justified," i.e. benefits exceeded costs. Evaluation has been done on individual project basis though there has been planning of river basins as a whole. Planning the development process has not been considered necessary and therefore the formula used has been an adaptation mutatis mutandis of the private profit accounting measures. An illustration of this is the exclusion of secondary benefits from the formula (for measurement reasons) although they are considered important and recognized to be a proof of induced development.

The most universally used formula or algorithm is the benefit-cost ratio, which maximizes benefits given a government budget constraint. -- Without this constraint, the criterion should be to make marginal benefit equal marginal cost, or in other words maximize benefits minus costs. The latter obviously favors large projects over small and the method is rejec--

ted by the Green Book![1]

The rationale of using a ratio is to maximize benefits with respect to a constraint by putting the investment funds in the denominator. The controversy arises whether operating and maintenance costs are considered constraints or not. For instance, the Department of Agriculture atone time included in the denominator the project costs, i.e. cost of project measures to governmental agencies, and to owners and operators of lands on which the measures are installed, decreases in gross incomes on any such lands and increase in normal operating expenses. This was later changed. The Bureau of Reclamation defines project costs (denominator) as the cost of project measures but does not include the farmer's or water user's costs. These are considered negative benefits in the numerator of the ratio.

This has been studied by Eckstein[2] who points out that each method may yield a different ranking depending on the proportion of operating costs to initial investment costs. The conclusion to this is that the benefit cost criterion for ranking projects is useful only when all projects are of similar ratio of initial investment to O and M costs.

In general, projects providing an input in further production such as irrigation projects or electric power should not use the "average rate of return"[3] because the funds are required and costs are incurred in using the product and not merely to provide it.

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[1] U.S. Interagency Committee on Water Resources, Proposed Practices for Economic Analysis of River Basin Projects (rev. ed.) The Green Book Washington, D.C., 1958. pp. 56.

[2] O. Eckstein. Water Resource Development, Cambridge, Harvard University Press 1958.

[3] This is the name given by Eckstein to the formula using operating and maintainance costs in the numerator as negative benefits.

If some other factor than capital is a constraint, "The optimal result is obtained if the highest rate of return is obtained on that factor."[1] A twofold problem arises here which is left unsolved by Eckstein if several factors are scarce:

> "... the benefit-cost ratio could not serve as a rationing device because it does not discriminate finely enough among commodities and does not discriminate at all among different periods in which they will be used"[2]

Eckstein judges that this latter fact can be neglected because "It is not unreasonable to assume that the rationing of federal money will remain equally tight over time," but he does not give a solution when different factors are constraints, "Federal expediture is considered the rationed commodity." His first assumption is also questionable as has always been discussed.

McKean[3] proposes as a solution that "Those projects that are not interrelated might be ranked according to the ratio of present worth to investment cost with the streams discounted at the marginal internal rate of return." This is the same as ranking according to the projects internal rate of return, (only when projects are independent which is not commonly the case). The arguments in favor of this are that cost streams and benefit streams are such that time preference is involved in the ranking but only to the extent that economic efficiency is reached in the sense that capital is put at its best use.[4]

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[1] Ibid. p. 61

[2] Ibid. p. 61

[3] McKean, Roland N. Efficiency in Government Through Systems Analysis, With Emphasis on Water Resources Development. New York, Wiley, 1958, p. 122.

[4] Ibid. pp. 117-118.

This problem is related to the discount rate to which we now turn.

The discount rate.

There are two points of view about the use of a discount rate. First, some authors believe that government investment is relatively risk free compared to private investment, that the life of projects is very long and that therefore the interest rate on long term governmental bonds should be used as discount rates.[1] Other authors[2] defend the use of a higher discount rate either because it has to reflect the social time preference which is best represented by market interest rates or because the opportunity cost of government investment is much higher than the nominal interest rate on government bonds. McKean proposes discounting benefits and costs with the marginal internal rate of return (i.e. the IRR of the poorest project chosen within the fixed budget) which is the opportunity cost. A problem arises because some private investment is necessary to implement the project.

Krutilla and Eckstein define social cost as "the opportunities foregone in the private sector of the economy, either because of curtailed investment or of curtailed consumption."[3] They recommended, the use of 5 to 6 % interest rate as the public opportunity cost at the time when government bond rates were 2,5 to 3 percent.

Most of the authors defend now the position against using a very low discount rate but they disagree slightly on which rate to use: 5 to 6 percent being the general range.

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[1] See the Green Book, p. 24.

[2] Eckstein op. cit p. 94-104, McKean op.cit p. 117.

[3] Krutilla, J.V. and O. Eckstein. Multiple Purpose River Basin Development, Johns Hopkins Press, Baltimore, 1958, p. 125

The measurement of benefits and costs.

This topic is not as controversial as the previous ones of objectives and criteria. Yet, all authors recognize it as the most difficult one. Four main factors hinder the measurement: The difficulty of identifying the chain of beneficial effects of a given plan or project; the limitations in computing the shadow prices that reveal the social values of the outputs in common terms; the existence of intangibles to which no price can be assigned and the uncertainty and risk of forecasting.

We will briefly analyze these four points and will see how they are coped with in actual project evaluation.

(1) Identification of benefits and costs.

A project is proposed when its outcome is claimed to be of some utility to someone. When carried out, the increase in utility is the direct benefit. But it may happen that there is an increase or decrease in the satisfaction of somebody else who did not make his wishes explicit at the moment of the proposal. This is either an indirect or a secondary benefit or cost. The primary benefit is often readily identifiable: it reflects a demand existing even before the project. Difficulty arises in identifying the secondary or indirect benefits. Let us remember that a benefit is the attainment of an objective as defined earlier. Therefore for the purpose of identification, an eye must be kept on the objectives to check which ones are reached and which ones are not. For instance in response to the objective of environmental quality, the Federal Water Project Recreation Act (PL 89-72) prescribes the consideration of opportunities for recreation (an indirect benefit of an irrigation project).

The Report to the WRC[1] says that "The concept of primary and secondary values of benefits is not relevant. The critical concept is the total

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[1] See Reference (89) p. 31.

benefit accrual associated with a particular objective."

For that reason the Special Task Force classifies the secondary benefits relative to national income into "externalities" (economies of scale, overcoming bottlenecks) and "resource unemployment" which includes the expansion of labor employment and the reduction of excess capacity. For the "regional account" the Task Force does not specify that transfers of economy activity from one region to another are not benefits.[1] Furthermore, other objectives such as income redistribution among regions or among functions have to be considered. This is to say that when benefits are being identified in the light of one objective, simultaneously costs and benefits have to be identified relative to the remaining objectives. Therefore, the identification of benefits must be within the context of all of the objectives stated.

Let us point out then as a conclusion that the identification of benefits and costs is a function of the objectives and of the economic conditions in the country or region.

(2) Valuation of benefits and costs.

Two main issues arise in the interpretation of benefit measurement. First, benefits should be measured as their value to society. Some suggest using consumer's surplus or the change in area under the demand curve, when the project affects prices due to increased production. The assumption behind this concept pose limitations to its application. The demand curve may shift for different reasons, for instance, due to higher incomes as a consequence of the project itself or due to substitution effects for other closely related goods. The consumer's surplus is built upon a demand curve

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[1] Schmid, A.A. and W. Ward. "A Test of Federal Water Project Evaluation Procedures with Emphasis on Regional Income and Environmental Quality, Detroit River, Trenton Navigation Channel," Ag. Econ. Report. no. 158, Michigan State University, April, 1970, p. 12.

which assumes prices of other goods constant. When the project affects the prices of these other goods changes in the producers' surplus of these goods should be estimated. These problems make Bromley, Schmid and Lord conclude that the consumers' surplus is a "totally useless empirical tool."[1]

Secondly, a closely related issue is that of future prices for the project output. Whether consumers' surplus is believed useful or not, is independent of the fact that prices change through time as a consequence of income, tastes and substitute products changes.

Both issues together constitute the problem of evaluating costs and benefits at their social cost in a dynamic framework within which interacting forces work. What the documents have to say is briefly discussed below.

In the cost side the initial investment should be evaluated with current prices and the operating and maintenance costs "on the basis of the prices estimated to prevail at the time of occurrence."[2] Senate Document 97 says the same thing and adds: "projected normal price at relatively full employment conditions for the economy."[3] These statements obviously neglect the benefits of giving employment during the construction of the

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[1] D.W. Bromley, A.A. Schmid and W.B. Lord, Public Water Resource Project Planning and Evaluation: Issues of Impacts and Incidence. Preliminary Draft. Madison. Wisconsin, January, 1971.

[2] The Green Book, p. 18.

[3] Senate Document. 97, p. 12.

project and its maintenance to resources that might have been unemployed. Whereas this should be taken into account in general it may appear that this assumption in the U.S. is not too heoric. The Green Book discusses this point proposing to reduce costs in terms of the increase in employment and used capacity. However it asserts: "The net effect creditable to the project would be difficult to measure and should usually be regarded as intangible."[1] This conclusion is now reversed by the WRC Task Force.

In the benefit side, market prices are prescribed to be used assuming that net benefits to producers are net benefits to society which assumes that market prices are accurate measures of social values. This implies perfect competition and absence of subsidies and excise taces. The latter should be excluded from benefits credited to the project. Excise taxes might be considered a secondary benefit if increasing government revenue was considered an objective. For secondary benefits the Green Book proposes the following:

" The amount attributable to the project is the difference between the market value of the project surplus and the cost of producing an equivalent surplus by some other means in the absence of the project"[2] referring to the use of the project output by successive industries. And for benefits due to employment of idle resources:

"The net increase in such value (the use value of the resources) is a net secondary benefit attributable to the project."[3] No hints, however, are given for measuring these benefits. A new report to the WRC proposed two approaches for measuring enhanced productivity under conditions of resource unemployment, but points out that there are no techniques available except in special cases for measuring external production offects.[4] One approach

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1 See the Green Book, p. 28.
2 See the Green Book, p. 10
3 U.S. Interangency Committee on Water Resources. Proposed Practices for Economic Analysis of River Basin Projects. (rev. ed.) Washington, D.C. 1958
4 See (89) p. 43.

establishes the achievable level of secondary benefits in one area from all forms of developmental investments and analyzes the contribution of a project to them. The other approach "is simply to build upon the effects of a specific water resource project and other developmental investments that may be required to determine the secondary benefits in otherwise immobile resources".[1]

The workability of these procedures has been tested by Schmid and Ward[2] applying them to a navigation project. They have used data from the national input-output tables to evaluate the increased activity due to an increased use of the products enhanced by the project, and they have used only the "first round of effects, because in essence, the interactions among economic forces in a region are very diffused after the first link in the chain of benefits and costs, especially when the industries using the project output use also a wide range of inputs not provided by the project. One major conclusion of this discussion is the necessity to integrate individual project analyses into programs. This view is emphasized when dynamic aspects are considered such as the fluctuations of employment, technological changes affecting input-output ralationships, etc. The inclusion of this phenomena into project appraisal is still at an embroyonic level but it seems more likely to see this problem approached from the planning side going down from there to the project level.

The problem is as much of lack of data as of lack of dynamic projection techniques.

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[1] See (89) p. 107.

[2] A.A. Schmid and W. Ward, op. cit., p. 12.

(3) Intangibles.

The existence of intangibles creates a problem both of measurement and of comparing results of the measurement. The latter often is particularly difficult because the unit of measurement cannot be the same, i.e., either monetary units cannot be used or it is not possible to compare utilities among a group receiving tangibles and a group receiving intangibles. The problem of redistribution of income also falls in this category. The transfer of income can be exactly measured but the number of dollars has a different meaning than the value of a wheat crop, for instance.

McKean[1] points out several indirect ways to measure intangibles: "Even if the intangibles are by definition not commensurable with other costs and gains, clues to their impact can often be given." The methods proposed are to draw values from past decisions and use the cost of providing the same utility by the cheapest alternative method. Special methods can be used in specific cases.[2]

The Green Book states the following: "... intangible effects will need to be considered on a quantitative basis. If the recommended degree of project development is influenced in either direction by specific intangible effects, the minimum value attaching to such effects should be clearly indicated. It is suggested that the agencies concerned adopt uniform procedures for the treatment of these effects."[3] This has never been put into practice.

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[1] McKean, op. cit. p. 62.

[2] For a measure of income distribution impacts. See A.A. Schmid: "Effective Public Policy and the Government Budget: A Uniform Treatment of Public Expenditures and Public Rules", in The Analysis and Evaluation of Public Expenditures. The PPB System. JEC. 91st Congress. V.1 P(VI).

[3] Green Book, p. 28.

It may be concluded that the (effective) value of intangibles should be assigned at the decision making level, although in practice they can usually implicit to the decision but not explicitly stated. This takes us back to the problem of objectives, their statements, and their relative weights. (See pages 16 and 23).

(4) Uncertainty.

Uncertainty is an inherent characteristic of planning and of forecasting the future. McKean considers uncertainty as a kind of intangible.[1] It is worth noting that is has the characteristics pointed out in the previous sections: in many cases the cost of reducing uncertainty can be measured but it cannot be compared to other benefits because situations are different among projects in time and space.

Two closely related aspects have to be considered:

1. The possibility of reducing or eliminating uncertainty.
2. The treatment of the uncertainties that cannot be eliminated.

It is possible to reduce uncertainties in different ways. Some uncertainties arise from the response of groups to features of the project. If the response is "regulated" by a more intensive planning of the economy, the range of the outcome may be narrowed. If that implies the regulation of the market, from the national point of view uncertainty is not reduced.

The degree of planning could be illustrated by the fact that if the return to a government project is based on the later completion of a private industry that might not be constructed for different reasons, it would be more certain if that industry was planned by the government.

Another way to reduce uncertainty would be to invest in some techno

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[1] McKean, op. cit., p. 64

logical device. For instance, the frequency and heaviness of frost might be diminished or eliminated by using heaters. The cost of the heater represents the benefit of reducing uncertainty in terms of willingness to pay.

For the purpose of evaluation of the type of uncertainties that cannot possibly (economically) be reduced, four different treatments can be implemented.[1]

a. Allowance in prices or type of the projects: This is especially fitted to possible technological changes that may cheapen the project product in the future.

b. Premiums in the discount rate: This is the same concept of interest in private investment as composed partly by a risk factor.

c. Safety margins or use of contingency reserve.

d. Selection only of the more desirable projects.

But as McKean says, "Often, however, the analyst can help most by describing the pattern of uncertainty, leaving the evaluation to the decision-maker."

The important thing about uncertainty is not so much its level but that it varies among projects and purposes of projects. If uncertainty were the same for all outcomes it would not change the ranking of investments. But uncertainty may discriminate among groups, regions or products and thus interfere with other objectives. The reason would be sufficient for a thorough description of the possible events. Statistics may play an important role in the measurement.[2]

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[1] The Green Book, p. 21.

[2] See for instance Haveman, R.H., Water Resources Investment and the Public Interest, Vanderbilt University Press, p. 156-177, or A. Maass, Hufschmidt, et. al. op. cit. p. 524.

Conclusions and Summary Statement.

At the present stage of knowledge the economic analysis of projects provides only one aspect of the impact of a project. In other words there is an objective criterion only for primary monetary benefits and some secondary monetary benefits and costs. Many elements that enter into final project decisions are subject to non-market choice. That is decided through the political process, the Congress.

Our task is twofod:

- appraise the assumptions underlying the strictly market analysis,
- evaluate the performance of the political process, in terms of efficiency in meeting its own stated objectives.

If prices are assumed to follow past trends for the computation of future benefits and costs, this implies the assumption that the supply of all factors which would complement the project in achieving the benefit are not constrained or limited. This is reasonable for a small project but may not be for groups of projects in a program, or large projects which bring non-marginal changes. As a result of this assumption, all benefits are credited to the constrained factor only, since that is the only item included in the denominator of the B/C ratio. That assumption implies unemployment of the complementary inputs so that new units of each of them can be used without increasing costs; decreasing returns would give the same result in the absence of unemployment.

This situation could possibly happen, but it may differ from region to region, and therefore the assumption should be carefully tested. If that assumption does not fit reality, then dynamic elements should be introduced in the planning process, and here the strongest limitation is the lack of methods.

Similarly, the use of a constant discount rate implies either that valuation of future consumption remains constant with different levels of income or that investment opportunities are equally profitable with development, or both. If the discount rate is McKean's marginal IRR, and in a few years the marginal project is undertaken, the marginal IRR drops, unless better alternatives are made available. Again this requires dynamic planning with its uncertainty limitations.

A question can be asked: What are the trade-offs in terms of criteria's efficiency in representing objectives, of gaining in scope of reality and losing in accuracy of measuring. To answer that question the alternative has to be considered. What is the accuracy of a political decision in terms of reaching the objectives? Apparently both decision accuracies are directly related, if we recall Senator Proxmire's statement (Page 6). But this decision process is in forced action situation![1] Therefore a second-best only can be reached.

Under a given set of assumptions an optimum can be reached (second best); if the assumption is relaxed a higher optimum is possible if information is available. Since in this case it is not, it is logical to stick to the assumption.

It is not possible here to decide whether political decisions are efficient in attaining objectives. Since those decisions have to be made anyway it seems logical to assume they are though significant improvements could be attained at least in the provision of information. Therefore we will conclude with most of the authors that "descriptions" of situations and effects are very useful.

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[1] "A situation in which available information is inadequate but in which action is forced by outside circumstances." See Bradford and Johnson, Farm Management Analysis, John Wiley Sons, 1953, p. 373.

Especially important is the appreciation of interaction among variables. We pointed out that the randomness of effects may be discriminatory. In other words in addition to the interconnections among objectives, external variables not controlled in the planning mechanism may have diverse effects upon benefits and costs.

The diagram below represents the cause-effect relationships among the concepts that have been so far discussed. It will be a frame of reference for the rest of the thesis.

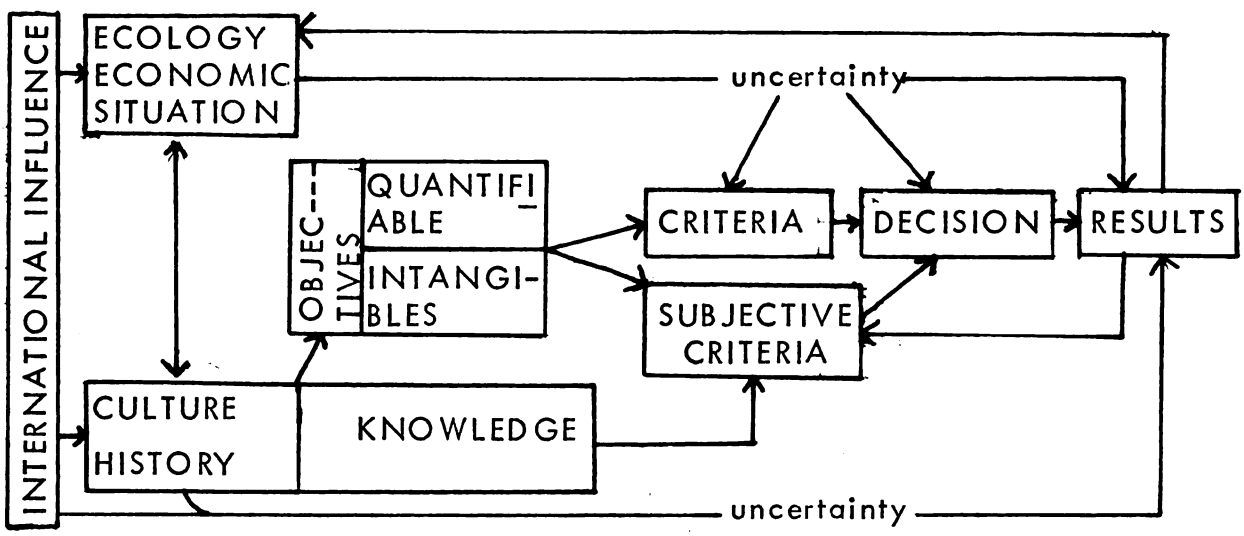

FIGURE 1

Related to the questions of Chapter II, the techniques for project appraisal in the U.S., have dropped the presumption of perfect competitive structure. They have tackled part of the problem of quantifying secondary benefits. The question is not much of lack of theory but of lack of applied techniques. This is especially true for dynamic considerations. Lack of data may be the main cause of the situation, but also there is a lack of agreement among agencies, academic groups and interest groups.

The main and maybe only field for which project analysis has initially been developed is water resources. This fact has biased the analysis to very specific objectives (flood control, irrigation, ...) and there is a lack of overall view and harmonization of objectives. Decision-making is much more than justifying projects. There has to be a weighting of alternatives. This concept has lagged maybe because of the independence among agencies and the instituional setting of an unplanned economy. It is obvious that when the government takes over more and more welfare programs the planning requires broader scope and techniques. When a Nation's government purchases of goods and services is 20 % of the GNP, an effective system for channeling decision-making is needed.

CHAPTER IV

PROJECT EVALUATION IN LESS DEVELOPED COUNTRIES IN THE FRAMEWORK OF OVERALL PLANNING

Introduction.

The purpose of this chapter is to analyze project evaluation procedures which are used in Less Developed Countries (LDC's).

Project evaluation techniques were originated in the U.S. and almost exclusively developed for water resources projects. Most of the techniques used elsewhere have been an adaptation of these and therefore it is useful to do the analysis by contrasting situations, objectives and subsequently methods, among the originating country and the adapting countries. A warning statement will be divided into the following points:

(a) From a unique set of conditions (U.S., water resources), we have to jump to countries that are (1), different from the U.S.; (2) are different one from the other and (3) display differences among sectors which play a role in development, and that closely interact within the economy.

(b) The differences appear in the overall situation, thus on the goals to reach and subsequently in the policies needed for implementation. Planning development is fully accepted and carried out in LDC's, while the U.S., in spite of the heavy share of government expenditures in the GNP, is essentially a non-planned economy, at least by the government.

(c) As a corollary, the final decisions at the highest level relating to

project construction depend heavily on political considerations in which the initial proposals based on B/C analysis play a minor role. In LDC's, due to the very nature of planning, projects are more dependant on plans, i.e. on the decisions made at the high level.

This chapter seeks to trace through the consequences and implications for planning derived from the difference in conditions prevailing in LDC's as compared to the U.S.

First, the variables affecting development and their interaction will be investigated to show that the current planning techniques need improvements in some specified directions. Secondly, an analysis of planning techniques will be carried out by prescribing a qualitative model of interrelationships within which a reconciliation of planning at different levels must take place.

Variables affecting development and their interaction.

(1) The objectives of development and their interactions.

The economic objectives of investment criteria are not the same for all countries. The U.S. decision makers are concerned with horse back-riding and fishing and recreational benefits for the leisure of 40-hours-a-week workers in the future whereas the Southeast Asian or African decision maker is concerned about starvation, pestilence, and increasing employment in large scale now.

In other words economic objectives change depending on the economic situation, and this is variable over time. A dynamic process is generated, within which planning will take place. Note the narrow sense of these policy objectives. They are the target for a given status and may point in another direction when the new status is reached. For instance, some

economists advise to reach first a certain level of GNP and savings, before starting redistributing income. Even at the beginning the final goal of equality is there but, as in the "Turnpike Theorem" it may be faster to reach it, taking a detour.

A word of warning might be useful in this context, for carrying on the economic research. Objectives are a result of knowledge and of valuations. A clear distinction among the two is in order. Knowledge is testable: it gives the key to truth. A belief (based on knowledge) is either true or false. Valuations on the other hand are not .

When a set of valuations exists in a community, they are part of reality and subject to research, in terms of their consequences. But there exists the danger of their instability due to interest groups, or intellectual leaderships. The danger becomes acute when such valuations as part of reality are confused with beliefs (knowledge) about reality. They distort knowledge and people believe what they want to believe![1] In our context this leads to the formalization of objectives and means as being unbreakable, thus foregoing the needed flexibility in implementing policies adapted to the specific situation.

Developing countries are full of these values and facts confusions and they hinder a dynamic decision-making, based on the accumulation of new knowledge.

In general, the objectives that countries pursue in development are consumption and its redistribution, self-sufficiency in various degrees and the abstract concepts of security, education, etc. These objectives are in specific cases often mutually exclusive or contradictory. The emphasis

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[1] See Gunnar Myrdal, Objectivity in Social Research, Pantheon Books, New York, 1969.

on one or the other is a matter of beliefs and valuations. They give rise to political systems and at a lower level of decision-making to policy programs of very different kinds.

Deepening in this topic would be a tremendous task of very little use here. In Chapter V, a specific case will serve for illustration purposes.

(2) A general view of development "variables"[1]/

The previous section (1) attempted to bring to light how the attainment of one objective is affected by the policies designed to reach some other objective. These ultimate goals are rather clear to the planner, and there is no confusion as whether right or wrong in the context of each government. But the more intermediate goals and strategies are not at all clear. There is no general agreement as to what variables are the most important ones to the attainment of a given objective, and therefore as to what strategy to undertake. Neither is there a clear understanding of the effects of one variable upon another, e.g. of the causal relationships of the development process. Consequently, the understanding of the interactions of policies for conflicting goals is very variable among agencies and governments and no less among economists.

The legacy of knowledge from experience in the growth of developed countries has not contributed significantly to filling the gap. However, adapted techniques and policies have been used in planning development, felt to be a "sine qua non" condition. And currently the effort is spreading to discover new methods that best deal with LDC's problems.

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[1] I define variables in the broad sense of characteristics or groups of characteristics of a country, susceptible to change endogeneously or exogeneously. It includes economic, social and political characteristics.

This section seeks to further this process. First, a common denomina tor for the explanations of variable interactions will be searched and second, the implications for planning will be spelled out.

The search for a Theory of Economic Development is the search for the variables that effect it, and the way they do it. The approaches taken for that purpose have either been historical or analytical. The historical approach considers empirical results along time in countries (where develop ment is obvious) and cross-sectional data seek to generalize the issues observed. The analytical approach tries to explain "in the general case why some countries should have developed while others remain more or less stagnant, or why some countries remain economically backward while others experience sustained secular advance."[1] The historical approach (german Historicism which later on influenced Rostow's work) tends to give a single path for development as solution and the analytical or abstract approach is comprehensive.

(a) Traditional variables explained.

The identification of development with "growth of GNP" or at most with "growth of GNP per capita" by many planners and also economists had led to the search of variables most directly affecting the rate of growth. These have been, in a Keynesian framework extended by Harrod and Domar, savings and investment. Capital has been considered the constraint to development, and therefore all other variables were considered as subordinate to it. For example, the selection of agriculture versus industry as leading sector with the array of economic variables in their implied, is borne to choose the most capital intensive, i.e. industry. Development and in-- dustrialization have been identified in many countries and the study of

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[1] H. Leibenstein, "Economic Backwardness and Economic Growth", John Wiley, New York, 1963.

growth has been that of the relationships among agriculture and industry in terms of flow of goods and capital from the first to the latter.

The idea of capital as the only motor of growth evolved into the consideration of entrepreneurial and managerial ability as a mean for a proper use of capital investments. This leads to an emphasis on investment in "human capital" as a productive agent. Using the assumption that human talents are very much the same in all developed and underdeveloped countries, the "lack" of knowledge and entrepreneurial ability has been associated by anthropologists, and sociologists with a number of beliefs and values that also are variables affecting development. These systems are translated into forms of organization, political and social relationships which must then be considered as factors of development. More specifically, this led to the study of the social structure, land tenure and in general the institutional system to explain motivations and attitudes that hinder the emergence or expansion of required economic activities and personalities. Institutional system and organization of the economic and social apparatus are interchangeable concepts. But the word organization implies an authority and a set of regulations that in classical theory was reduced to the "invisible hand" of Adam Smith, and that nowadays is not coceived without a planning mechanism developed by the political authority, the government.

As well as individuals and groups lack knowledge and entrepreneurid ability, the planning authority often suffers of the same fault at itsparticular level.

Development is also a function of the ability of governments to plan their economy. There is also an interaction between planning and performance in terms of confidence of the people on the aims and promises oftheir

leaders: very simply exposed, a successful plan reinforces the political strength of a government which in turn gains in efficiency for further planning. Economic and political development enjoy a synergistic interdependence.[1] If at the individual and group level knowledge and attitudes may be enhanced by a superior authority, at the government level skills in planning, acquisition of knowledge and techniques and understanding of past experience require an external, international learning source. Therefore, LDC's committed to the attainment of certain objectives, and relying on foreign assistance and aid are subject to ideological and political influences that forge developmental and social or economic philosophies.

Thus, there is a whole array of variables on which development is based, and it is important to stress the political-economic character of such a phenomenon. Maybe a better way to put it, would be to say that each fact or characteristic has an economic content, a social content and a political content. For instance, the fact that a country has a large traditional agricultural sector implies a low productivity of labor (economic), a low mobility in the social structure and probably a large conservative class little inclined to political change. The three facets are certainly highly correlated, and if an external force modifies one of the aspects the way is open for a natural change in the others. Thus an increase in productivity due to the introduction of new technology could trigger a change in attitudes towards more progressive socio-political relationships, or even the reverse.

It appears then that identifying and testing variables is useless if their interactions are not simultaneously understood. Efford to reach this

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[1] Adelman I., Practical Approaches to Development Planning, The Johns Hopkins Press, Baltimore, 1969, pp. 3-6.

understanding has been through inductive reasoning mostly by field of specialization. Economists have looked at the interdependence of economic variables,[1] given the social constraints or given the constraint of a deterministic parallel change in the pattern of other variables. Similarly sociologists have examined social variables given the pattern of economic variables. Very little multi-disciplinary study has been carried out. In other words, little analysis of simultaneous interactions has been done. For a comprehensive study of interactions among variables, only the work by Irma Adelman and Cynthia Morris[2] is known by the author. This is the topic of the next part.

(b) Interactions of variables in a comprehensive framework.

The foregoing discussion has pointed out the web of causal relationships among development indicators and means. However, there is little understanding of how this dynamic web is connected to the process of development as a whole. Adelman and Morris, with data from 74 countries and over a five-year (1957-62) period,[3] have inferred, using step-wise regression analysis, a model to explain the way in which technological, social and political factors interact with economic forces to alter the structure or volume of an economy's productive capacity. They were interested in explaining "potential for economic development" and not per capita growth in GNP, which might explain only the case of "growth without development."

The difficulties encountered by the authors are as significant as the

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[1] See, for instance, A.W. Lewis, Development Planning- The Essentials of Economic Policy, Harper and Row, New York, 1966, pp. 26-38.

[2] See Reference (3) and Adelman, I. and Morris, C.T. Society, Politics and Economic Development: A Quantitative Approach, Baltimore The Johns Hopkins Press, 1967.

[3] Ibid., p. 1186. The data was constituted by 39 indicators of economic, social and political aspects of national development, listed in Appendix A.

results obtained. For our purpose, the following comments are relevant (without going into an appraisal of the econometric methods used):

The classification of countries into the three different groups previously defined[1] is explained in 97 % by only four of the variables selected (39 in total). These four variables and all those explaining them (19 in total) are in turn related by 14 equations.

These variables are related by 35 causal interactions. The economic variables account for 34 % of the causal relationships and the socio-economic, social and political variables account for 28, 20 and 17 percent respectively.

In spite of the limitations of the technique used these results are sufficient to indicate that development is a very complicated process, and that economic factors are not the exclusive determinants at all.

Even if the results are not reliable because of the deficiencies of the analysis, these very deficiencies such as the definition of the variables[2] point to the intricate overlapping of development aspects. According to their model, the economic variables have an effect on other social or political variables measured by 8 relationships out of 18 and in turn are effected by them through 6 relationships, leaving 4 in cause effect lines for relationships among economic variables. Obviously these results depend on how the variables are defined. For instance, a socio-economic variable is "extent of dualism" and an economic one is "size of the traditional agricultural sector". The way they are defined implies in advance a close relationship. But, still the numbers are significant enough to suggest the

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[1] In Adelman and Morris, Society, Politics and Economic Development, The Johns Hopkins Press, 1967.

[2] See reference (3), 2nd Comment.

importance of variables other than economic ones. The authors estimate multipliers that give the relative impact of each economic or non-economic force upon the potential for development, both directly and through other variables. The step-wise regression technique introduces variables in a predetermined order giving more weight to the first introduced relative to the last, especially when all variables are very correlated. This in turn results in a precondition for the order in which multipliers will affect development potential, and therefore the results might not be exact. However, on the basis of experience [1] the order of magnitude of the multipliers appears to be illustrative. Appendix A-1 lists them with their magnitude.

Again, it is worth noting that among the multipliers that exceed 0.80 only 4 are purely economic, and one of them political.

The model does not specify the direction of effects. The statistical techniques are not able to explain which is the primary cause and the resulting effect. The authors do give directions and in some cases they happen to be reciprocal but this is due to the methodology of the technique of step-wise regression, and no conclusion may be drawn. This difficulty may suggest, however, that in many cases different variables move together in parallel or that they are complementary in the sense that one pushes up the other. This last point would be an important topic of further research.

Given that performance is a consequence of potential for development, let us conclude this section with the following remark by Clark and Stout:

"The concept of a developing country's economic development performance can cover many different phenomena. The growth process consists of a complex and convoluted series of cause and effect relationships ranging

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[1] Specifications of meaning for the derivation of scientific concepts is based on empirical evidence. See A. Kaplan, The Conduct of Inquiry. Methodology for Behavioral Science, San Francisco, 1964, pp. 77-78.

from plans and rethoric to eventual improvements in the level and conditions of living. Performance can apply to the effectiveness of pursuing either intermediate or ultimate goals and can be observed at a wide variety of points in the development process."[1]

The implications for planning are obvious. The Adelman-Morris model is merely explanatory and does not offer any device for policy-making except to point out in a very specific way the interactions and therefore the variables to consider when trying to affect particular interrelated development variables. (These causal relationships from the A-M model are shown in Appendix A-II).

In the context of this thesis, the variables of the model are (or may be) what has been named policy objectives but not final economic goals (consumption, its distribution, etc.). The discriminant analysis[2] does separate four variables proved sufficient to explain the ranking of countries into the three categories to a considerable significance level. These characteristics may be objectives of a higher level given their importance but are still policy objectives. The objective of highest level is "potential for development", but given the empirical approach (rather than theoretical, see p.1185) it is not a final goal. This has to be kept in mind in the next section to understand the planning process.

(3) Implications for planning.

Given the many meanings of planning, an attempt to define it comprehensively would require a whole survey. Furthermore, since the conditions and therefore goals of countries are different, planning takes many

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[1] Clark, A.M. and Stout, P.G., Aid, Performance, Self-Help and Need, A.I.D. discussion paper Nº 20, July 1969, p. 3. This paper also includes a similar stydy on statistical correlations among indicators for 43 countries, but all of the variables are economic, and it is mainly viewed from an aid point of view.

[2] Adelman and Morris, op. cit., p. 1187.

different forms with only one thing in common: it implies action by the State. A definition that fits the foregoing analysis and that narrows down sufficiently the scope is that given by Waterston:

> " A country was considered to be engaged in development planning if its government made a deliberate and continuing attempt to accelerate the rate of economic growth and social progress and to alter institu-- tional arrangements which were considered to block the attainment of this goal. The attempt had to be a conscious one made by a govern-- ment and it had to be made often enough to give substance to the gov ernment's claim or belief that it was concerting policies and taking action designed to bring about economic and social progress and insti- tutional change"[1]

The importance of planning in the development potential is consider- able but does not constitute the major component. The Adelman-Morris model found that "Extent of leadership Commitment", the variable indi-- cating degree of planning[2], had the eighth highest multiplier (.940). This points out the degree of importance at which this factor has to be considered. Of course, since the model is empiricist, this might mean that the defi--- ciencies in planning could explain why the effect of planning is not larger. But planning is an empirical device as yet, since no theory can apply generally to all situations.[3] Therefore planning has to be analyzed like it is, i.e. in terms of its efficiency, and not as it should be or in terms of its logic and internal consistency.

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[1] A. Waterston, Development Planning Lessons of Experience, The Johns Hopkins Press, 1965, p. 21.

[2] Defined, Adelman and Morris, op. cit., p. 1216.

[3] As a matter of fact, the lack of theory stems from the fact that no "perfect"model in the Adelman-Morris line has been devised.

It would follow from 2.2 that the only way to plan development is by taking a comprehensive view, since all variables interact with each other. But it follows also that the lack of understanding of those interactions poses very serious problems. The case for comprehensive planning is then a compromise between both opposing forces. The compromise is reached by making assumptions as to how decision units behave. These decision units are taken at different levels of aggregation.

Due to these problems comprehensive planning, usually done at high levels of aggregation, has not had much success.[1] As a remedy several authors have advocated the "project by project" approach, which considering projects as units of development, allows for the close consideration of productivity, profitability, entrepreneurship, etc. Myrdal's physical planning is now emphasized as a step towards more realistic and efficient procedures. Chapters II and III have analyzed the aspects related to project appraisal and have shown that planning on such grounds leaves incoherence among projects.

Analysis of Planning Techniques.

(1) Introduction.

This section is an attempt to reconcile the project-by-project approach with the macro-planning approach within the constraints to be pointed up. In order to understand the importance of the constraints it is necessary to know the directions in which they act. It would also be useful to have an analytical framework in which planning takes place. For these reasons the dimension of planning will be specified here. These are:[2]

- Time, or the length of the period for which projections and decisions are made and from which limitations come.
- Scope and degree of detail of the commodity clasification.

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[1] A wide number of illustrations of this statement is presented by A. Waterston, op. cit.

[2] Porwit K. Central Planning. Evaluation of Variants. Oxford, London Pergamon Press, 1967.

- Type (and size) of the organizational units that the plan considers as elements of the process of aggregation and disaggregation.
- Space or size and characteristics of the area under planning (region, nation, watershed, etc.).

These dimensions constitute the network in which a planner manipulates variables, and makes decisions. Some of the manipulation and decision-making takes place in less than the four dimensions, if one or more of the dimensions is taken as given. Which dimensions can be taken as given is also a function of the extent to which the other are considered. For example, if the commodity classification is considered at a great deal of detail in a very small organizational unit, say an industry, time and space considerations may be taken as given for instance, short-run planning and the location of the industry. Similarly depending on the type of industry time periods must be defined for planning since the gestation period of such industry is predetermined by technical constraints. On the other hand, the scope of the decision-making determines the time period in the sense that some of the decisions may affect the conditions involved in other decisions. (In general, it could be said that the longer the period, the lesser the degree of detail).

This amounts to saying that there is an interdependence among the depths or extensions in the dimensions of planning. The limitations encountered act within those dimensions (e.g. uncertainty in the time dimension) and are partly responsible for that interdependence. Thus, the uncertainty constraint does not allow for very detailed calculations in the long-run.

However, there is no agreement as to how this interdependence works, in part because the constraints are different among countries. Take, for instance, lack of data. The general idea about this is that macro-planning

requires more reliable data than the project by project approach.[1] But in Uganda, Nyakaaua and Stanton point out that "data at the project level are often equally unreliable; sometimes, even at this level, macro level data have to be used because there exist no others."[2] This means that the size of the organizational units considered depend in different manners on the degree of detail that data permit.

Probably the interdependence that is subject to more accurate rules is that between time and scope of the commodity classification. Porwit[3] points out that "in the short run the dominating influence is exercised by the existing productive capacity, the knowledge of its alternative uses and the application of known techniques" all of which require a considerable degree of detail. The "rule" is put by Porwit in this way:

> "The main role of the annual plan is to collect information on the proposed decisions concerning sectors and to analyze and coordinate these decisions, including intervening when they should be changed.
>
> In designing the long-term plan the approach must be diametrically different. In this case the vision of the structure that is to be attained in the future is of decisive importance. But we cannot start with an evaluation of what the productive capacity and the production technique ought to be; the starting point should be the desired final product."[4]

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[1] Waterston, op. cit., p. 127.

[2] L.M.A. Nyakaaua and D. Stanton, "Agricultural Planning in Uganda," in Agricultural Planning in East Africa, G.K. Helleiner (ed.), East African Publishing House, Nairobi, 1968.

[3] Porwit, op. cit. p. 9.

[4] Porwit, op. cit. p. 10.

Another point to keep in mind is the distinction between planning and policies. The latter are devices to control the behavioral constraints due to the existence of a private sector. They are part of the implementation of a plan and are derived from the decisions made in planning. Once they are implemented they constitute a new set of constraints that planning should take into account. The purpose of planning is to set policies. Conversely, policy implementation is the result of some planning activity whatever its kind and degree. But "the consistency (of planning projections) will be meaningful only if the aggregations allow policy conclusions to be drawn, if the data are based on painstaking detailed work, and if the policy pro-- posals are suitable as well as feasible."[1] This constitutes a " sine qua non" condition for planning, working as additional limitations in the framework of the dimensions above. In words by Bhagwati and Chakravarty "...There is no guarantee that the dynamic system which is governed by the matrix will insure non-negativity of the relevant variables over time. Hence one cannot be sure that consistency necessarily implies viability."[2]

The relevance of these questions for the purpose of this section, e.g. to reconcile the project-by-project approach with the macro planning, reads as follows:

Projects are different in scope, life-time and spatial (regional) effects. They are different among themselves and from the planning dimensions. They are also affected by the policies implemented at a more general level and affect in time the results and viability of these policies.

The reconciliation calls for overcoming these difficulties. I would call this vertical consistency by contrast to the horizontal consistency needed

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[1] W. Stolper, Limitations of Comprehensive Planning in the Face of Comprehensive Uncertainty: Crisis of Planning or Crisis of Planners. Center for Research on Economic Development. University of Michigan, October 1969, p. 10

[2] Bhagwati and Chakrawarty, Contributions to Indian Economic Analysis: A Survey, A.E.R., September 1969, p. 14. They refer to the Indian Fourth Plan.

between sectors (in an input-output matrix for instance).

(2) Sector programming: the link?

The comprehensive approach to planning does not provide a solid base for resource allocation because it cannot deal properly with the micro level. The project-by-project approach suffers for lack of coordination and difficulties to aggregate and compare projects. How can both approaches be linked together in a simultaneous planning "from-the-bottom-up" and "from-the-top-down" is the subject of this section.

This simultaneous process obviously has to be made by disaggregating the macro-economic projections into parts of the economy and by aggregating micro-economic capacities into larger parts of the economy. These "parts" have to constitute a unit or set of interdependent variables. The data of an economic region or an economic activity can constitute what is called a sector. Unless region and activity coincide, what is usually meant by sector is an industry or group of related industries (an economic activity). Regions usually include different activities and if programming is regional, it requires techniques very similar to those of macro-planning. Therefore here, a sector will be defined as a part of the economy producing a set of products with common characteristics either in their use (food) or in their production (agriculture which includes food and fibers). For practical purposes the more specific definition will be that which identifies a sectorwith the scope of action in economic activity of government agencies. Thus, the scope of the Ministry of Agriculture defines the agricultural sector. Successive breakdowns of a given sector will also be done in the same fashion: the Ministerial division for livestock or forestry defines a subsector. This will not avoid all overlappings (irrigation may be administered by M. Public Works) but for purposes of planning by the government it has obvious administrative advantages.

The first question encountered in the disaggregating-aggregating process is at what level should the adjustment be done. That is, at what level of aggregation should the from-the-bottom-up and from-the-top-down planning processes meet.

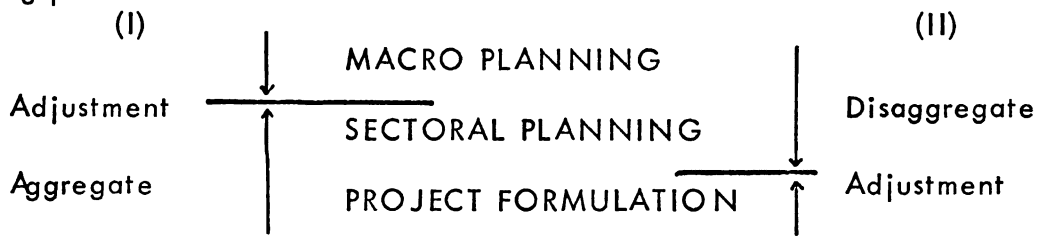

Figure 2.

Case I in Figure 2 would build the sector program from project data and would check consistency with the macro-model. Case II would disaggregate the macro targets into sector targets and would adjust the micro possibilities to it. Historically Case I has preceded Case II even excluding the adjustment, that is without any macro-economic framework.[1] Currently the general feeling is that sector programming must be made, when possible within an overall framework, for the same reason alleged for dealing with projects within sectors: interdependence among them.

Centrally planned economies, as a rule, follow model (II); they are concerned with "the principle of a comprehensive balancing of the plan" which "is analagous to the thesis..., that overall central calculations should play an active and independent part within the framework of a system which, of course, also contains sector calculations." Porwit considers Case (I) "less correct"?[2]

An evaluation of both methods is necessary to carry on this study. First, some statements to define the problematic situation are in order.

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[1] Waterston, A. "Sector Programming," World Bank, Washington, D.C. (Mimeo), pp. 4-5.

[2] Porwit, op. cit. p. 140. ff.

. The degree of "optimility" in planning is a function of the information available. (quality, detail and scope). The data constraint deter--- mines the depth of planning. A good sector program based on detailed data may be distorted by the lack of intersectoral coefficients. To say that at least the sector would be "optimized" is risky since the choice of technology, for instance, depends heavily on external prices of "Imports" into the sector.

. The developing countries are mixed-market economies. The pressure of a private sector determines a set of prices at which inter-sectoral transactions are made. First, these prices may not be a reflection of the real scarcities because of market imperfections and second, the government usually tires to correct or direct transactions by price, or taxation policies, which is in fact one of the goals of planning (i.e. to set policies). In this context, a private sector is relevant to determine at what level decision-making takes place. If the modern private sector is strong, the development investment decisions are mainly made at the project level. This means that government action must operate at that level and on the basis of objectives at that level (derived from higher objectives) If development decisions are institu--- tionally) made by the government, then the level of decision making depends on the government's degree of centralization.

. The level of decision-making is meant to be the resource allocation process. Of course, there is always a decision at every level: among sectors, among subsectors or among projects. However, there may or may not be room for decisions depending on the number of constraints that planning meets, and this is a function of how planning is done. Thus, in Case (II) the decision-making is mainly at the level of disaggregating macro data into sectoral data (allocation among sectors), and the adjustment consists in fitting individual projects to that set of decisions (with more or less flexibility). In Case (I) the decision lies at the level

of aggregating projects into sectors, and the adjustment corrects the figures in terms of the macro constraints.

The important question for planning in this case is which decision level is more efficient. This in turn depends upon other points such as data, centralization of the government organization, size of the private modern sector, etc.

. Resources allocation criteria also determine the planning method, or vice versa. The criteria take usually either of these forms: maximize production (or consumption, or savings) with a given amount of fixed factors or minimize the use of scarce factors for a given production target, with further adjustment to the availability of factors. The former corresponds to Case (I) and the latter to Case (II).

In terms of the criteria the method of planning depends on the nature of the scarce factors. To give an example, if the scarce factor is an aggregate measure, such as savings, Case II could be more appropriate. If the scarce factor is a composite concept, such as skilled labor of different types, Case I could be the appropriate technique, because, disaggregated among sectors, scarcities are better handled.

I have separated into four points the planning-decision-making process.[1] But they are only different aspects of the same problem, i.e. choosing the most efficient way of planning. In summary these four points amount to saying that choosing between (I) and (II) is nearly the same thing as finding the decision level best suited to a country. Let us then make a brief evaluation of both methods.

(i) Method (II) calls for a strong central planning. The disaggregation is based on a complicated calculation of shadow prices[2] which requires

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[1] Note how this points are again fitted to the general model of page 40 in which knowledge and the economic situation determines criteria.

[2] Porwit op. cit., pp. 15 and 50.

data and econometric skills. If these shadow prices are used at the project level, then the adjustment can be facilitated. For this to happen when the private sector is large, it is necessary to implement price or subsidies and tax policies to correct the private allocation of factors. The machinery is further complicated.

(ii) Lack of sound projects is considered to be one of the shortcomings of planning from-the-top-down.[1] The sectoral targets might not be met, in Case II, not because of scarcity of factors but because of inability to use the factors. The adjustment of targets to possibilities will then be done at a lower sub-optimization level. In this case the planning effort should first be directed to the identification of sound projects and this calls for decentralization, and the use of method (I).

(iii) Method (I) also requires knowing the effects of sectors among them due to the selection of projects. But there is a difference in both methodologies. Method (II) is definitely based on past observations of input-output coefficients and more subject to their continued use. Method(I), starting with projects in their new form of technology, is more readily adapted to modern coefficients.

As an extension of this, at the project level, it is easier to deal with technical, institutional and social bottlenecks (response of farmers for instance) which are considered to be the major shortcomings to development.

(iv) There are a number of theories or strategies for economic development. Most of them emphasize the reliance on one sector or subsector for starting the development process.[2] In this context sectoral planning takes on special importance, and consequently the projects within the sector. Method (II) can set this sector priority starting from macro targets

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[1] Waterston, "Sector Programming" p. 12a.

[2] Waterston, "Sector Programming" pp. 7-8. Also see the concept of "leading-sector" in Lewis, Development Planning, p. 26.

and macro policies (fiscal, monetary, etc.) but the transformation of the sector has to start from the micro level, and this is the most important issue.

As conclusion, methods (I) and (II) are not mutually exclusive. If data are available and planning skills are not lacking, both approaches are complementary. But the "lack of facts" suggests the need to concentrate efforts into the from-the-bottom-up approach leaving consistency at a secondary plane. However, coordination is not a secondary matter and therefore sector programming is a way to start implementing the overall view and finally the use of both approaches, when the planning machinery is able to produce data and skills, or in other words, organized information.

(3) Interrelations in a Three-Level Planning Framework.

(a) Purpose.

An attempt to specify the relationships among constraints and decision variables at different levels of planning is made here in order to understand how a reconciliation among planning approaches can take place.

The results of such exercise should be the following:

(i) To lay out the manner in which the decisions made at one level pose conditions for decisions made at a different level. In other words, what are the trade-offs for the purpose of viability of planning among having more or less degrees of freedom for decision-making at one level or the other. This is relevant to the evaluation of the usefulness of making first decisions at the sectoral level and then allocate resources among projects versus making decisions at the project level and then aggregate into sectors for consistency.

(ii) To point out the constraints that the private sector raises. These obviously depend on the degree of participacion of the private sector

in the productive activity[1] This relates to the adaptability of the private sector to the modernization process, which depends on social attitudes as well as on economic and financial feasibility of the changes to make.

(iii) To establish the temporal constraints that in general accompany the setting of objectives and the consideration of the initial conditions. In other words, it is necessary to reconcile the process of planning and implementation over time. This consisting in matching together different operations that require different time lags. These planning operations differ in the scope of commodities and the type of organizational units in them considered.

(iv) To classify objectives into ranks depending on the sequence of their attainment. This would mean that policy objectives and final objectives are different depending on the level of aggregation and on the constraints relevant to each level. The sequence of objectives is partly based on the theory adopted and partly on limitations encountered.

The purpose here is to present a framework of planning that could in principle establish the steps to take towards a reconciliation. To lay out a basis for this reconciliation let us first relate the concept discussed in chapters II and III to those raised in (a) through (d) above. In page 20, it was pointed out that to evaluate projects which fulfill different objectives a comprehensive view should be taken. But given the different scope of projects, as part of one or more sectors, there are some constraints in how the comprehensive view can be taken. That is the point raised in (a).

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[1] I will assume that the private sector plays no role in the non-productive activity. But the public sector may have a place in the productive activity, for instance, if the steel industry is nationalized. Non-productive activity is understood as infrastructure.

The point to be made is that capital requirements may not be the only scarcity, as is usually assumed in benefit-cost analysis. The equivalence between the B/C ratio and the issue raised here varies among the types of constraints (specialised labor, responsiveness to economic incentives, etc.). The concept of constraints in planning is taken as a generalization of the narrow scope of capital scarcity. Their identificacion is however bound to the specific situation and must be based on detailed data.

The discussion of the discount rate (page 29), and especially that on dunamics (page 15) led to the conclusion that (c) tries to pick up at this stage. Point (d) is also related to the dynamics discussion together with the multiple purpose question.

(b) A three level model of interrelationships.

Let us first view where the process of planning fits into the decision model presented for investment criteria in Chapter III (page 40). There, the present economic situation and the cultural and knowledge aspects of the country determined a set of objectives through the political process. For the attainment of those objectives specific criteria were to be used leading to changes in the initial situation. The criteria were policy tools for decision-making. That model was set up to explain the framework in which those tools are devised. Here the criteria and the objectives are known, and the problem becomes that of operation within this new context:

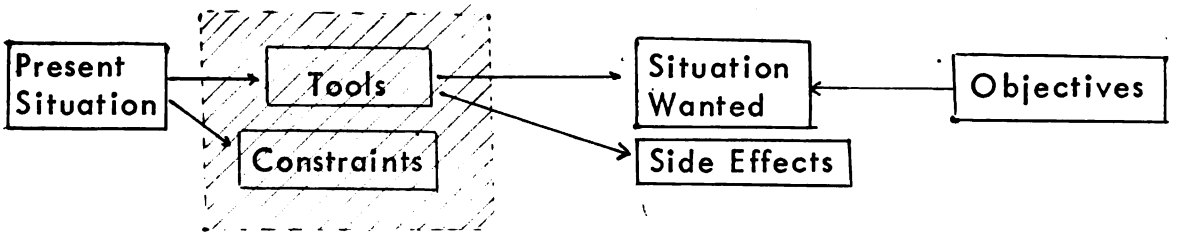

Figure 3

What should be understood in this section is the shaded portion of the diagram in Figure 3. Policy tools, decision and constraints will be strat-

ified at three levels: macro planning, sectoral planning and project ap-- proach. Eventually these three levels would become a continuum of aggregation and disaggregation and planning would not be classified following the organizational dimension; only its computational aspects would.[1]

The present situation is imbedded in the physical and social micro level, and has manifestations at the other levels too. This present situation defines the constraints to the attainment of objectives. Some cons-- traints are similar for different levels, but are considered at a different level of aggregation: thus capital formation can be considered as an over all figure for the economy and also can be specified for different sectors. Conversely other constraints are specific to one level and this is what makes important the consideration of that level. For instance, the res-- ponsiveness of farmers to new techniques of production is a specific constraint of the project level and can only be dealt with by means of proj-- ect analysis.

The economy will be divided into the public and the private sectors because decisions in each reflect different motives. Furthermore, the private sector is assumed to hold only productive activities and no infrastructural activities. The motives for the private sector reflect exclusively economic incentives, and for the government it is welfare as defined by the objectives of the country. Therefore since the private sector obeys to only one stimulus, its decisions can be shifted to government action by making the government set up the necessary conditions for private response. This process by which the goverment directs the private sector will be called development policy in contrast with development planning.

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[1] This of course is a question of terminology. The point I wish to make is that any level of aggregation is but a component of planning which would be considered only possible if vertical and horizontal consistency are sought and attained.

Figure 4 indicates the major features of the interelationships. The arrows represent cause -effect relationships either in decision making or in aspects of the situacion. Thus the comparative advantage of the country has an influence on the decision of choosing priority sectors. This decision in turn accounts for some effect on the choice of techniques, another decision at the project level. The major cause-effects among constraints (either in the public or private sector) are also pointed out, such as the inffluence of the availability of transport, education, etc., on-- the responsiveness of the private firms.

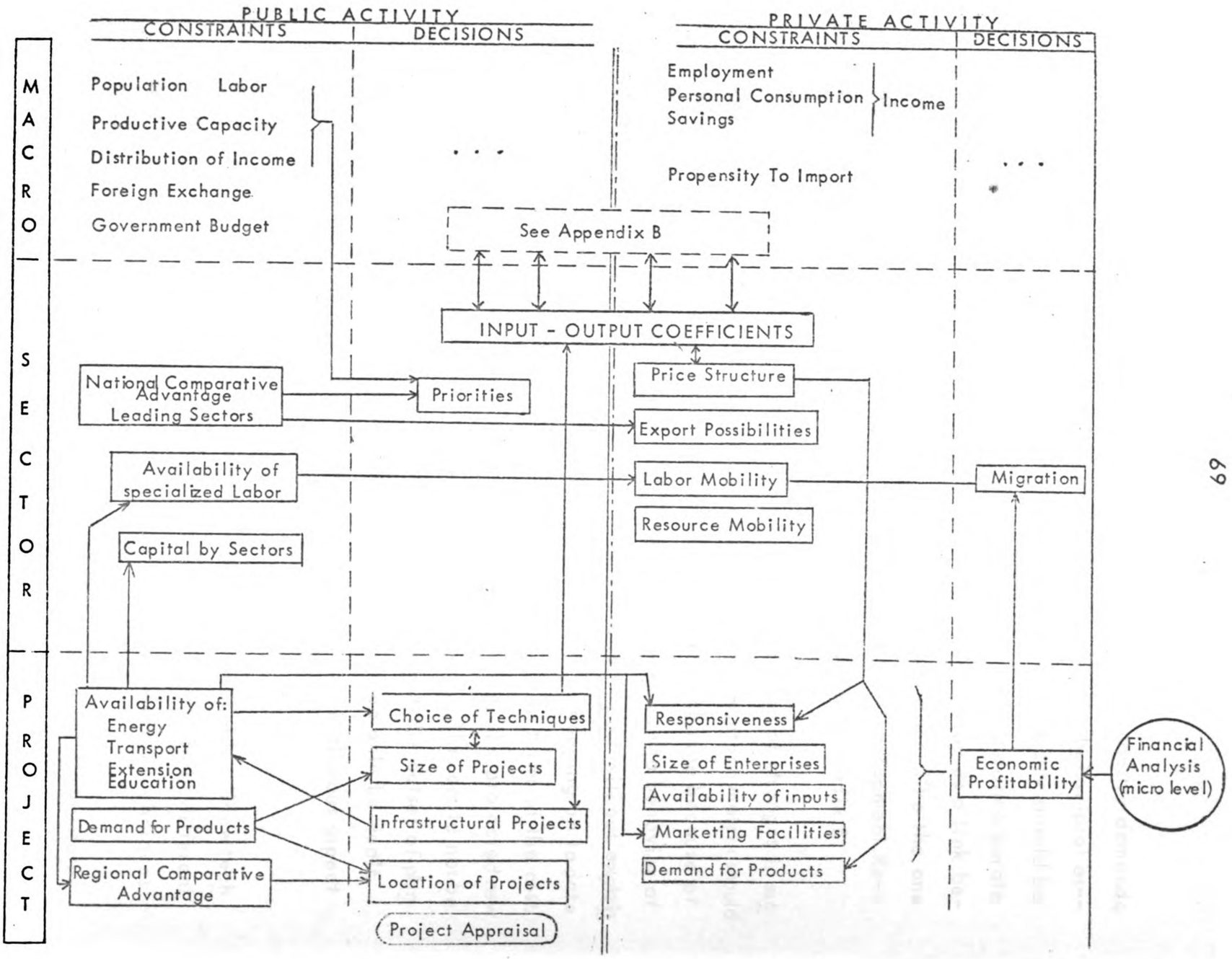
The diagram does not show policies or implementation of decisions made. These would be at a different plane of analysis directly related to the objectives. Here we only look at the points that must be considered when a decision is to be made, but the right decision is not specified. In other words the central goal of this analysis is to connect directly or indirectly the different subjects of planning decisions among them and with changing or static aspects of the economy.

i) Interrelationships between macro and sector level.

This set of relationships will just be reviewed in this study and we will mostly concentrate later on the relations between sector and project levels for reasons that will be specified here.

The core of interrelationships among macro and sector levels is the input-output matrix of the economy. A conventional input-output set of coefficients is first a set of technical requirements and possibilities and second a situation and not a process. But the macro and sectoral levels include behavioral aspects and are changing in a dynamic process. Therefore these two important characteristics must be taken into account.

Note that this discussion is the follow up to the evaluation of secondary benefits through input-output coefficients, discussed in page 35.


PUBLIC ACTIVITY
CONSTRAINTS
DECISIONS
PRIVATE ACTIVITY
CONSTRAINTS
DECISIONS
MACRO
SECTOR
PROJECT
Population
Labor
Productive Capacity
Distribution of Income
Foreign Exchange
Government Budget
Employment
Personal Consumption
Savings
Income
Propensity To Import
See Appendix B
INPUT - OUTPUT COEFFICIENTS
National Comparative Advantage Leading Sectors
Priorities
Price Structure
Export Possibilities
Availability of specialized Labor
Labor Mobility
Migration
Resource Mobility
Capital by Sectors
Availability of:
Energy
Transport
Extension
Education
Choice of Techniques
Size of Projects
Infrastructural Projects
Location of Projects
Project Appraisal
Demand for Products
Regional Comparative Advantage
Responsiveness
Size of Enterprises
Availability of inputs
Marketing Facilities
Demand for Products
Economic Profitability
Financial Analysis (micro level)

For the first one, we should have, besides the interindustry demands, a breakdown of the final demand by industry, so that the behavioral aspects are made explicit. Similarly the inputs for each industry should be broken down so as to show the origin of outlays. This would incorporate national income accounts into input-output analysis serving as a link between macro and sectoral approaches. In principle a model like the one presented by K.A. Fox in "Economic Models for Area Development Research"[1] could be adopted. This model is presented in Appendix B.

For the second characteristic, i.e. the introduction of changes in sector behavior and technical aspects over time the input-output matrix should be changed continuosly (e.g. each year), as the a_{ij}'s change because of technological advances and changes in relative prices due to behavior of the economic units. This would record the changes ex post without explaining or predicting the sequence of change.[2] Obviously, keeping up to date an input-output table is a tremendous task, impossible in terms of the cost. But if the new projects are considered in the first place, the projected new coefficients are immediately introduced in the analysis. This could not be done if sectoral or macroeconomic targets were fixed at the outset of planning. Therefore, this explanation and/or prediction can only be dealt with at the micro level, which stresses once again the continuous aspect of planning at different aggregative levels.

The change of coefficients does not take place suddenly. New techniques are introduced while some of the old ones still remain in different sections of the sector so that at a given point in time several techniques

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[1] The Regional Development Analysis. Agricultural Policy Institute. North Carolina State and the Great Plains Resource Economics Committee. May 1963, pp. 147-94.

[2] K.A. Fox, Ibid., p. 171.

are available for the same kind of product. If the breakdown were detailed enough this fact could be considered, but the impossibility of doing so requires taking a weighted average. This impossibility requires also that the phenomenon of changing coefficients be taken into account at a more disaggregated level, i.e. in our model, the project level. This would allow the introduction of new coefficients ex ante, when the new projects are proposed and before they are actually carried out. The same could be said forchanges in relative prices. They can only be incorporated ex post if no project approach is developed, whereas by considering the project level price projections could be introduced. For prices, the problem arises when the new technique will make them drop either for input prices (external economies to the sector considered) or for output prices (internal economies of scale, for instance, or technical externalities). This complication could in principle be tackled by making the price dependent upon the quantity of input used through a downward sloping demand function leading to nonlinear programming features.

Therefore, given that one of the major shortcomings in planning is precisely this lack of data it would be more useful to concentrate efforts on the accumulation of them, and this can only be done by planning "from the bottom up". This is why we will leave in the air the study of macro-sector interrelations and we will also concentrate our efforts in the other set of interconnections.

ii) Interrelationships between the sector and the project levels.

The nature of a sector is closer to a national economy than it is to a project. A sector, as a part of the economy can be defined in similar terms to those of the whole economy, such as capital formation in the sector, or distribution of personal income, etc. In other words the data to define a sector are a simple disaggregation of macro data plus the purchases and sales

and transfers from one sector to the other, i.e. imports and exports. The only difference among the relationships between sectors and the relationships between nations is that the nations have a certain degree of autarky whereas sectors do not by definition. That is what constitutes the essence of an input-output table: the transfer of resources and products or services from one sector to the other.

Two important aspects characterize the relationships among sectors: the relative importance of sectors in terms of different macro-economic variables and the performance of the market in the exchange among sectors and the transparency of scarcities.

The relative importance of a sector within the economy can be de facto, or potential and both can be looked at in terms of the sector's contribution to a specific objective of development. Thus the objective may be de facto the most important in terms of people employed and yet present the highest potential for future employment. It may be the primary source of capital and it can have the highest or lowest potential for future capital supply to other sectors on the economy as a whole.

These sort of considerations would eventually define, in the light of the overall objective, the priorities given to either sector of the economy.

However, if a sector is considered high priority as a result of its leadership in development, the possibilities of expanding and triggering other parts of the economy have to be evaluated, within the market mechanisms, domestically and internationally. This means that there has to be a certain degree of mobility of resources, a certain comparative advantage over other nations, and a real price structure that allows for the needed mobility of resources in terms of purchasing power of some sectors from the others. In Stolper's words "at any moment of time the amounts of output

that can be sold depend on what happens elsewhere in the economy (and abroad if it is possible to export), but what happens elsewhere in the economy will itself depend not only on cross-reactions in the economy but also on the speed with which factors can be shifted and investments undertaken."[1]

The sales and purchases among sectors, the smoothness of the operations, and the relative resource intensity of the productive process, are concepts that have to be defined at the project level, both intra and inter sectors. The new techniques adopted in modern projects may change both purchases and sales from other sectors, and the factors proportions, and prices of inputs and outputs. Also, improvements or expansion of certain sectors, especially those representing the infrastructure (transport, education, etc.) will improve the mobility of resources and the potential for adaptability and development. These improvements or expansions are materialized in projects, which have physical aspects such as location or size, and which therefore are subject to decision making, that is planning. This is the context in which the interrelationships among the sector and project levels of planning take place.

The point being made here is that the interrelationship among sectors and the decisions concerning them are dependent on the constraints and decisions made at the project level, and vice versa.

We will go here into the detail of these interactions.

It has been said earlier that the private activity of an economy responds merely to economic incentives. We will further assume that if the economic incentive exists there will be a response. Economic incentives is meant to be profitability of investment. Therefore if a government policy wishes to have the private enterprise acting on a specified direction, profitability has to be present:

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[1] W. Stolper, Planning Without Facts, p. 57.

"Profitability, being the resultant of complicated interactions, becomes in fact the criterion which allows an individual project to be analyzed without forgetting the rest of the economy. The profitability criterion is indeed these interactions made operational."[1]

Profitability takes in the private sector the form of possibility of getting profits in the market place at the market prices and within the tax, subsidies, or price policies currently holding. Profitability is not merely the fact of making monetary profits but also of receiving payments in kind or services that subsidize either consumption or production by substituting otherwise more expensive outlays. Similarly incentives is not only money but may be education possibilities in the sense of social promotion or a nicer environment to mention examples.

Despite the many times mentioned fact that market prices do not reflect the real scarcities of factors of production, still several authors[2] believe that the market mechanism is not the most wasteful way of making many kinds of economic decisions. As a consequence economists stress the need for turning over to the private enterprise the potential for development and this means setting up the necessary conditions that make possible the implementation of the right combinations of factors by means of price policies, and other devices. Also an aim of government activity to enhance private participation is the setting up of conditions that enable

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[1] Stolper. Planning without Facts, p. 144. Stolper has been often criticized for taking economic profitability as the sole criterion for investments not taking into account social factors. This criterion is interpreted here as perfectly applicable for private projects and for government activities aimed to enhance private projects. With regard to purely public projects the criterion is also accepted when eventually the project provides some kind of incentive for private activity, which is true in most of cases, directly or indirectly. But there are government projects or programs merely aimed at social benefits such as distribution of income, which contribute to development and do not obey to profitability purposes. Therefore Stolper's criterion is accepted here with that reservation.

[2] For a review of this topic see J.P. Gittinger. The Literature of Agricultural Planning, p. 32-38.

enterprises to take advantage of economies of large production and externalities.

The on-going discussion is considering government projects as well as policy. This is the point from which the different plans concerning policies mentioned in page 68 would stem. Obviously, planning and policies are not independent but they are separated in this analysis. The implications of the existence of a private sector for the planning of projects within sectors is merely that the specific objectives of a project, for instance, increasing the availability of cheap irrigation water, be not contradictory at the level of targets in agricultural production, with the use that farmers make of that water, the response to the new facility and the new circumstances in the input side and the demand side.

Figure 4 on page 69 summarizes the aspects to be considered in this respect at project and sector levels, and indicates the important cause-effect relationships among them. Those aspects quoted at the project level responsiveness,(size and distribution of ownership units) are the "material expresion" of the higher level concepts of intersector resources mobility or export possibilities. This means that any action aimed to improve the speed of market operations and their efficiency must be done by providing better services at the project level thus enabling increases in marketed product through private profitability of the operations.

No matter what criterion is used for investments in the public sector and whenever the project relies on private initiative, the leading idea and common condition is that any investment pays for itself and yields a profit so that available resources are increased.[1] Stolper shows how criteria such as factor intensity, foreign exchange earnings, maximum reinvestment rates lead to this conclusion. We will see in the next paragraph how the rela--

[1] Stolper, Planning without Facts, pp. 144-64.

tionships between the private and public sectors work and the conditions implied in decision making.

The decision process includes the definition of criteria, i.e. the formulation of bases for decisions. First, the variables subject to decision making should be specified, and later we will be able to connect them together.

In planning, decisions are made in two different frameworks: allocation of resources and distribution of benefits. A third one would be the share of economic activity among the private and the public sector, but that is part of the other two in the sense that the government will take over an activity when it is believed to be more efficient than the private sector or when it wants to control the profits that otherwise would go to fewer people in the private sector (for instance with monopoly).

The decision pertaining to allocation of resources are what we might call purely economic and those pertaining to distribution of benefits political. This does not mean that one decision cannot have effects on both sides. Thus if resources are allocated in favor of general education it has also effects on benefits distribution and if income increases are desired to be directed mostly to low income classes this might have an effect on the structure of demand. But still the two components can be differentiated. We will mainly concentrate on the allocation of resources and mention occasionally the distribution aspects.

Section (2) of chapter IV presented some issues of the decision process in planning from the bottom up. It was said that if consistency has to be reached it should be between macro and sector levels whereas the decisions of allocations were to be made between projects and sectors. This means that sector programs are an aggegate of projects decided to be under

taken. Ideally, if knowledge were perfect and the multiple objectives of investment programs were perfectly specified so that projects could be selected in such a way that all objectives would be maximized, there would not be any need for aggregating figures at the sector level: each sector would be defined in the process. But, since only a second best can be attained, this implies that there is still room for decisions in a non-maximizing interaction. That is, if projects are selected under a certain criterion, there are still some decisions to be made at the sector level concerning priorities among sectors. For instance a decision may allocate a certain amount of money to each sector and there within it select the best projects. Or projects may be ranked and on the light of their sectoral interaction, a superior decision can determine how far to push down the ranking in each sector. Stolper does not distinguish between sectoral and project investment criteria since a sector is an aggregate defined by its components. His point is that "there is no reason to push resources into any one sector if profitable uses of the resources cannot be specified. He argues then that a sectoral contribution to development must not be a plan target but a result of selecting projects. This is questionable on two closely related grounds as mentioned earlier. First the lack of knowledge concerning projects and secondly the impossibility of setting equivalent criteria for different sectors, for example education and the export agricultural sector (if such is the breakdown). The marginal projects (the last project undertaken from the list) of each sector should yield the same benefits. But if the benefits are classified under different objectives whose relative weights are not specified, then it is not possible to compare cut off points in the lists by sectors. This would only be possible if only one criterion were used for all sectors and there were enough data to allow that. This is what Stolper assumes by defending profitablity as the sole criterion.

The priorities assigned to specific sectors relative to other stem from

different theories of growth, certain beliefs about comparative advantage or the ideas about leading sectors. Within a given theory, the priority given to a sector is associated with the idea that the chosen sector is best to attain a certain objective which the theory assumes to be an important or even the exclusive meaning of development. For this reason sector priorities are set up in the light of macro economic variables. For instance capital formation as an objective is associated with capital intensity as a highly productive device which would give priority to the industrial sector, and probably basic industries. If employment is considered as a goal, under certain circumstances, the priority may be given to agriculture which is believed to be the employment generator.

The whole question of priorities is based mainly on factor proportion considerations. The simple way to put it is that a country should use relatively more of the resources that are abundant. A perfect market would enable the right proportions for profit maximization to take place in a free manner. Since this does not happen the problem is the same as the origin of shadow pricing. In any case the public sector implies decision making on that basis (shadow prices) and is closely related to the choice of techniques in projects in such a way that both concepts are equivalent.

Conclusions

Let us finally tie up planning as discussed in this chapter with the concepts raised in chapters II and III. It might be noted that the evolution of investment decision techniques in the U.S. has been toward a more comprehensive framework including evaluation of secondary benefits through input-output coefficients and a broader range of objectives. Also the evolution of planning in LDC's has been toward an emphasis on physical planning and the project approach. How can both be reconciled is essentially an emprical question depending on data availability and applical program-

ming techniques. The main points are as follows:

(1) Obviously, the conceptual problems encountered in both sides are the same, since both are trying to solve the same problem. For instance, the choice of a discount rate as an opportunity cost of government capital (McKean's marginal IRR) together with the problem of the complementary costs of private activity, has the same root as Stolper's discussion of profitability.

In effect, both concepts are concerned with handing over to the private enterprise the attainment of a "fair" rate of return within the market. In other words, the use of both criteria is aimed to undertake government projects only to the extent that their returns are above the market returns, evaluated in social terms.

(2) Constraints on B/C analysis were limited to the capital budget and, we saw, there was discussion about operating and maintenance costs. In planning, we have pointed to other constraints encountered in LDCs such as availability of specialized labor, export possibilities or availability of complementary inputs. But the economic problem is still to maximize the returns to the constrained factors. The difference lies on the technique to do it.

(3) The fact that a more comprehensive view is explicitly taken in planning does not mean that all problems are solved or can be solved. For instance, the decisions about leading sectors discussed in page 76, are still subject to beliefs about development factsin the same way as decisions are taken in selecting projects from different sectors.

(4) What I believe a more comprehensive view can do, is to explicitly interrelate and contrast the attainment of different objectives and to obviate the interactions among projects and sectors.

Given that the reconciliation (or contrasting) of both approaches depends on the specific techniques used, in addition to the concepts involved this discussion will be extended to the "Illustrative Case Study" of next chapter.

CHAPTER V

ILLUSTRATIVE CASE STUDY

Introduction.

Up to this point, this thesis has analysed the problem following logical paths on relatively abstract grounds. This chapter will reverse the process. Starting from a specific case the consequences of a project will be traced through in order to evidence the points made above. The conclusions have to draw on both analysis.

The case for study is that of an irrigation project in South East Spain. This project would transfer water from the Tajo, an Atlantic water way to the Segura, a Mediterranean one. The justification of the possible profitability of the project lies on agronomic reasons: The South East region is better suited, except water wise, than the Central region, for agricultural production, especially fruits and vegetables, a primary export source of Spain. Besides, as a secondary issue the tourism potential of the Mediterranean area calls for a larger water and power supply than is thought to be available without the project.

And another secondary issue is that in the South East per capita incomes are lower in agriculture than the Spanish average.

The economic evaluation of this project,[1] first shows that the best source of water for the region is that of the mentionned atlantic watershed. This is equivalent to selecting the best project among all the mutually exclusive ones for that purpose. Afterwards, the economic study carries out the conventional benefit-cost analysis which includes two different B/C ratios, the IRR, the pay-off period and the C/O ratio (modified to "ad-

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[1] Dirección General de Obras Hidráulicas. Estudio Económico del Trasvase Tajo-Segura. Ministerio de Obras Públicas. Madrid. April 1968.

ditional output"), and also does a sensitivity test to the variation of variables. Secondary benefits are pointed out without any further quantitative analysis.

This B/C analysis would be used to compare this project with other in different regions and/or sectors.

The B/C analysis of the project only looks at direct costs and benefits. The latter include agricultural production at exogenous projected prices and hidroelectric power.

What concerns us the most in this case study is the relationship between the project and the rest of the economy and in a parallel manner the relationship between the evaluation of the project and the planning of the rest of the economy.

The evaluation document (see footnote p. 82) uses the following exogenous information:

- *The demand for agricultural products that the project is aimed to provide, in order to maintain a balance between supply and demand.
- *The technical constraints such as the available volume of water from the Tajo, the edaphic constraints and the possibility of new technologies becoming available that would jeopardize the project's relative viability.

The external consequences of the project that the document considers are the secondary benefits, (qualitatively enumerated). Under "intangibles," the document lists the following benefit:

"The multiplier effect on economic activity derived from increase on personal income due to increased production."[1]

This thesis emphasizes that the above benefit constitutes the essence of

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[1] Ibid. p. VII-7.

a development project. The evaluation document, though aware of this, lacks "an integration of the study within a programming of the agricultural sector of the national level"[1], because of the lack of the necessary material for that purpose.[2]

Other secondary benefits listed are the increase in employment, reduction of uncertainty in agricultural production, redistribution of regional income, improvement of balance of payments, among others. The absence of a quantification of them does not permit their inclusion into the numerical assessement. This does not differ from most B/C analyses carried out in a large variety of projects and countries.

The purpose of this chapter is to expand with the available information the possible consequences of the project thus bringing into evidence the relationship between the project and the sector and the project and the whole economy.

Analysis of the project consequences and implications for planning.

The first step will be to briefly describe the explicit and direct objectives that the project is aimed to cover and the constraints to which it is subjected. From there the consquences will be expanded and analysed.

(1) Analysis of objectives and constraints.

(a) The transfer of water.

The question of interbasin water transfer has been considered in Spanish hydrologic history as the solution to the redistribution of water supply

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[1] Ibid. p. III-30.

[2] The document points to the progress done by the Ministry of Agriculture in programming the Agricultural Sector. At this moment, that work is completed and published in "Programación Interregional de la Agricultura Española." Secretaría General Técnica. Ministerio de Agricultura. Madrid. June 1967.

among basins. The Atlantic basins enjoy an excess potential supply of surface water whereas the Mediterranean basins suffer from a deficit, relative to the potential use of water for agricultural production, (yields and quality of products). Within the planning approach this project responds mainly to this limitation, (in addition to the appeal of such an engineering achievement as the first of its kind). By elimination on the bases of physical aspects of other alternatives for the same purpose (of correcting the disequilibrium) the Tajo-Segura transfer is the fastest and easiest mean.

The correction would be of about 30 %, i.e. the deficit of 2500 cubic Hm. per year would be reduced to 1700. In terms of hectares, the potential irrigation land is 300,000 Ha., and the project would provide water for 90,000 Ha. This defines the magnitude of the project. The remaining deficit would be covered eventually by another transfer from the Ebro (a Northern Mediterranean water way).

The agronomic support for the project can be summarized in the fact that the ratio of land productivity under irrigation to land productivity on dry land in the Tajo basin is 4.57 whereas in the Segura basin is 17.57.[1]

Therefore correcting the disequilibrium on the basis of agricultural productivity appears to be a justified objective, if the products to produce under the project are those for which the productivity figures are given, i.e. presumably fruits in the Segura and grains and livestock in the Tajo. However, since 15,000 Ha. of the new irrigation land will be used for livestock enterprises, (p. IV-129) one may wonder whether this comparison is correct given the little experience that the Segura presumably has

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[1] Ibid. p. 22. Table I-5, for the period 1955-58. If one hectare gives a product value of 1 in dry land, with irrigation it would give 4.57 in the Tajo and 17.57 in the Segura.

in this enterprise.

The transfer of water for other purposes (such as hydroelectric) are not considered on the basis that most of the transferred water will be used for irrigation.[1] But the document does not mention the relative use of the water for irrigation and other purposes in the Tajo basin. In other words the weight given to the difference in agricultural productity among basins for making the decision of the transfer may be too large. For instance, the Tajo basin (which includes the urban area of Madrid) may need relatively more the water for urban purposes than the Segura basin for agricultural purposes.

It appears then from the beginning that there is an interaction among objectives on three grounds:

- interregional.
- among enterprises within a sector (fruits versus livestock).
- among sectors (hydroelectric power, tourism and agriculture).

In the analysis of the remaining objectives we will refer to this framework.

(b) The agricultural objectives.

The evaluation document shows that the transfer of water from the Tajo would not affect that basin in terms of irrigation potential. If all the land potential for irrigation were exhausted there would still remain a water surplus.[2] Therefore, in terms of agricultural production there is no opportunity cost of the diverted water. This means that even if the productivity were smaller in the Segura than in the Tajo, the project would be profitable in this respect. This also means that the distribution of new irrigation land among crops is independent of the alternative optimum distribution on the other basin, contrary to what was said in (a) (but not

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[1] In the region of the Segura the potential demand for water for urban uses is 4 % of the potential demand for irrigation. Ibid. p. 44.

[2] Ibid. p. III-36 ff.

necessarily independent of the sectoral distribution of water, as we shall see). The optimum distribution of land among crops depends on technical factors as well as on economic factors. The evaluation document bases this distribution upon the "demand for citrus land or vegetable land...." under irrigation, whose estimation comes supposedly from the current distribution. Therefore the share of each crop is left to the private initiative of agricultural entrepreneurs. The sensitivity analysis gives a variation in the B/C ratio form 3.0 to 3.5 given a "reasonable"variation of the distribution among crops.[1] But if all the water were used for vegetable purposes (in which case only 65,000 Ha. could be irrigated since water necessities are higher for these crops), then the B/C ratio would be 4.25. Assuming these figures correct, this means that the private initiative leads to a less profitable project. Or alternatively, if entrepreneurs are responsive to prices which would appear to be the reason for the difference between B/C ratios, they would tend to shift from citrus to vegetables. This is not considered by the document. That is in implementing this project the question of government action should be considered if the difference in B/C ratios is due to lack of responsiveness, or otherwise there is a need to analyse the effect of the project on the past distribution of crops.

(c) Interregional distribution of income.

It is quite clear from a number of studies[2] that the South East presents in general a lower income per capita than the nation's average. In agriculture this differential can unduobtedly be atributed to the lack of water for irrigation, since the actually irrigated land provides an agricultural income per capita well above the nation's average.

Therefore this is a case where efficiency and interregional equity are not contradictory in the sense that other plans have been undertaken for purposes of equity even though other more efficient alternatives were avail-

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[1] Ibid. p. VI-3.

[2] For instance M. Martin and J.I. Ramos, Estructura Económica de la Empresa Agraria I.D.E., Madrid 1969.

able; an irrigation project is justified on these grounds. Another question is that of the functional distribution of benefits, on which the interregional distribution might have an effect. Thus, as was pointed out above, diverting water from the Tajo to the Segura could improve agricultural income at the expense of the urban industrial sector. Similarly, the personal distribution of income (among income classes) can be affected depending on the distribution of ownership under different alternatives. This question belongs to a higher decision level, i.e. welfare at the national level.[1] Refering to the framework mentioned in (a) suffice it to say that project level decisions trascend the project level in terms of decision making. In this case for instance, the planning authority might consider intervening the distribution or irrigation land as it has been done in other projects throughout Spain. Within the practice of planning a further comment is relevant. The evaluation document assumes the irrigation of 90,000 hectares, distributed among 6 groups of crops organized in standard rotations. All costs and benefits are given per hectare disregarding the size of farms. However, figures by Martín and Ramos show a significant difference between farm costs (or production value) per hectare for large farms and for small farms.[2] If costs and benefits per hectare are an average of the existing pattern, a change in the pattern of ownership would change the results.

A sensitivity analysis to the variation of costs and product value is sufficient to insure the efficiency of the project but the distributional aspects cannot be considered that way. A financial analysis, that the document relegates to other studies, and further committment in regional planning would provide additional information in this respect.

(2) Implications of the project at the sector level.

Section (1) has presented the objective of the Tajo-Segura Transfer as

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[1] The unavailabity of data on this aspect will not allow analysis of the direction and probable magnitude of these effects.

[2] Ibid. p. 296 and 311.

specified by the official evaluation document. It has also pointed very briefly and in general terms to their direct consequences and mutual interactions. Here we will go beyond these project level objectives looking for the effects of the project on the sector.

These effects are the secondary effects or "forward and backward linkages" (Hirschman). Backward linkages refer to the complementary inputs to the irrigation water provided by the project. They can be publicly supplied such as education, extension, credit and infrastructure in general. Or they can be supplied by private businesses such as fertilizer, pesticides, machinery and accompanying services. In terms of planning, one has to be certain as to the availability of such complementary factors. On them depends the timing and probably the success of the project. If the private response with respect to the supply of fertilizer, etc. can be assumed on the basis of past experience, and their purchase is financially feasible to the production units, it remains at least the provision on part of the planners of the certainty that publicly supplied inputs are available. The evaluation document of the project does not consider this issue, which is closely related to the technical and physical aspects of the project. Additional funds must be available for that purpose. Wherever they come from, they should be allowed for in the economic appraisal. Backward linkages, therefore, include additional costs and also additional benefits due to increased economic activity of the industries supplying complementary factors.

Forward linkages refer to the increased economic activity of other subsectors and sectors by using the project's agricultural products, (fruit processing for instance). These are not considered either.

The study of these effects will be done in connections to planning so as to handle together evaluation and programming. We will refer simultaneously to other available studies that could be a basis for the reconciliation.

(a) Agricultural Sector Programming in Spain.

There is only one comprehensive programming model of the Agricultural Sector in Spain, (mentioned in footnote 2). This is a linear program on how a certain number of crops should be distributed among different regions in order to meet the demand for those products at the minimum cost, subject to technical constraints.

The relevant characteristics of this model are the following:

1. Only annual crops are considered, i.e. fruits, vegetables, olive trees and grapes are excluded.
2. Arable land is the main constraint and the allocation of crops among areas is on the basis of hectares of land, given the yields and rotation intensities of the corresponding areas.
3. Yields and rotation intensities are given as they are at the moment of the study (1967), which means that the model is static. In other words the comparative advantage among regions is taken as it is, not as it could be a result of programs carried out from 1967 to 1971, for which the results of the LP model are given.
4. Dry land and irrigation land are independently divided into areas. Irrigation land is taken as it would be in 1971. In other words, irrigated land is given in the linear program.
5. Prices are also considered static.
6. The total production is a constraint as specified by the demand in 1971. The model does not tell what to produce and how much, but where to produce a given quantity.

The questions that we would like to answer is whether this sector program, which is the only one available and for which some experience has developed in Spain, could be useful in an integration of project evaluation into sector programming, which would also permit specifying costs and ben-

efits of backward and forward linkages. Furthermore, we would like to know what modifications could be done in order to increase its usefulness for our purpose.

The first thing is that the project here considered is aimed at increasing fruit and vegetable production which are not included in the sector program (SP). In this SP, all crops not included are given as they had been projected, by regions, for 1971, in another study by the Ministetry of Agriculture. Let us assume that the SP could be extended also to these crops and let us proceed with this first modification, which does not represent a structural modification of the model.

Secondly, irrigation land is a "given". In other words the SP assumes that all irrigation projects actually implemented through 1971 are worthwhile undertaking,[1] in the sense that if it were not assuming that, it would try to show that new irrigation would be more costly than none, at least after a certain stage. Assuming now that the SP does not take the project's profitability for granted, how could it introduce their evaluation into the LP model?

This could be done by considering irrigated wheat for instance as a separate variable from dryland wheatand adding new constraints on the amount of irrigation possible in terms of hectares, instead of considering wheat as a single variable that has different costs and yields in previously fixed areas some of which are irrigated, others not. With the necessary technical constraints of irrigation, the model would yield results as to where to construct irrigation projects. This would not tell whether irrigation or dryland is better. For that, if total government expenses for the accomplishment of the program are given as a constraint, and these expenses are allo

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[1] This is in fact a consequence of not reconciling project evaluation and sector programming.

cated among their possible uses by using the LP model, we could get results as to indicate whether extension in dryland is better than irrigating new lands, for instance. This would greatly complicate the model: we would need to introduce input-output coefficients explaining the effect of a certain government activity in the different areas for the different crops[1] These data are certainly not available: allocation of government resources incorporated to the LP model, whereas theoretically feasible, is not possible. But at least as pointed out above, given the budget for irrigation we could program on a national basis the irrigation projects (location and size) with a simple modification of the present SP.

Third, in the SP allocation of crops among regions is made on the static basis of the current prices, yields and rotation intensities. Upon the basis of the last modification, if as Chenery suggests[2] changing prices and coefficients could be introduced the model would take account of dynamic comparative advantage among Spanish regions. This problem is independent of our task of reconciliation.

Fourth and mos importantly, what can be done about forward and backward linkages? Obviously, a SP which is aimed to locate crops in the most efficient way does not indicate the mutual effects of subsectors. The only products considered as inputs to other products in the SP are feeds for beef, dairy, sheep, pork production, whose input-output coefficients are deterministic.[3]

With the model modified as mentioned in the first two points above, the interaction among subsectors is implicitly considered through the transformation coefficients. For example, if the model assigns an irrigation project for producing feed to a certain area, it also specifies the corre--

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[1] For instance, the average number of pesetas needed in extension to produce 1 peseta of oranges in the South-East.

[2] Chenery H. Comparative Advantage and Development Policy, AER, March, 1961.

[3] Beef production for instance is translated into the land necessary for grains, for forage, etc. through yields and feed transformation coefficients.

sponding optimum production of forage that would enter the ration for producing the fixed quantity of beef specified by the demand constraints. But, since the transformation coefficients are given and fixed, there is no possibility of recording economies of scale and externalities that could change these coefficients, depending on the size of projects, etc.

The most important limitation arises from the fact that the SP does not include the sectors. For instance the model does not have the fruit processing industry. Therefore, the secondary benefits of producing oranges in terms of additional orange juice do not appear. In the backward linkages side, since storage facilities are not included, we do not know what optimum additional supply of these is necessary to allow the given orange production.

Theoretically again, the model could be extended to these other sectors by adding new constraints and new coefficients. In the example just mentioned the additional constraints would be the demand for orange juice and the cost of transforming oranges into orange juice.

The preceding lines have shown that at least in theory, the available study made in Spain at the sector level can be extended to include optimization of government expenditures, for a given purpose. It is now proposed to investigate the problems that are left in planning investments at project and sector levels.

(b) Multiplicity of objectives.

The Tajo-Segura Transfer evaluation study considers only production benefits in the quantitative analysis. The objectives of employment and foreign exchange earnings are said to be fulfilled, since it is obvious that the project will employ more people than before and that the exports of fruits and vegetables will increase. For income distribution, it is an im-

portant motive of the project since the South East is a relatively depressed area. Qualitative considerations of this kind are the only way in many cases of tackling the problem. They are valuable pieces of information for politicians when the "yes" or "no" has to be assigned to an individual project. However, the question should be restated when the project is analyzed in a broader context such as the sector. In such a case the problem is more difficult to evade because the objective bases for comparison among investments come more clearly to light. Assume for instance that the LP above is used to locate irrigation projects and determine their size throughout Spain. As implemented by the Ministry of Agriculture, the LP objective function is to minimize costs of production, i.e. the comparative advantage is in terms of those costs. If the objective function were to distribute income as evenly as possible, the comparative advantage in the new terms would allocate projects differently. In this case, saying that income distribution has "improved", needs much more analysis than the case where the project is individually considered since in this case the alternatives do not come specifically into light.

In conclusion, if there is a concern about more than one objective, it cannot be left to qualitative statements, and all the objectives must be included in the sector analysis either in the form of constraints or as weighted objectives in the objective function.

(c) The private sector response.

The Spanish planning philosophy is based on a mild intervention, i.e. indicative planning. The SP model of the Ministry of Agriculture is also of this character. This is based on the assumption that the private sector will respond to the "indications" given. Where necessary, policies are implemented to provide incentives or disincentives aimed at redirecting private action towards the attainment of planning goals. The Agricultural sector is

characterised by strong institutional constraints and as a consequence by heavier government intervention. Planning in these circumstances substitutes for private activity but by the same token a great deal more of government action is dependent on what is left of private activity.

To analyze the effects on project-sector planning of private responsiveness, let us outline the most important aspects of the latter:

i) Lack of information

To be fully effective any program must be known to the participants including all the opportunities made available.

ii) The pattern of ownership distribution has an effect on efficiency as it changes.[1] Similarly a project in one area has a different impact on income distribution than in some other area with a different pattern. If distribution objectives are considered the SP should take into account where projects are located in terms of ownership patterns.

iii) A wide range of institutional constraints such as custom, legislation, etc., may prevent the speed of changes and their direction may be altered. Including this in quantitative models is certainly impossible but this would not justify excluding their consideration, when the allocation is among sectors or regions of different social characteristics.

In terms of physical planning, correcting for these biases from a competitive model is an additional commitment, and is in fact reduced to introducing services which would help to minimize their negative effects. These services or infrastructure have been mentioned already, when discussing "backward linkages".

(d) Financial analysis

Throughout this thesis, the financial aspects of projects have been neg

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[1] Consolidation of farms is carried out throughout Spain.

lected to concentrate on the economic evaluation. This is not intended to reduce the importance of such aspects, but simply the focus has been biased. The financial feasibility of a project or program is of equal importance to economic feasibility. Whereas no analysis will be done here either, it will be pointed out what are the implications of financial constraints for re-- conciling project evaluation and sector programming.

- Certain objectives (the most clear being income distribution), are both affected by financial and economic issues.

- In the broader context of government activity which includes farm policy such as price supports, credit programs, the financial constraints are different among sectors and subsectors.

- This last point is especially relevant when private operations are concerned. For instance the beef subsector is currently being more encour aged by credit facilities, and price supports than the food grains subsector. In general terms, sector programming and farm programs are fully inter--- related.

One illustration will suffice to make the point. The SP uses the actual prices received by farmers whether they are governmente supported or not. For that reason (among others) maximization of net agricultural product is not possible because that would redistribute income from one group of farmers to others and from consumers to farmers at the same time. That is why what the SP does is to minimize costs given the level of demand. If the model assigns a certain level of production to a certain area for a certain crop and the financial situation of farmers changes as a result of a policy, the effect is the same as redistributing income and again the optimum would be changed.

This is what is meant by interaction between financial and economic

aspects.

Summarizing, there does not appear to be any theoretical limitation for reconciling the SP carried out in Spain with the evaluation of projects. However, it is worth pointing to the problems that can be solved as dis-- cussed above by contrast to those that are not solved. That is, conclusions should be drawn in relation to the points raised when closing chapter IV.

(a) The interactions among projects can be systematically considered, in particular among complementary projects of different sectors. For this, an extended model should be used to include more than one sector. The interactions are represented by the input-output coefficients and their projected changes involved in the projects.

(b) The problem of multiple constraints like capital, specialized labor, etc, can be handled by introducing them in the linear program, (in an analogous way to putting them in the denominator of benefit-cost ratios if that in fact is the relevant way to view the constraint).

(c) The problem of multiple objectives, obviously remains in terms of assigning proper weights. Any decision criterion has to fulfill this need.

(d) The choice of discount rate also remains. As a time preference concept for the time path of benefits, one issue becomes more obvious. By considering projects by groups, a supporting infrastructural project which would yield a low benefit-cost ratio if the time preference is high, will not be discarded, if it enhances the benefits of some other project of faster returns.

As a marginal return concept, the same could be said, particularly because secondary effects, or the impact on other projects are explicitly stated.

As a criterion for government versus private activity, the programming approach does not solve the problem unless private activity is also

programmed which becomes nonsense (since private activity is by definition non-programmed). The question of private participation needs analysis outside programming.

In addition there are a number of practical constraints to the programming approach:

(a) Even without taking account of dynamic changes, a broad LP model would require a number of input-output coefficients for which data may not exist.
(b) The LP model was already considered very large in terms of computer facilities (the Ministry used an IBM 360-40, and hat to leave out some important products).
(c) Demand studies for non-agricultural products need be carried out.

(3) Implications of project evaluation at the aggregate level.

This thesis has focused mainly on the project-sector implications. Here only some observations will be given about-aggregate implications.

All economic analysis deals with aggregates. The distinction between project, sector and economy is only practical. In theory, by extending the SP model to the limit, the whole economy could be analyzed. But since conventional analysis specifies that macro theory deals with aggregates given the distribution of factors, the question of the effects of projects on the aggregates should be considered. Two types of observations are relevant.

(i) Project-aggregate relationships:

Assuming that project evaluations are carried out independently without integration into sector programs, their relationships with aggregates are reduced to the specification of objectives, as it is usually done.

- redistribution of income among regions
- increasing exports
- increasing employment
- increasing production

All these are usually considered at the aggregate level and are identified with objectives at the project level.

In the evaluation document it is implicit that as far as there is a positive change in the attainment of those aggregate objectives, the project is in absolute worth carrying out. The question is whether some other project would yield larger positive changes.

But if secondary effects come into the evaluation, the picture changes: if the direct effects produce positive changes of the four objectives above, secondary effects do not necessarily add to these. This is why projects should first be aggregated into sectors. This is the second type of observation.

(ii) Relationships between the integrated project-sector levels and the aggregate level.

Assume an extended SP model which includes project assessment with secondary effects through input-output coefficients. Assume also a simple objective function of minimizing costs subject to the demand constraint. What is taken as given in the SP and what are the repercussions of the SP at the aggregate level?

First the demand constraint is a projected demand on the basis of data from past years. A SP including new projects will increase national income which in turn may push up consumption. Similarly exports are built in the demand constraint and imports are programmed on the basis of it. New projects may affect positively or negatively the balance of payments. These

two examples illustrate that aggregate and sector planning are not consistent. Some recursive device should be implemented to account for these interactions and match the programmed production with the new consumption, generated from the multiplier effect. Similarly for imports and exports.

Second, welfare questions of employment, consumers versus producers, etc. which are usually aggregate type considerations, are affected by very complex characteristics of the projects involved in the SP. These characteristics are beyond the strictly economic field and it would be much too ambitious to believe they can be treated in the SP model.

CHAPTER VI

SUMMARY AND CONCLUSIONS

1. Summary:

The first goal of this thesis was to evaluate the extent to which benefit-cost analysis at its present stage is appropriate for assesing development projects in LDC's in the light of the structural changes that development implies. In doing so, the principal shortcomings have been reviewed in the light of what development means and represents. The shortcomings are the inability of economic analysis to deal with dynamic processes, weighing of objectives and the lack of data and techniques to follow the sequence of secondary effects and evaluate them. The benefit-cost techniques developed in the U.S. have been reviewed also to investigate the usefulness of the progress made and to support the arguments above.

The main conclusion of my review of benefit-cost analysis is that project evaluation by itself could not solve the problem of investment decisions and that a broader context of planning should be considered in that respect. This argument has led to further review of the planning techniques used in LDC's, namely macro-planning and sector planning. The literature cited was aimed to support the idea that planning in general has not had a great deal of success in LDC's, the reason being twofold: lack of data does not permit planning from-the-top-down and reach consistency between project level and higher levels of planning. And there are no adequate techniques that reconcile the different levels of planning.

The conclusion drawn from this is that sector programming is the link in reconciling "from the top down" and "from the bottom up" planning. Further more given that projects are the "units" of development, physical plan

ning is first priority in the process. The analysis has therefrom disregarded to certain extent the lack of data and has tried to lay out a framework in which planning at different levels must take place if consistency between levels is to be reached. This analysis has concentrated on the reconciliation between sector and project levels and has given second priority to sector-economy relationships, given that the distinction between sector and aggregates is rather a matter of degree.

To illustrate the points, the evaluation document of a project in Spain has been contrasted with the Sector Program model of the Ministry of Agriculture and suggestions for reconciliation of both have been given. In particular the conclusions have been that in theory the works done up to now in Spain can be extended as to incorporate project evaluation into sector programming, if input-output coefficients are available at the province level. The existence of data and the possibility of meaningful aggregations that would permit the use of the computers available in Spain are considered to be the only limitations to the solution of the problem.

2. Conclusions.

The nature of the conclusions that may be drawn from this study is merely indicative, since no testing of the hypotheses hay been carried out. The study has been explorative and therefore it only permits suggestions for further research. The study does not pretend to solve any problem, but only to lay out the path to undertake this task.

Two kinds of conclusions emerge; theoretical and practical.

In theory, the reconciliation of project evaluation and sector programming is possible to the extent that the interactions among variables in development are understood. It has been seen that cause-effect relationships among social, political and economic variables is very complex and that there is as

yet no generally accepted theory to explain them. However, restrictive assumptions may be used to isolate problems, specifically the economic consequences of projects. In some cases private response can be assumed at the project level. Financial analyses are necessary to support this kind of assumptions. With respect to the effects of projects on costs, prices, etc, the dynamics of change are also confuse at this stage. It is suggested that partial analysis of subsectors where projects are implemented cannot tackle this kind of problem and that only analysis at the sector level where projects are explicitly interconnected among themselves can be a first step in that direction. Secondary effects of projects are to be handled by means of input-output coefficients. These coefficients are generated at the project level which means that the more disaggregated the analysis the better changes in coefficients can be accounted for. These two opposing forces, namely disaggregation for reaching realistic analysis and aggregation for handling comprehensiveness and consistency arethe most important issue in the theory to be developed in the reconciliation.

As a consequence of this trade-off among aggregated and disaggregated analysis the practical methods are necessarily narrow, i.e. limited to a single level of aggregation. This is why there so far has been little work done simultaneously at different levels, and this is also why it has been stressed that reconciliation between project and sector programs is necessary.

One practical method of doing so has been investigated in the Spanish case. The simple conclusions mentioned in the summary above can be extended and generalized in the form of the following suggestions for further research:

- Linear programming can substitute for ad hoc methods of reconciling investments on complementary projects. This optimization procedure permits the best allocation of resources among sectors, subsectors and/or

regions. Complementary costs of backward linkages can be introduced. Partially substitute projects can be programmed. Choice of techniques in projects or mutually exclusive projects can be compared by running the model under different assumptions.

- Recursive linear programming can handle changes of prices and other magnitudes over time. The uncertainty involved in this process may however set a limit to the length of time in the future that can be handled.

- Lack of data, especially input-output coefficients, is the major shortcoming in the application of any method of reconciliation. It is suggested that under these conditions the process of reconciliation be started at the project level neglecting consistency for the sake of realistic conclusions. This would permit the accumulation of data on one side and the building of experience in referring projects to more aggregate units.

- If project and sector levels are made consistent with each other, then the adjustment between sector and macro aggregates has to be by successive approximations, since agregates change depending on the composition of the sector programs.

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APPENDIX A-1

1. Multipliers of the Adelman-Morris Model in order of their magnitude.

x	The degree of improvement in financial institutions	2.309
	The degree of modernization of outlook (x)	2.169
	The extent of dualism	2.133
x	The level of adequacy of Physical Overhead capital	1.986
x	The change in the degree of industrialization	1.624
	The importance of the indigenous middle class	1.062
	The rate of improvement in Human Resources	.955
xx	The extent of leadership commitment to Ec. Dev.	.940
	The extent of literacy	.884
x	The degree of improvement in agricultural productivity	.823
	The extent of social mobility	.797
	The extent of political stability	.536
	The extent of Mass Communications	.407
	The character of Agricultural Organization	.288
	The political strength of the military	018
	The degree of social tension	- 300
	The political strength of the traditional elite	- 310
	The rise of the traditional Agricultural sector	- 320

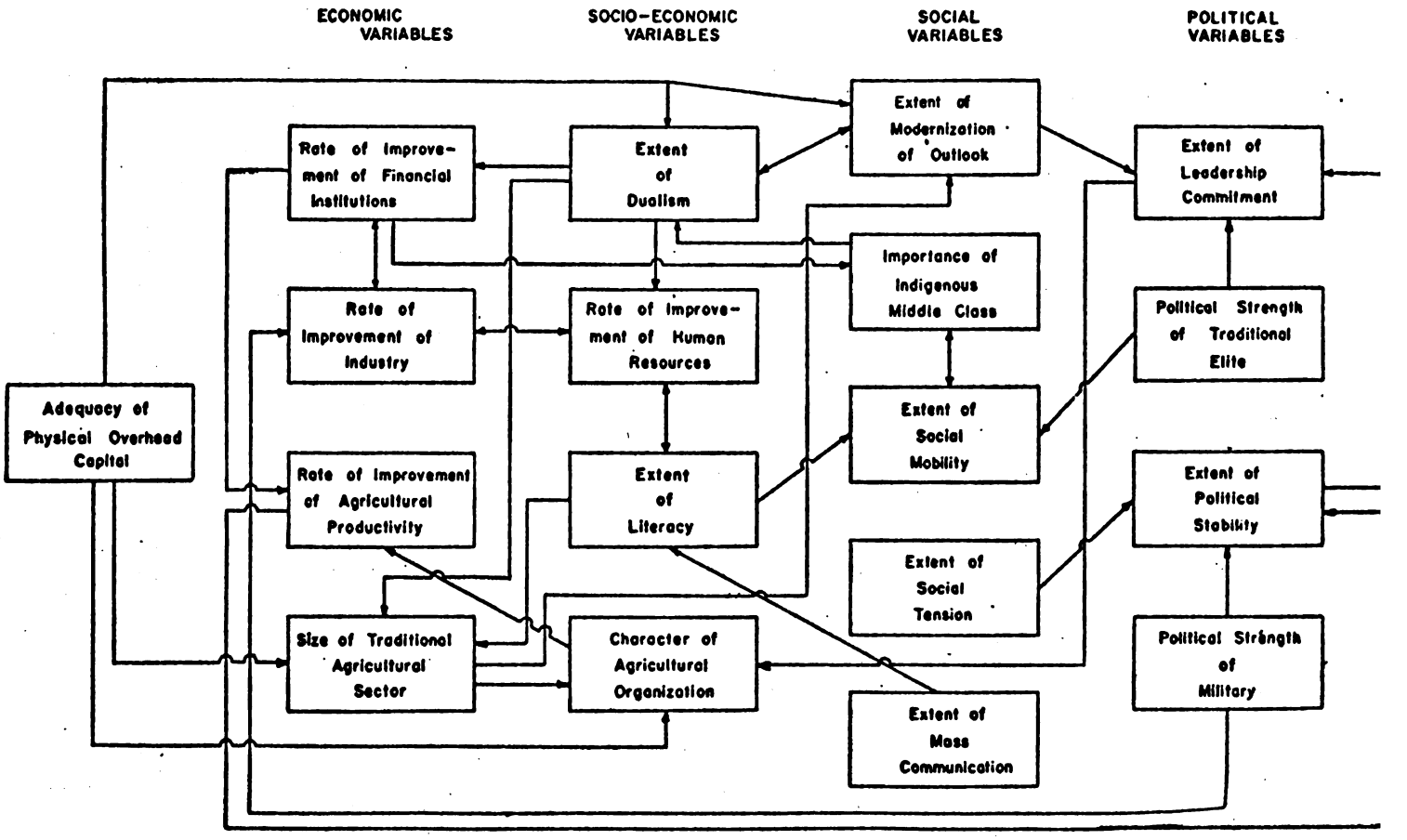
x Purely economic variables scoring a multiplier > .8

xx Political variables scoring a multiplier >.8

(x) "A composite measure of the degree of modernitation of outlook of educated urban groups and of the extent to which programs of political and economic modernization had gained the support of both rural and urban population."

APPENDIX A-II

Causal Ordering of the Model



APPENDIX B

INPUT-OUTPUT STRUCTURE INCORPORATING CONSISTENCY WITH GNP AND NATIONAL INCOME ACCOUNTS

Total Gross Output		Industry Industry	Interindustry Demands 1 2.....n		Final Demands C I G Ha E
X_1		1	X_{11} .....X_{1n}		f_{11} . . . f_{15}
X_2		2	X_{21} X_{2n}		. .
.		.	. .		. .
.	=	.	. .	+	.. .
.		.	. .		. .
X_n		n	X_{u1}.....X_n		f_{n1} f_{n5}

+

Autonomous Input	1	2..... n
ΔH_d	S_{11}	S_{12}.....S_{1n}
M	S_{21}	.....S_{2n}
D	.	
T_b	.=	
W	.	
i	.	
R	.	
π	S_{81}	.....S_{8n}
	=	
Total Gross Outlay or Income	X_1	.....X_n

Where: $GNP = C + I + G + (AH_a - AH_d) + (E - M) + TG \text{ output} - AH_a - M.$

$GNI = D + T_b + W + i + R + \pi = TG \text{ outlay} - AH_d - M.$

Where:

C= personal cons.exp.

I = gross private domestic fixed invest.

G= gov't purchase of goods and services.

ΔH_b= increase in inventories of industry.

E = gross exports.

$-AH_d$ inventory depletion for each ind.

M gross imports.

D depreciation.

T_b indirect business taxes

W wages

i interest

R net rent

π before tax-profits

$X_{ij} = a_{ij} X_j$

$X = AX + F$

$(I - A)X = F \Longrightarrow X = (I - A)^{-1} F$ a matrix of elements X_{ij}

that gives the composition of GNP by sectors in terms of consumption, investment, government expenditures, inventories and exports.