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CHAPTER I

THE STATUS OF PLANNING: AN OVERVIEW

BY

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CHAPTER II

MODELS AND POLICY: THE DIALOGUE
BETWEEN MODEL BUILDER AND PLANNER

BY

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Chapter I

THE STATUS OF PLANNING: AN OVERVIEW

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JUNE, 1979.

1. INTRODUCTION

Development planning is a complex process involving many different organizations and individual agents interacting in the formulation and execution of a country's economic and social policies. This volume deals with one aspect in this process - the use of economy-wide planning models. Before beginning this review of technique and practice, it is important to put this subject matter into its proper perspectives, by examining where our topics fit into the wider and more general field of development planning.

Among the principal agents in the planning process are: policy makers, planners, statisticians, and researchers. Although in the real world there is considerable overlap in their activities and responsibilities, it is useful for our purposes to visualize each agent as being involved in different tasks, typically communicating with each other along the lines outlined in Figure 1. Effective planning, to a great extent, involves developing an efficient flow of information along this chain. This flow is not generally one-way but is multilateral involving important feedback at all levels.

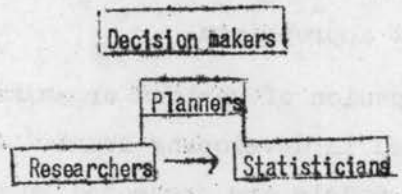

Figure 1. Information Flows in Planning

These agents need not be identified with any particular organizational set-up; indeed these same information flows occur in any planning framework - centralized or decentralized, private sector or government. Neither agents designated "planners" nor a central planning office is necessary to the process. Throughout this volume the use of these terms should be interpreted as suggestive of one common style of organization.

Economy-wide planning models are intended to be a practical tool for investigating certain development problems. As such, their proper operational usage involves all of the chains shown in Figure 1. However, as we shall emphasize later, because the usage of these models is still largely experimental, we are most concerned in this volume with the planner-researcher linkage. To date, the techniques of formal modelling represent attempts by researchers to respond to the needs of planners to learn more about the aggregate problems and intersectoral relations of the growth and development process.

As more countries gain experience with these techniques, more attempts will be made to use model results as part of the information flow between planners and policy makers. This part of the process is the principal subject of Chapter II. At the same time, much data of good quality are required if these models are to evolve beyond the experimental stage. The necessary linkages with the statistician are discussed at length in Chapter IV.

In this chapter, we address the relationship between economy-wide planning models and the whole of development planning from two perspectives. The first involves the conceptual view of models and the planning process, while the second focuses on past experiences and the types of countries for which these methodologies seem most appropriate.

Section 2 begins with a discussion of various organization frameworks for planning which have been adopted in developing countries. The basic characteristics and uses of formal models are presented in section3, with special emphasis on the role of economy-wide models. In section 4, we become more specific and address the relationship between the choice of models and particular economic problems and strategies.

2. THE FRAMEWORK OF PLANNING

Planning represents an attempt to coordinate economic decision making over the long run, in order to give direction to and accelerate a country's development. This process involves choosing social objectives, setting various targets, disseminating information, as well as organizing a framework for the implementation, coordination, and monitoring of the plan. For the time being, leaving aside economic aspects (such as criteria for project selection or techniques of forecasting national income), we shall concentrate on the structure of planning - the organization of the decision making process, relationships between various decision makers and planners, and strategies for plan implementation.[1]

The countries with which we are concerned all have mixed economies with important public and private sectors producing goods and services. These economies are mixed not only in terms of ownership of the means of production but also in terms of interdependence of decision making. For example, the government influences private sector decision making only indirectly through its manipulation of prices, taxes, or tariffs, and sometimes directly through licensing schemes and credit rationing. On the other hand, the private sector usually wields considerable influence with the government, which values the private sector's entrepreneurial role. Effective planning must pay careful attention to this symbiotic relationship.

In addition, neither sector is monolithic. The private sector includes industrialists (both foreign and domestic), small businessmen, farmers, landlords, artisans, and often important labor unions. There is rarely, if ever complete mutuality of interests among them. Similarly, governmental power is divided among politicians, bureaucracy, and military in a large number of ministries and organizations which are often quite independent

1. There is voluminous literature on development planning which cannot be adequately summarized in only a few pages. Most of our discussion in based on Tinbergen (1958) and Lewis (1966). Other important references include Waterston (1965), Hagen (1968), Higgins (1968), Tinbergen (1964), and Meier and and Baldwin (1957).

in their objectives and operation. The organizational problems of bringing these divergent elements together and getting them to work together in closer concert to meet long-run national goals are formidable. Typically, a central planning offic (CPO) has been created in an attempt to provide the necessary coordination. Since the powers of the CPO vary greatly from country to country, its ability to achieve this coordination has not been uniform. Indeed, a CPO is neither necessary nor sufficient for effective planning. Without a CPO, planning can be organized around particular sectors, whose detailed plans are very loosely coordinated through a ministerial council, the governmental budget authority, or representatives of the public and private sectors. (Mexico and Israel are examples of countries which have had satisfactory planning without heavy reliance on a CPO). On the other hand, if careful sectoral planning, or dialogue with the private sector, or linkages between the CPO and the budgetary authority are ignored, even a plan devised by a technically competent CPO will rarely be well formulated or implemented.

Which organizational framework is most appropriate for any country depends on many factors, including: how economic decisions are made, which sectoral growth strategy is adopted, and what direct and indirect powers are given to planners on the central and sectoral levels. Therefore, we now turn to a brief discussion of various strategies or approaches to planning which a country could choose. For conciseness, a rather abstract view is taken emphasizing the extremes of several approaches while leaving the reader to fill in the continuum.

First, planners can take either an active or passive role in decision making. The "active" planner has some direct control of economic policy. In the limit, the CPO and sectoral planners would have the powers necessary to implement all key aspects of the plann directly. In this case, the distinction between planners and decision makers all but disappears. In such a system, in which the plan is mandatory, other economic agents are subject to the authority of the planners.[2]

2. To a certain degree, Soviet-type planning is designed to work in this way. In practice, economic planners have not had such complete powers; see, for example, Bergson (1964) or Nove (1964).

At the other end of the spectrum, "passive" planners have little direct control of economic policy. The major role of these planners is to provide critical information about future development alternatives and forecasts to all agents in the economy so that important decisions will be more consistent with common goals than they would be otherwise. The plan itself is indicative,[3] rather than mandatory, with planners acting as advocates and transmitters of information rather than decision makers. Their chief role here is in coordination and monitoring.[4]

Planning can also be characterized by its chain of command. Here we refer only to the "active" aspects of planning. Once again there are two two hypothetical extremes. In the one, all decisions are made by a central authority such as a CPO, which transmits a complete set of instructions to the economy. These can relate to both quantities (taking the form of production targets, import quotas, credit or investment allocations) and prices (wages, taxes, tariffs, or price control guidelines). In constrast to this centralized planning, there are decentralized techniques in which the CPO and sectoral planners send instructions about how decisions are to be made. Also, the central planners will usually transmit instrutions and guidelines to the sectoral planners. The planner here usually emphasizes price (rather than quantity) policies.[5]

Developing countries fall well within these extremes. The typical ministry of planning is neither GOSPLAN nor the publisher of a prestigious economic newsletter. The Third World is characterized by mixed economies. Planners have little direct control over either the public or private sectors. In dealing with the private sector, the government as a whole,

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3. "Indicative" planning is common in many developed countries such as Japan, the Netherlands, and France, Excellent discussions of planning in these countries are found in Watanabe (1965, 1970), Netherlands Central Planning Bureau (1965), and Bauchet (1964).

4. For a more complete discussion, see Chapter IV.

5. Several of the chapters in Leeman (1963) discuss the differences between centralized and decentralized planning. For a discussion of recent Eastern European experimentation with decentralized planning, see Kornai (1967, 1974).

as well as the planning organization, cannot always ignore powerful special interests. Moreover, central planners (e.g., the CPO) rarely have direct control over the government controlled sectors, which are usually managed by a number of separate ministries, often with little coordination. Additional control problems arise if the governmental budget is regulated by a finance ministry which has little interest or involvement in the development of long-run plans.

Nevertheless, almost every CPO controls some economic decisions directly, such as planning the government's capital budget, approval of direct foreign investment, trade licensing, veto power over certain investment projects, and administration of development assistance programs. While planners usually have more direct influence over the government sector, considerable leverage (through controls and persuasion) can also be applied to the private sector. In addition, while economic decisions are usually made in a decentralized fashion even within the public sector, many of the most important are made centrally - in particular, capital budget allocations and basic fiscal policy.

Thus, the development planner, in both centralized and decentralized systems, has both a passive and active role to play; he helps make and monitor important decisions and designs schemes for improved decentralized planning. While no two planning frameworks are identical in their approach, responsibilities, or mode of operation, it might be useful to attempt to characterize briefly a typical central planner's relationships with other economic agents. Usually, the CPO is responsible for the development of medium - and long-term plans for the economy as a whole, often in the form of Five Year Plans. In building these plans, the planner is engaged in a dialogue with technical specialists and planners in other ministries and the private sector of the economy. The process is complex, time consuming, and filled with compromise. The planner's function is to try to see the whole picture while others pursue more narrow interests. Perhaps even more important is the planner's role in public budgeting. Even when he does not

have final authority, he plays an important role vis-à-vis other ministries and the Ministry of Finance in setting investment allocations. Once again, the planner attempts to present the bigger picture over the long run, often in conflict with the realities of the short run.[6]

The planner also engages in a dialogue of give and take with the private sector. For medium-term planning this may take the form of sectoral planning committees which include representatives of various special interest groups. Planners deal with the private sector on a more microeconomic basis regarding individual large scale or foreign investment projects, export and import licensing, as well as price, tax, and tariff policies.

A final point to be emphasized is that the development of a framework and strategy for planning is evolutionary. In many instances, the first planners in a country are a small group of academics, local or foreign, largely carrying out an educational function and, hopefully, training their replacements. As a country gains experience with planning, the organizational set-up may change in response to perceived problems in coordination and implementation. With mixed economies, this will typically imply a diffusion of planning responsibility throughout the economy and increased attention to the sectors and income groups most crucial for attainment of national objectives.

3. TYPES OF PLANNING MODELS

In the previous section, we were concerned with the relationship of planners to other agents of the economy, methods of plan implementation, and various constraints which must be recognized in developing plans and policies. Nothing was said of the methodology of formulating plans and investigating trade-offs or consistency. Formal modelling, qualitative as

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6. Tinbergen (1964) is an excellent reference on these problems of the short versus the long run.

well as quantitative, is a systematic tool which is available to a planner for these purposes. Model results can provide some of the information necessary for formulating plans and making economic decisions in both the private and public sectors. By using models, the planner is able to study systematically certain economic interrelationships which otherwise might not be easily understood. This process carries over directly into an investigation of possible trade-offs and their magnitude, as well as the internal consistency of a set of plans. In this sense, models are instrumental in character, attempting to relate policies to economic reactions.[7]

It is important to emphasize that while any model should be a reflection of reality, no model is a perfect reflection. This is so for several reasons. A model is an abstraction which can only incorporate certain aspects of the real world. Many economic relationships cannot yet (if ever) be formalized either in quantitative or qualitative terms. Also, all models leave out relationships and details which could, in principle, be included. Not only are very large and comprehensive models expensive to build and to solve computationally, but they are usually more difficult to understand than smaller, simpler formulations. Clearly there are important trade-offs here between a desire to paint the broadest picture possible of an economy and a need for simplicity so that nontechnical planners and policy makers can understand the model's rationale and results.

In order to demonstrate more clearly these trade-offs in model formulation, various characteristics of planning models are reviewed briefly. In this discussion, the work of Tinbergen (1964) is followed closely.

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7. In practice, most economy-wide multisectoral models have included relatively few endogenous policy variables, concentrating instead on formulating consistent projections without explicit linkages with instruments to achieve them. Further discussion on this topic is found in Chapters II and V.

The first important characteristic, or criterion, of a model is its scope, which can range from subproject to the entire economy.[8] The appropriate scope is determined by the problems to be analyzed. Thus, national issues such as savings generation, intersectoral investment allocations, or the impact of additional foreign loans are usually central to economy-wide models. On the other hand, choice of technique, location, and size of plant are topics found in sectoral or project models which pay great attention to detail while treating the rest of the economy as fixed.

Time is another very important dimension. Models can be either static or dynamic. Static models generally compare one future date with the present, e.g., now versus five years hence. Dynamic models incorporate endogenous variables from a number (usually between three and five) of time periods, thus providing information to the planner on how to get from now to some target year, e.g. yearly investment levels for a five year plan or cumulated investments over the three year subperiods of a twenty year plan.[9]

Another aspect of the model's treatment of time is how far into the future it is designed to project Model design here is intimately related to the problems to be studied. A short-term model (typical defined as forecasting for at most three years into the future) will often emphasize the role of financial variables in controlling aggregate demand, and may be estimated by econometric techniques on the basis of time series data. Although interesting, and important for formulation of short-term policy, such models are not treated extensively in this volume, aside from some general discussion in Chapters III and IV.[10] Rather, the focus here is on models appropriate for medium-term (three- to seven-year horizons) and long term of "perspective" planning.

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8. The whole world can be included, as is being attempted to a certain degree by Project LINK. See Ball (1973).

9. A review of the relative costs and merits of static and dynamic models appears in Chapter III.

10. Adequate treatment of the use of these models in developing countries would probably require another volume (and another set of authors), even though use of models in these countries is not nearly so widespread as it is in developed) countries. For some reasons as to why this is so, see the chapter cited above.

The next characteristic is the focus of the model, which is often closely related to its degree of aggregation (for a given scope and time horizon). In this sense, essentially three types of medium- and long-term economy-wide models have been applied extensively in developing countries. The first, macroeconomic models, treat the whole economy as one producing sector and are oriented toward forecasts of the major national accounts aggregates. As discussed in Chapter III, the most common representative of this type is the well-known Harrod-Domar model (often extended into a two-gap model by explicit consideration of the foreign trade sector). In contrast with macroeconomic models, there are multisector interindustry planning models which divide the economy into a number of explicit producing sectors. These models form the main subject matter of this volume.[11] A third type of economy-wide model is focused on "dualism," and usually is set up to highlight the dichotomies between two sectors - a large, mostly agricultural "traditional" sector and a smaller, dynamic "modern" sector. Although this type of model provides insight into development phases, it has been little used for planning purposes.[12]

A final key characteristic involves the extent of endogenous choice - that is, the extent to which projections are made within the model itself. For example, sometimes export levels are projected exogenously and fed into the model and sometimes the model itself computes the appropriate levels. In the latter case, the projections are said to be endogenous. A model is fully determined (or "closed") if all variables or unknowns can be calculated once certain policy variables are fixed and exogenous projections made. Such models are frequently called simulation (or forecasting) models. In other models, there are many alternative growth patterns which are consistent with the set of exogenous variables. Some sort of optimization technique

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11. There are wide variations in the number of sectors actually included in these models - the range is from 3-5 to 30-40 or more. Appropriate aggregation levels for different types of problems are discussed in Chapters III, IV, and VI.

12. Such models are critical for evaluating the broad lines of a country's development strategy since many dualisms are created by the structural rigidities of imperfect factor markets in less developed countries. Long-term policy simulations are increasingly using 2, 3, or 4 sector models. (See for example, Blitzer and Manne (1974), Chenery and associates (1974), and Kelley, Williamson, and Cheethan (1972).

based on the objectives of the plan[13] is then used to close the model. As discussed extensively in following chapters, linear programming is often the technique selected - hence we refer to programming models.

Both in practice and in theory, different types of models are suitable for analyzing different policy problems. As was suggested at the beginning of this discussion, the "useful" model should be focused on a subset of problems. This implies a need for a set of models which together cover the key issues facing the planner. In particular, while economy-wide models are emphasized here, sectoral models can be extremely useful for analyzing many important problems and should not be ignored when selecting the set. A proper division of labor between models helps improve the instrumental nature of models by relating explicitly particular variables (such as trade balances or aggregate growth rates) to each other.

It is also important to note that, for consistency, various planning models should be interrelated; results from one model can and should be imput into the others. For example, the savings rate in the Harrod-Domar model is usually exogenous, while it is frequently an endogenous variable in a financial or budgetary model. The assumed rate for one model should be consistent with the rate forecast by the other. Otherwise, when the rates differ, the rationale or meaning of the divergent behavior must be interpreted or explained. These characteristics of models and their relationships both to specific problems and one another are discussed in much greater detail and in a more technical manner throughout the rest of this volume.

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13. Discussion of objective functions and the treatment of conflicting goals are found in Chapters III and IX. Chapter V discusses relative merits of simulation and optimization models.

4. DEVELOPMENT STRATEGY, ECONOMIC PROBLEMS, AND MODEL CHOICE

Planning models should be designed to fit the development strategy of a country as well as its principal economic concerns. Strategy in this context refers to a chosen development path, for example, an export promotion or import substitution orientation. The strategy varies greatly among countries according to size, relations with the world-wide economy, natural resources, level of development, social objectives and outlook.

The basic approach in multisector planning models is the computation of rather detailed supply-demand balances for a number of aggregate commodities. While final demands (i.e. consumption, investment, and exports) can be computed in a variety of ways,[14] intermediate demands are computed mostly on the basis of input-output coefficients. Therefore, the usefulness of this modelling approach depends, to a great degree, on how important are the interindustry linkages of the economy. And in turn, their importance appears to be mostly a function of the country's size and degree of industrialization.[15]

Not surprisingly, then, these models are, ceteris paribus, more useful in larger than in smaller countries. Because of their larger markets, the larger countries tend to have a more diversified industrial base, and, in terms of development strategy, rarely (with the exception of petroleum producers such as Iran or Indonesia) specialize in the export of primary products.[16] During the growth process, a large number of sectors (especially industrial) develop, making multisector consistency an important planning

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14. For a review of alternative techniques for deriving final demands, see Chapter III.

15. The relationships between development patterns and these characteristics are investigated in Chenery and Taylor (1968).

16. For recent evidence, see Chenery and Syrquin (1974).

consideration in the investment allocation decision. In fact, input-output tables have now been built for all of the more populous Third World countries except for several of the very poorest.

Economy-wide planning models, based on multisector input-output analysis, are also useful for small countries pursuing an industrialization strategy. These countries (Israel and Taiwan are relevant examples) are seeking to specialize in certain manufactured exports, selected on the basis of comparative advantage, in order to finance otherwise heavy import requirements. Multisector models are useful tools for investigating comparative advantage. As such, smaller countries often use them more for "domestic resource cost" calculations[17] than for intersectoral consistency testing.

Turning from grand questions of development strategy to specific areas of policy concern, we now review the problems discussed in the various chapters in this volume. Needless to say, when several authors are involved, each one's judgement about any specific issue may (and does) differ from that of the others. Hence, when several chapters discuss the same topic, the readers should look at all of them to get a full range of opinions.

Rapid economic growth is a major objective in all developing countries, and perhaps the most frequent use of economy-wide models has been in tracing plausible alternative growth paths over the medium and long run. Indeed, these models, whether macroeconomic or multisector, are uniquely suited to investigating the implications for macroeconomic parameters (such as savings requirements trade balances, or incremental capital-output ratios) of alternative aggregate growth projections. These uses are reviewed in Chapters III (theoretical discussion) and V.

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17. For a full discussion of these uses, see Chapters VI and VIII.

Intersectoral consistency, another important issue which is very frequently studied using economy-wide models, is the cornerstone of multi-sector modelling. An input-output matrix is used for relating macroeconomic projections to sectoral production requirements, and vice versa. Chapter V describes how the multisectoral demand and supply balances can be related to the relevant policy instruments and factor uses in order to maintain consistency between objectives and policy solutions. However, since multi-sector models are numerically constructed with considerable aggregation (for example only one agriculture sector), more narrowly focused models, say for the entire energy sector, are required if the planner is concerned with deriving specific requirements at the detailed sector or process level. In Chapters XI and XII, these problems are discussed.

While economy-wide models are often used to derive sectoral output and investment forcasts for a five year plan, the linkages between these rather aggregate projections and detailed project appraisal work are quite tenuous. Attempts have been made to establish such linkages through using the implied, or shadow, price system implicit in any optimizing model. While these attempts have not yet been entirely successful, several important relationships have been developed and are discussed in Chapter VIII.

Obviously, certain foreign trade issues cannot be separated from either macroeconomic policy or sectoral investment decisions. Almost all economy-wide models have some sort of foreign trade sector. In practice, a wide variety of assumptions can be made concerning the competitiveness of imports and exports (at a given point of time and over the long run), the costs and constraints associated with foreign borrowing, future tariff policies, etc. In Chapter VI, various foreign trade formulations and their policy implications are critically discussed. The important issues include such things as comparative advantage calculations, impact multipliers for foreign assistance, and effective protection rates. Once again we emphasize that, just as with investment decisions, aggregation level puts effective limits on the uses of economy-wide models.

Although problems relating unemployment and underemployment to labor skill creation have become increasingly important in recent years, they have not been analyzed systematically in economy-wide models. It is not yet clear how much the models can teach us about these problems, but existing techniques are reviewed in Chapter VII. Among the issues discussed are sectoral employment projections, education planning, surplus labor, and bottlenecks in skilled labor markets.

Similar comments apply to problems of income distribution, which have received even less attention than employment on the part of designers of economy-wide models; however, Chapter V summarizes what has been attempted, along with some suggestions for future research. In a similar vein, Chapter X presents a discussion of possible techniques for analyzing the disparities in regional development which are so important in several countries.

In contrast to these specific problem areas, there are several important general isues in planning which are only now being introduced into models. The first deals with the pursuit of multiple social and economic objectives. Various objective functions, based on economic theory, are discussed and criticized in Chapter III. Chapter IX deals with alternative, nontheoretical techniques which have been developed largely by systems engineers. Largely untested in economy-wide models, these show considerable promise as future tools for investigating a wide range of policy trade-offs.

Economies of scale cut across many economic problems, ranging from project appraisal to foreign trade specialization. Various treatments of this phenomenon are reviewed in Chapter XI. Since scale economies are difficult to measure at an aggregate level and hard to introduce into multisector models, the discussion centers around sector and single project models.

Finally, substitution possibilities exist in all part of the economy. Substitution in demand is important in drawing implications for both price and income redistribution policies. Similarly, in choosing appropriate technologies, both for aggregate and disaggregate production, substitution in production is of utmost importance. Appropriate methodologies for handling various types of substitution in planning models are the subject of Chapter XII.

In closing this section, it may be useful to reemphasize that some important issues are excluded from discussion in the rest of this volume. First, short-run problems and instruments are largely ignored. As is emphasized in Chapters II and IV, these issues are often important in real world planning; however, the financial and monetary aspects of development policy lie beyond the scope of this book, which focuses on the modelling of the planned structural change of real resource allocations in the medium or long run. Thus, discussion of the short-term influence of changes in relative prices and their effect on technical choice, savings, and consumption is to a large degree omitted, except for brief treatment in Chapters III and XII. Finally, most of the models discussed are concerned with the expenditure side of national income accounting, leaving out most income creation linkages. If real progress is to be made by augmenting economy-wide models for simulation of planned income redistribution, future research effort will have to be devoted to this topic.

Chapter II

MODELS AND POLICY: THE DIALOGUE BETWEEN MODEL BUILDER AND PLANNER

BY

JANOS KORNAI

JUNE, 1979

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1. A SUBJECTIVE INTRODUCTION

I am not a "development planner." I am commenting, more or less as an outsider, on the problems of trying to use mathematical models in the planning of developing countries.

It is true that I am only in part an outsider. For several years I participated intensively in the design and application of mathematical planning models in my country, Hungary. Hungary falls perhaps halfway between a typical developing and developed country. A significant portion of our problems are similar to those of the developing countries: Which should be the leading sectors? What new industries should be established? What should be the rate of industrialization? How can we fit into the international division of labor? How should we distribute the burden of growth between present and future generations? And so on. There is also a similarity between the modelling techniques of out group in Hungary and those discussed in this volume - for example, input-output analysis and static and dynamic linear programming models.

Despite these similarities, I am still an outsider. After all, planning in Budapest is quite different from that in New Delhi or Mexico City. For one thing, the Hungarian economy is based on European economic and cultural traditions. But more importantly, Hungary is a socialist country where the bulk of production is supplied by state or cooperative enterprises, where control of the economy is to a large degree centralized, and where there was considerable experience with nonmathematical planning and a large functioning economic organization at the time that mathematical planning began.

My opinion of mathematical planning or formal economy-wide models was shaped by personal experience in Hungary. It is true that I have participated as a consultant in several research projects which built models for developing countries. I have been present at meetings where competent development planners propounded their opinions. Before that, I tried to review the literature of the problem. Nevertheless, I derived from all this only an indirect impression, without the quality of personal experience. Now, while preparing this study, I reread some earlier material and perused some more recent work as well. I tried to choose "representative" items. I reviewed primarily the most famous, most quoted works, including the more important ones of the other contributors to this volume. The fact that I did not read these works over a long time period, but almost in one sitting, one after another, probably helped sharpen my general impressions. Here, my objective is not to comment on individual works but rather to give a picture of this general impression. While my remarks do not precisely fit any one specific model, perhaps they give an accurate feeling of the image created by the "average" economy-wide planning model to an outsider.

To this, I must add a few qualifications. First, I concentrated primarily on the evaluation of the mathematical programming models. These closely resemble (from a technical point of view) the models I have worked with myself and feel most qualified to comment on. Second, my remarks are based almost exclusively on journal articles and books. It is possible that the published descriptions are not complete; perhaps much of what the authors have had to say has appeared in unpublished reports or has been said at meetings on the spot. Nevertheless I beleive that the choice the researcher makes in deciding what is most worth publishing, and what he reserves to himself or transmits only to a small circle, reflects his final priorities.

Here I emphasize the items that I believe are missing from these studies. Yet I would like to avoid even the appearance of judging superciliously from the height of some glorious successes. Let me confess that I not only esteem but even envy the high intellectual level and the theoretical standards characterizing these works almost without exception. We Hungarian planners are all self-taught, with skills obtained through hard work, whereas many mathematical development planners have come out of the best schools with a high degree of technical knowledge. I felt, as I read all of these works, that the authors are well acquainted with all the tricks of the art, with those we in Hungary apply, and with many more. I wish that five or ten of the top workers of this group would work in our planning centers in Budapest; the professional quality of the work there would surely improve by leaps and bounds. In addition, I envy the wonderful computing facilities at their disposal: no matter how much our facilities improve, we are always one or two steps behind in computer speed, efficiency of the algorithms, and richness of the program library.

The coin has another side: Any criticism of mine can also be seen as self-criticism. It is always easier to find distortion in the other fellow than by looking in the mirror. Much of the criticism I level at the planning models of developing countries also fits some of my own research and that of other Hungarian model builders.

There are two major topics in this chapter. In section 2, the relations between economic policy makers and model builders, and the dialogue between these two distinct groups, are discussed. Sections 3 and 4 deal with various political implications of development planning models. In other words, section 2 focuses on relations between different groups of people, while sections 3 and 4 emphasize relations between different economic and political issues. My remarks are addressed primarily, but not exclusively, to model builders from a model builder. However, much of the material, especially in section 2, is also aimed at policy makers and other participants in the planning process.

2. THE MACHINERY OF PLANNING AND MATHEMATICAL MODEL BUILDERS

The good Boy Scout performs a good deed every day.
"Boy, was today's good deed difficult!"
"Why, what did you do?"
"I led a blind man across the road."
"And why was that so difficult?"
"Because he did not want to go!"

(Joke frequently told in Budapest)

The first mathematical planning models appeared in Hungary in 1957-58. Economy-wide and sector planning, both for the medium and long term, had already been going on in Hungary for about a decade, but exclusively relying on traditional, nonmathematical methods. The scale of planning could be described by two values: (1) The number of people working in the machinery of planning. Hungary is a small country of ten million people. Before the appearance of mathematical planning, the central planning office had a payroll of 500 to 800. In addition, every ministry, the directorate of every industrial branch, every producing company, and every local administrative authority had a planning office. Altogether, tens of thousands of people were busy planning. (2) The number of parameters used in the documentation of the five year plan. There is no accurate count, but a crude estimate of the order of magnitude would be several million.

At the first trials of mathematical planning we had to decide what our relationship to nonmathematical planning should be.[1] Confident of our technical superiority, should we try to assert our independence from the machinery of planning? Should we come forward as competitors, proposing the replacement of traditional planning by mathematical planning? Finally, the following "battle plan" emerged: The task was not the "revolutionary

1. This is dealt with in detail in Kornai (1974).

overthrow" of traditional planning but rather its gradual transformation of "reeducation." Having the fanciest models was not the most important thing. It was not even so terribly important, especially at the beginning, that the numerical results of our research be accepted as the basis for the official plan. What was really important was the "infiltration" of formal or mathematical methods into the actual machinery of planning. Everything - the design of the structure of models, the choice of colleagues, the working procedures, the presentation and dressing up of results - should be subordinated to this aim. Mathematical planning should not be forced on practical economical leadership but should be built into the actual economic management and become a part of it. Progress should be achieved gradually, step-by-step, so that the planning apparatus would consider mathematical modelling as its own work. The official bureaucracy should accept the professional mathematical planner as a collaborator. Moreover, even those in the planning process who would not become modellers should at least understand the working of the models; they should help the model builders and also rely upon their help.

In Hungary, this implied that those who started their career as researchers, professors, and academic scholars, were faced with a decision. Some of them gave up their academic positions and took it upon themselves to work as mathematical planners within the planning apparatus of the economic administration. On the other hand, those who were unwilling to do this gradually handed over the day-to-day work to those permanently attached to the planning apparatus. The principal task of researchers and other academic people is the further development of improved methods, and some consulting, while the systematic application of mathematical planning is a governmental job rather than an academic one.

I do not want to idealize the Hungarian situation. We are, frequently, rightfully impatient because of the slow, uneven progress of this penetration, transformation, and reeducation. There is too much conservatism and inertia. The transformation is slowed down by intellectual laziness and by an aversion to getting acquainted with the new methods. Nevertheless, we have made great progress.

Nowadays, there are special groups and departments in the Hungarian National Planning Office with many workers specializing exclusively in mathematical planning. The Planning Office has its own large computer center. Many models have been built - some of them of very large scale, having more than a thousand variables - with the active participation of one or another leading official of the Planning Office. The planning process has several phases which would be unimaginable now without the use of mathematical models. There is a repeated dialogue going on between the practical planner and the model builder and, with the mediation of the model builder, ultimately, the model. We will return to this later.

My impression is that a very different approach has been taken by the first generation of the mathematical planners in most developing countries. Typically, the initiators of the model, the directors of research, felt that it was most important to generate a good plan, instead of improving planning per se or if it never existed before, creating it. They considered their work as mainly economic research, starting with the design of a model and ending up with the evaluation and publication of the research result. Yet, a more important impact would have been made if organization and reeducation - in other words, the establishment of modern methods of planning the national economy - had been at the center of their work.

The following is a typical story. An outstanding Western professor, or maybe a talented graduate student, shows up in a developing country. His work is financed by some institution of his native country, a foundation or university, or perhaps by some international organization. He is filled

with desire to help and has intellectual interest in research. He completes the work; his report is discussed on location; even a few remarks by local economists may be muttered with proper reverence. There is no great battle over the statements of the model. The professor or graduate student leaves soon after - and life continues just as it was before he came.

This is just like a concert given in a little hick town once a decade by a world-famous violinist. He is listened to with proper reverence but without a real enjoyment of the music: "Bartok, Schönberg - this is too modern, too highbrow for us..." The effect of such an unusual concert would be different if there were better music instruction in the local schools or if there were a town conservatory, quartet, choir, and orchestra to make music available, even on weekdays. If all this is missing, then the world-famous virtuoso leaves, the little town is left without any music at all.

Returning from music to development planning, even short references to the following questions can hardly be found in the literature. How is the planning process working in the country under discussion? What was the state of planning and its underlying quantitative foundations before the appearance of mathematical planning, and what became of it afterwords? To what degree were efforts to have the model adopted by local groups successful? Was the model sound? What were the most typical objections? A discusion of whether the plan was accepted and "applied" is not what is missing. Everyone agrees that the results of a mathematical model can never be accepted literally, number by number; rather what is missing is a discussion of how the researcher, the modelling, affected "planning," i.e., the planning and decision making as a permanent activity. Did mathematical planning, at least in this sense, have a lasting effect?

The connections between policymaker and "domestic" model builders are probably closer than the ties with "imported," short-term visitors. Moreover, even in the case of foreign consultants, the real-world experience is

somewhat better than one would conclude from publication, or more precisely, from the lack of pertinent published information. In any case, the literature reflects the subjective priorities of the researchers and other model builders; they are not writing about these problems, or hardly at all. Neither positive nor negative feedback is mentioned. How, then, should a model building project be organized in order to make an effective contribution to "planning?" I offer the following set of recommendations based on my own experience, both its successes and setbacks. We emphasize requirements for projects led by academics in countries where there has been little experience with model building. Most of the lessons also hold in more "sophisticated" settings.

(i) The entire task, each individual phase of it - from data compilation, to design of the model, to appraisal of results - should be performed as a team project. There should be local people, who are present or future planners, as members of the team. In their selection, their immediate contributions to the current project should not be the only considerations. An equally important or even more important consideration should be: Will they be able and willing to take over the relay stick from us some day, to continue the construction and computation of models similar to those we worked on together? This is typically an area where real pedagogical results can be obtained only by the principle of "learning-by-doing." My impression is that in the few countries where such teams were developed, e.g., in South Korea and perhaps in India an enduring effect can indeed be found.

(ii) Occasional discussions between the model builders and the local practical economic leaders, economic politicians, and official planners are not enough; rather, a constant, lively, working relationship is needed. Here I am thinking of the people who are not participating directly in the team but who have actual planning and economic leadership responsibility.

It is no less important to establish lively contacts with local academic economists, who may exert strong influence on public opinion, and who perhaps act as advisers to the local government of planning agencies. If these people observe the activities of the modellers with suspicion or, even worse, with envy and aversion, there can be little hope for acceptance; they will be permanent opponents and critics. The friendlier the contacts with local academic circles, the smoother will be the progress of new methods.

(iii) The structure of the model should be simple, especially in the initial phases of introducing mathematical methods and formal models. The degree of complexity should not be set to satisfy the high standards of the university colleagues or the professor in charge of the project; rather it should be adjusted to the intellectual "absorptive capacity" of the local practical planners. The primary consideration should be that the local planners understand and accept the simpler model, consider it their own, and begin to apply it independently. If this "revolutionary" change takes place in the planning process, all the rest can be left to gradual development; in this case, the local planners will be able, by themselves, to change over from simpler to more complex models.

This is a difficult requirement and requires selflessness. It may not add to the academic reputation of the professor directing the research. Sometimes there may be a ligitimate need for compromise between these two research objectives. In any case, this criterion is a most important gauge of the real goal of the researcher, the improvement of planning in the country involved, or his own scientific achievement.

(iv) Local decision makers and planners face numerous economic policy problems. A model, or rather the series of computations performed with a model, should be designed to be able to furnish valuable information about the real-world problems of the planners and practical decision makers.

I used the broad wording, "to furnish information, intentionally. We cannot expect our model to give final, decisive answer; it can be considered an accomplishment if it only inspires interesting thoughts, if it furnishes additional points of view for a decision. Neither will I take a stand about the mathematical form that the information should take. Suppose that the problem under consideration is the balance of payments. The balance of payments may be an endogenous variable of the model; it may be a maximand or objective function; or it may be an exogenous constraint subject to parametric variation. In each of the three forms, we may gather information about the mutual relationship between the balance of payments on the one hand and about other economic events and activities on the other.

We also have to take into account an internal dilemma for the researcher, similar to the one already mentioned in connection with simplicity of the model. Every researcher has one or more pet themes. One is interested in import substitution, another in increasing returns to scale, a third in the length of the time horizon, a fourth in the stability of shadow prices. It is quite understandable, and scientifically very useful, if the researcher views his work in a developing country as an opportunity to experiment with the real numbers of a real economy in connection with investigating his pet interests. It can only be to the advantage of his own research if he discusses such questions with the local practical planners. But he should also be aware of the real weight and importance of his pet theme in the totality of <u>all</u> of the problems and development dilemmas of the country in question. His problem may be only one of methodology; even if the issue concerns economic policy directly, it is only one of many such problems. The impossible, to completely ignore one's personal scientific interests, should not be asked. But self-discipline and sober compromise are possible and needed in deciding the weight to give the problems of economic policy as they are perceived by local policy makers as opposed to those of the research scholar.

(v) With these points in mind, it is highly desirable that both the structure of the model and the series of computations to be performed with it are fully designed at an early stage. But even the best thought-through design cannot substitute for an active dialogue between the model builder and the decision makers who will be asked to use it. It is important to emphasize this recommendation, for it is a most important element of the general requirement for a lively working relationship.

The planner and the model builder should try to delineate together the issues to be analyzed. In any intellectual problem-sovling activity, developing a clear formulation of the problem is often more difficult than finding the actual solution. The dialogue between planners and model builders should usually start with the planner thinking aloud about the range of problems which concern him, and the modeller explaining what his tools can accomplish in analyzing them. Ideally, the model builder would later take the results of his computations to a responsible economic politician, to a planner in a high position, and evaluate the results jointly. The economic politician then may ask, "And what would be the result if we did this instead of that?" The mathematical planner then returns to the computer, translates the question into the language of the model, runs one or more new computations, and returns to the planner with the result. Of course the questioning can take the opposite direction as well. The model builder may ask, on the basis of the lessons learned from computed results, whether this or that assumption of the policy maker is realistic.

If I had to judge on the basis of a single phenomenon whether the work mathematical planners has "matured" in a given country, I would try to observe whether such a question-and-answer process had been developed or not.

(vi) The estimates, forecasts, and plans of the nonmathematical planners should be utilized to a considerable degree. We should not strive to generate all of our computations exclusively by a "parthenogenesis," drawing directly from objective statistical sources. This is only way to

approach problems. At least some experiments should be constructed on the basis of numbers obtained from practical, nonmathematical planners. For example, with programming models we frequently use the procedure of describing as constraints certain aggregate targets, which are forecast by nonmathematical methods, leaving the model free in the choice of details. In other words, the model tests whether the aggregate forecast of the planners could be accomplished more efficiently. The interest of the nonmathematical planners is usually increased if they see "familiar" numbers, if they can relate the results obtained by modelling to something they know. The following approach creates confidence: "We are not aiming at something completely different from your ideas. At least as an approximation, we want to investigate how your plans can be realized, only a little bit more efficiently."

I am not proposing that, in the computation phase, we should not deviate courageously from the original ideas of the planners. But gradual change of thought can be assured by calculating variants close to the original ideas as well.

This is complemented by another related proposal: The calculations obtained with the models should be compared carefully with independent nonmathematical plans. One also has to take into account the sensitivity, and possibly even the resistance, of those who developed the original plans; these people would not like their ideas to be shown as stupid by the mathematical planners. I am not proposing a lack of principle but rather special attention to fitting together different arguments and approaches. The superiority of a plan computed using a model should be demonstrated convincingly. No one is convinced by the mere fact that the plan projections were computed by a mathematical model using an electronic computer, not even if we call them "better" or even "optimal," according to an indicator (objective function) designed arbitrarily by us.

The mathematical planner must not believe that, when he debates with practical planners, he is always right, and that the only problem is to convince the other side about his truth. We should be very modest and quite critical of our own work. In many cases the practical planner, relying on long experience, will be right. His naive and subjective estimates will sometimes be more reliable than ours, generated by mathematical models, which are also based on very strong simplifying assumptions. The modeller should approach the men of practice with the double aim of teaching and learning

(vii) The model's results should be summarized in a report clearly understandable to practical people. This task closely resembles that of a translator. The mathematical planners have developed a peculiar slang, full of such terrifying expressions as "complementary slackness," "two-gap model," "gradualist path," and "turnpike." We have to acknowledge that even academic economists, working in other specialities, do not necessarily understand this slang, to say nothing of the economic politicians. It is sometimes a real headache to determine how to present the end r sults of computations, involving several hundred thousand numbers and obtained from a large system of equations, in only a few words, tables, and simple diagrams, so that they are really understandable, yet without unnecessary oversimplification.

(viii) Another necessary (but not sufficient) condition for successful completion of the project is that the practical planners and economic leaders should consider the results meaningful and interpretable. Unconditional acceptance of our recommendations cannot be expected, and there is nothing wrong with objections voiced to the results obtained by a formal model. But as a minimum requirement, the results should not be considered absurd for naive. In my view it is very important that the computations should not be smiled at behind the back of the model builder. We should not begrudge some expenditure of energy in finding out how the people who are responsible for economic decisions in the country really feel about the results. We should try to provoke a frank discussion and should not relax until we are convinced that the computations are taken seriously.

(ix) Finally, work is not finished with the preparation of a particular set of computations for a given plan. The proponents of mathematical planning should try to instill a familiarity with their methods and assure their inclusion into the systematic institutional planning framework. If the work was led by a foreign consultant, it ishould not be irrelevant to him what happens after he leaves, who is going to continue his work, and under what conditions. Future systematic improvement of the statistical data base (along the lines advocated in Chapter IV), further development of the compitational basis of mathematical planning, and training of mathematical planners should be advocated. In the foundation of enduring results, the researcher should be not only a scientist and adviser, but also an organizer and "agitator," a popularizer of modern planning methods.

(x) Summary. If the time spent by the leaders of a research project on the construction of a model, securing that data, carrying out the computations, and evaluating and publishing results is considered as taking up 100 percent of their time (that is, if they are unconcerned about whether the methodology itself is being adapted and whether the model's results will have any practical effect in the distant future) then, according to my experience, this "basic working time" may be doubled if the nine above recommendations are carried out. The education and convincing, in work and writing, of both the research team and other practical planners are extremely time consuming.

I have not read anywhere an account of how the working time of the development planning model builder has been divided. But I am probably correct in believing that it is closer to the above described "research" 100 percent than to the "organizing-educating" 200 percent. But as long as this is the case, real penetration of mathematical methods into the planning processes of the developing countries is going to remain very, very slow.

I believe my proposals have much general validity; however, their practical implementation depends on the degree of maturity of nonmathematical planning. It is only clear what aims are worth striving for if there is

already organized, institutional, nonmathematical planning. The development of the "battle plan" is more problematic if, at the first appearance of the mathematical planners, there is no or hardly any other kind of planning available. Should we then start exclusively with modelling? Not in my opinion. No matter how much I believe in these methods, I feel that they cannot really stand alone. Life is much more complicated than our greatly simplified and condensed models. We need double-checking tools, including the estimates and "naive" calculations of the practical planners and high-level economic administrators, at least as a complementary control. In a single model, only a few hundred relationships and constraints can be considered. But people working in the central planning agencies and lower-level institutions and enterprises "sense" hundreds of thousands of further constraints and relations, and they can give expression to these in their own estimates. Mathematical planning will develop successfully only when it develops as one element of well-prepared and well-oriented institutional planning, connected by many threads with real economic life in developing countries.

3. THE SCARCITY OF THE PROBLEMS EXAMINED WITH MODELS

In the previous section there was a detailed discussion of how to establish a closer relationship between model builders, on the one hand, and official government planners and high-level economic administrators, on the other. While agreeing with these proposals, I wish to call additional attention to one particular danger: It is not at all certain that the official planning bureaucracy sense correctly the actual development problems of the country or, more precisely, the relative weights of different problems. Planners can be inhibited by many different factors, ranging from erroneous theoretical economic views to social and political bias. It would be a serious mistake for the model builder to exclude from his investigation those burning questions which the politicians in power would like to forget.

I do not wish to discuss here what kind of recommendations the mathematical planner should propose but rather what alternatives he should examine. In my view, the models, and the experiments performed with them, should be constructed in such a way that it would be possible to analyze the conditions and consequences of various social-political trends and various development strategies. For example, in a country in which there is argument about whether there should be agrarian reform, and whether the reform should be moderate or radical, the long-term, economy-wide planning model should be capable of testing the implications of at least a few policy variants.

Of course, in this regard the model builders should not restrict their intellectual contacts exclusively to the circle of government planners. They should also pay attention to what other groups and movements have to say or what they write.

Let us take a look, more concretely, at the key questions of economic policy that have been usefully studied using economy-wide planning models:

(i) The growth patterns between various sectors,

(ii) The structure of foreign trade, import substitution, the trade balance, and the balance of payments;

(iii) Foreign credit and aid;

(iv) Technical development, especially in the allocation of capital and labor;

(v) The scale and proportion of saving and investment. Along with this the time paths of accumulation and consumption, and, ultimately, the division of the benefit and cost between present and future generations.

This list is, of course, not complete. Several other problems, discussed in one study or another, may be added. But I feel that it contains the intersection of the principal problem sets studied in practically every significant research project described in the development planning literature.

The listed problems are extremely important. The criticisms below are not aimed at diminishing their significance. The themes I will emphasize next are not meant to take their place but to stand next to them at the centre of attention. They are important issues which have been largely ignored in previous research in developing countries.

3.1 Targets versus Instruments

Economy-wide planning models concentrate their attention primarily on "real" flows such as physical inputs and outputs of the economy, the structure of production, foreign trade, and consumption. The objective of the analysis is to determine numerical, quantitative development targets in these areas. At the same time, these models rarely specify how these goals and targets are to be realized. The models are not particularly instrumental in character. This is one of the most important criticisms made by potential users who feel there is nothing they can do with the results of planning models.

In my view, economy-wide modellers who leave careful analysis of instruments to other models (such as short-run econometric models) or to the practical planner working independently are mistaken. One of the most important elements for further research in methodology is how to build instrumental variables and relations into development planning models. Admittedly, this is a difficult task, requiring careful analysis and raising a number of perplexing problems.

One major problem is disaggregation. A model becomes, at least in part, "instrumental" as soon as individual investment projects are included, in addition to several rather aggregate sectors. Indeed, the model itself could then decide about whether or not the projects should be accepted.

There are several techniques for attempting this. For example, one method is to treat several especially important projects as indivisible integer variables and then link them with the rest of the economy.[2] Another way is to "blow up" one or two key sectors for detailed examination.[3] Finally, there exists a still more comprehensive technique: The development of a multilevel planning system such that aggregate sectors are placed in the higher levels, while in the lower levels disaggregated individual projects are included.[4]

Another important issue is the building of financial variables and relations into the model. While literally all economy-wide models deal with the international balance of payments, there are other financial considerations of equal importance:[5]

(i) The national budget and system of taxation. If there are significant regional problems in the country, then the regional budgets are also important;

(ii) The financial requirements and sources of financing investment which usually must be specified in a disaggregated form according to different forms of ownership (for example, state, private capitalistic, small farmer), and possibly according to different sectors;

(iii) Economy-wide balance of private purchasing power and the supply of consumer goods and services, which is very significant from the point of view of possible inflationary tendencies; and

(iv) Credit balances.

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2. For an example of this approach for Korea, see Westphal (1969).

3. Clark (1970) uses this method in the case of Nigeria.

4. This has been attempted for Mexico and reported in Goreux and Manne (1973).

5. The large-scale linear programming model of the Hungarian five year plan for 1971-75 contains a large set of fiscal and financial variables and equations. See Morva and Bager (1972).

Some mathematical programmers object to including financial considerations because a whole series of new constraints would show up in the model, making more difficult any conceptual interpretation of the system of underlying shadow prices. I feel that this objection is irrelevant. It is not necessary and, indeed, is probably impossible for the shadow price system of a long-run, economy-wide programming model for a developing country to have a strong resemblance to a real market price system. I am not going to expound the arguments and counterarguments which are well discussed in Chapters III, V, VII, and especially in VIII.

I should remark here that, in principle, the shadow price system itself is instrumental in nature, usuable in the cost-benefit analysis of investment projects; however, use can be made only with great circumspection, care, and much reservation. In cost-benefit analysis and project evaluation, several other sources of information also have to be taken into account. As a result, I cannot agree with the quite widespread point of view that the shadow price system should be the main or even the only instrumental result of such models. Much more important and effective would be the inclusion of the instruments mentioned above; however, their introduction would require some restructuring and reformulating of existing modelling techniques.

3.2. "Physical" versus "Human" Aspects

Two adjectives originating with Hegal and Marx, "Verscahlichung" and "alienation," apply very well to most planning models for developing countries. Although these models describe the flow tof objects, things physical inputs and outputs (and perhaps of money), somehow, living people are missing from them. Let us use an example: The model states that as a result of industrialization, certain changes will occur in the technological structure of production, the capital-output ratio, the balance of

payments, and so on. Yet at the same time a deep-seated social change is taking place as a consequence of industrialization. Millions of people become factory workers, giving up their traditional rural living patterns. As cities swell, masses of people stream to the slums. Urbanization, together with the both beneficial and malvolent effects of overturning the whole fabric of society, is as important a consequence of economic development as the deficit in the balance of payments. Despite the fact that this is well known to every economist and model builder who deals with the developing countries, somehow the convention that it does not belong in the model has become established.

I will try to summarize, at least in key words, which social processes, in my opinion, should be included:[6]

(i) The transformation of the occupational structure.

(ii) The transformation of the structure of learning, training, and culture.

(iii) The transformation of the residential structure (the proportions living in hamlets, towns, cities, and giant metropolises);

(iv) The transformation of property and class relations (small farmer, plantation owner, domestic servant, factory worker, small businessman, big businessman, and so on).

These processes are not simply to be reclassified into sociology, "urban economics," or some other related science; they belong most intimately in the process of economic development; they are accompanying phenomena, causes and effects, goals and methods, all at the same time. Neither should we argue that they cannot be "mathematized," as they are all observable, measurable, and quantitatively describable phenomena.

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6. Some of these processes are reflected in the Ivory Coast model of Goreux (1973) and Condos and Davis (1973a).

3.3. Allocation versus Distribution - Employment

Although very closely connected with the previous point, distribution questions are so important that they deserve special consideration. Most planning exercises are models of rational allocation of resources. The distribution of the social product among various individuals, groups, and classes is, for the most part, ignored.

The truth is that, in the majority of developing countries, the most acute economic and political problems are mass poverty, unemployment, and underemployment. These are extremely painful problems which, considering the entire Third World, affect hundreds of millions of people. There is no need for lengthy statistical arguments, as the phenomenon is well known and described in hundreds of different documents, official data, statements of politicians, studies of economists and sociologists, and newspaper reports.

The entire economic profession is more or less in agreement that an enduring solution can be effected only by economic growth over a very long time period. Nevertheless, a pertinent question is: What about until then? Should we wait until the economic development of 10, 20, or 50 years somehow overtakes the period of mass misery? And, although with an aching heart, should we leave hundreds of millions of people in destitution until then? Or should something be done urgently? How much of a compensation is a better life in the twenty-first century to people hungering today?[7]

And misery is only one side of the picture. Most economists agree that the typically observed process of development actually increases the income inequality in most poor countries (at least in the short run). Should we acquiesce to this as an unavoidable fact of life, or is it possible to do something about it? I really do not have the answer; I only raise questions. But, do not forget that these questions are raised daily in developing countries, not only by the opposition to the establishment, not

7. Many of the issues raised here are summarized and discussed in Chenery and associates (1974).

only by revolutionaries. They are also posed by important supporters of governments, and even by those in power, because an explosion of mass dissatisfaction might threaten their power and position.

Quite intentionally, I do not want to go too far along these lines; I do not wish to discuss changes that are accompanied by a radical transformation of the existing power structure, either political or economic. Instead, as an illustrative example, consider the eventual application of those Keynesian prescriptions that are now adopted without hesitation even by many conservative politicians in developed, capitalist countries. Mass misery in many underdeveloped countries would be quickly reduced if the unemployed were given work opportunities through public works such as building roads, canals, public buildings, schools, and hospitals. This would have little direct foreign exchange cost and would require very few skilled workers. Yet, such projects could absorb a considerable portion of the unemployed and the underemployed. In addition, well-planned public works would be a productive use of labor, for they would enrich the national wealth by creating useful social facilities.

This is an important measure, suggested and urged by the Committee for Development Planning of the United Nations.[8] No one thinks that such a policy, by itself, is sufficient to solve the problem; however, it seems clear that implications of these kinds of policies can and should be tested using economy-wide models. Variables could be introduced into the model to represent the labor-absorbing public works projects, together with equations which assure the consistency of these activities with the rest of the economy.

I have not seen any economy-wide model which deals seriously either with the idea of urgent labor-absorbing public works or with any other economic policy directly aimed at attacking mass poverty and unemployment. Seeing this deficiency, I regard as sterile and grotesque the endless discussions about appropriate time horizons in "welfare maximizing" models. It

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8. See United Nations, Committee for Development Planning (1972, 1973).

is a bit ridiculous to debate whether welfare should be maximized over twenty years, thirty years, or over an infinite horizon, when millions of people who are hungry and unemployed right now are demanding immediate help. The well-known Keynesian saying "In the long run, we are all dead..." is true here in the medium run, too; many may starve if economic policy does not provide help soon. I am not against long-run planning; I do not want to push onesided, short-run considerations. But we must study very carefully the interactions between urgent short-run measures focused against mass poverty and unemployment, and the long-run growth of the economy.

The main reason for this neglect is almost certainly the political circumstances in the developing countries. If the local policy makers were really concerned with the organization of public works, they would force the planners to insert such activities into their models. Nevertheless, model builders need not wait for the initiatives of the politicians; they have their own responsibility. Therefore, as an additional explanation, we must look also at the theoretical background of the model builders. I think that, at least in the case of economy-wide models, mathematical planners are strongly influenced by the neoclassical tradition. The typical mode of thought, with perhaps slight exaggeration, is described below.

The country modelled has surplus unskilled labor or open unemployment. Ergo, we do not need to regard labor allocation as a constraint for the model. In other words, the purpose of the plan is to solve the conventional neoclassical problem of resource allocation, with scarce resources to be allocated. It does not matter whether this is done in the framework of a firm, or a competitive market economy, or a developing country. All cases are alike since the crucial problem is always the same: The efficient allocation of scarce resources.

I, for one, think that the scope of economics, and within economics the scope of scientific planning, is much wider. Resource allocation is only a narrow subset in the larger set of economic problems.[9] You do not have to be a Marxist, or a Keynesian, or an adherent to the new Cambridge school, but only to be a sound pragmatic economic policy maker to admit that the serious exploration of employment problems simply cannot be left out any development planning model. The importance of employment is greater, the farther we are from achieving it. It is a somersault in logic to say that since there is surplus labor, we may disregard labor in the model.

Why do the designers of planning models usually think in terms of scarcities, and consider only upper bounds on scarce resources? Why not apply lower bounds on the minimum level of employment, at least for some experiments?

Let me add some qualifications to these critical remarks. What I am criticizing is not planning as such, but formal, mathematical planning. There are countries where some nonformalized planning exercises try to deal with the questions mentioned above. My comments are mainly concerned with improving the medium - and long-run economy-wide studies which are discussed in this volume. We can notice signs of improvement. Some of the practical models discussed in Chapters V and VII try to focus on income distribution and employment.[10] It would be very helpful to give wide publicity to these experiments, and to develop further the methodology of formal planning of income distribution and employment.

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9. The author summarized his critical comments on neoclassical econmics in his book Anti-Equilibrium (1971)

10. Goreux (1973) and Condos and Davis (1973b) on Ivory Coast, and Blitzer and Manne's (1974) model of dualistic economics represent two promising new approachers.

3.4 Disharmonic versus Harmonic Growth

It is easy to understand why developing countries wish to grow as rapidly as possible. Unfortunately, this rush may lead to one-sided, distorted growth and to disharmonies of the following kinds:[11]

i. Usually physical capital growth is given prominence, and human capital development lags behind;

ii. Usually the quantitative expansion of output is emphasised, with improvements in the quality of goods and services lagging behind;

iii. Usually the construction of new housing, schools, hospitals, and roads comes into prominence, and careful and continuous maintenance of old buildings lags behind;

iv. Usually increases of reproducible national income and wealth are emphasized, and the conservation of the nonreproducible environment lags behind.

The first half of each phenomenon listed above refers to processes which are well defined in conventional statistical accounting, particularly in aggregate indicators of production, physical capital, and consumption. Accordingly, they are easy to include in economy-wide planning models. At the same time, statistical accounting is very deficient regarding the processes in the second half of each of the phenomena. These processes are usually barely treated or completely ignored in compiling national income accounts. Accordingly, they are also neglected in planning models. In economics we have many respectful names: "externalities", "imponderabilia", "public good". The tradition of our profession is to mention them occasionally to demonstrate that we are aware of their importance and then continue the discussion of any problem as if they did not exist. Small wonder that development planning models continue the tradition!

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11. For further elaboration of these ideas see the author's book, Rush Versus Harmonic Growth (1972).

design of future consumption patterns should not be left exclusively in the hands of isolated individuals. The decisions must be supplemented, and if necessary corrected, by planning and active governmental intervention.

4. Two Possible Counterarguments

I just described what I see as the missing factors in most development planning models. There are two usual counterarguments brought up in debates. One argument refers to technical difficulties. It states that until now, planning models have been designed mainly for modelling the real sphere, i.e., production, trade, investment, and similar physical activities, I do not find the argument convincing. There are no technical obstacles to adding variables and equations which describe income determination, employment, education, urbanization, and various social characteristics. Mathermatical programming is a very flexible device and can be expanded to include a very large set of problems; even when optimizing techniques are not feasible, simulations models can be utilized to investigate many important questions.

The other couterargument refers to the academic freedom of the research scholar. All criticism is answered by saying that there is no book or article that could not be attacked for leaving this or that problem out of the discussion. I think those using this reasoning are confusing two very different matters: The role of the academic scholar versus that of the responsible planner. I agree with the principle of freedom and sovereignty in the choice of subject matter for academic research, perhaps because I, too, am an academic. The probability of success is, of course, higher when the scholar is researching topics in which his interest is strong.

The situation for the development planner is quite different. He must deal with all socially important questions. The choice of problems cannot depend completely on his personal taste and intellectual interest, He simply does not have the right to neglect any important question, because to do so may harm the country. Perhaps he will not be able to handle all important problems, because of lack of skill or experience, or because of theoretical or technical difficulties, or limited information. These are acceptable excuses. But the international exclusion of some problems simply because as an economist he does not find them interesting is never justified.

The dilemma stems from the fact that most designers and builders of planning models are both scholars and planners at the same time. I think they should apply a double moral criterion. When writing a book or an article, or when lecturing at the university, they could follow the principles of academic freedom. But, when developing a model for serious discussion by responsible decision makers, they should adopt the moral criteria of a planner. In that case, they must try to consider all the important questions when building their models. And, furthermore, they must weigh the relative importance of vatious policy issues on the scales of their social importance rather than their academic challenge.

From these ideas we can draw a general conclusion. We must step out from the narrow circle in which are moving. The model builder does not make a final political decision; usually, he only explores problems; however, the exploration should be much broader than in the past. We cannot be satisfied with bureaucratic or technocratic "allocation" exercise. A development planning model should demonstrate the consequences of different alternative economic policies on the whole life of the society in question.

The set of problems just described partly overlaps another set, often called "quality of life". Our policy recommendations for a developing country are based partly on our judgements about the factors influencing the quality of life. I shall discuss only one example, that of consumption.

Almost without exception all models use either demand functions or fixed consumption patterns. The Engel curves which are often used[12] are usually based on the assumption that the consumption pattern of a developing country will simply follow that of the developed countries. Is this really necessarily so? Consider the case of transportation. Leaving aside cost levels, is it beneficial to permit the widespread use of personal passenger cars, which leads sooner or later to pollution, noise, fatal traffic accidents, and complete financial failures of public transport systems? Perhaps it is already too late to reconsider the question in the United States or Western Europe. The automobile is there, and life would stop without cars. But it is not too late to think about this, and about similar aspects of the quality of life, in Nigeria or Burma. Nevertheless, economy-wide planning models, and even sectoral models, rarely treat such problems; in most cases they regard the composition of future consumption as already decided through known demand functions. They tacitly assume that if we raise illusion of consumer sovereignty, the problem is already settled. Unfortunately, that is not the case. The decision on consumption patterns is extremely complex and full of dynamic externalities. To continue the previous illustrative example: The automobile customer of today decides on his own expenditures for transportation. Buying a car in a developing country, he will enjoy the fact that there are only a few cars on the road. But, in making this decision, together with many other consumers, he does not take into account the future externalities of preferring individual transportation to public transport. All the harmful consequences will fall on future generations including future car owners and commuters using public transport facilities. Of course, this is only an illustration, showing that the

12. For a discussion of the use of Engel curves in planning models, see Chapter III.