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SECTORAL PROJECTIONS: SOME BASIC APPROACHES

Contents

A. BACKGROUND

1. Macro-economic modelling of African economies

1. In 1979-1980, the ECA secretariat devoted considerable effort to building macro-models of the African economies for the purpose of forecasting their future growth under different sets of assumptions. During the construction of these models attention was drawn to the various limitations to which their design was subject. It may be useful to recapitulate some of these limitations briefly here.

2. It was noted in the documents presented to the first session of the Joint Conference that econometric model building even of the simplest type is in its infancy in Africa 1/. While such model-building excercises have been welcomed as pioneering efforts, it has been realized that several very grave limitations exist in both the formulation and the quantification of the models. Yet whatever their deficiencies, they are the only available means of arriving at a systematic and consistent understanding of the economic process, its past performance and its future growth path.

3. It was emphasized that these models are subject to a great deal of error owing to the paucity of data and various unprecedented changes in some of the variables and their interrelationships, which may not be obvious at the time of formulation of the model. A pragmatic and critical approach is thus needed in appraising these models and their performance. The limitations lie both in the economic content of the mathematical relation involved and also in the paucity, unreliability and inadequacy of the statistical data base used in estimating the structural and behavioural parameters.

4. It was further noted that building a set of mathematical relationships with coefficients derived from time series might lead to a certain type of mechanistic concept of growth in which certain sets of selected variables are accepted as key indicators of growth and development. It should be kept in mind that some of these concepts are still held in doubt even in developed economies. The theory of investment in under-developed economies, for example, does not take into account the absence of competent entrepreneurs. Similarly, the role of individual investors in such countries may be quite different from that presented in conventional Western theory.

5. Another problem concerns the stability of the equations of the models. For example, the patterns of consumption and the imports, particularly in developing countries, may change with increased industrialization. The same problem arises with potential resources. In many cases the discovery of natural resources has brought drastic change to the economy of a given country or region. The discovery of petroleum in the Middle East completely changed the tempo of development there and it is now faster than could have been envisaged in the model. The African continent still remains very much unexplored, and therefore discovery of resources may completely upset any path projected by a model.

1/ See, for example, "Perspectives of the African region in the 1980s and policy implications" (E/CN.14/737); "Projections results for some individual African countries" (E/CN.14/737/Add.1); "Comparative analysis of the projections made for developing African countries by various United Nations bodies" (E/CN.14/738); "Quantitative analysis of the problems and perspectives of the African LDCs and "Perspectives of the African least developed countries in the framework of the Third United Nations Development Decade" (E/CN.14/748).

6. Finally, there remain political limitations on the stability of the economic and behavioural relationships contained in the model, especially in developing countries. Because the present economic order is based on the domination of developing countries, through transnational corporations, the monetary system, technology, etc. a partial or total change in the economic order may give rise to a new socio-economic structure which could not be assumed as one of the available options in the projection exercise, and which would of course upset most of the parameters and relationships in the model. The large increase in petroleum prices and its impact on the economies of oil-exporting countries is a vivid example. In other words, in making projections it is difficult to make exhaustive provisions for such types of strategic structural parameters, which in fact, are the most challenging in most of developing Africa.

7. Another category of limitations relates to the statistical framework. Firstly, the adequacy of statistical data is often a major problem as far as developing countries are concerned. There exists a gap between observable problems relating to the dynamics of socio-economic change and the conventional methods of quantification. Thus the choice of statistics is predetermined in the measurement of socio-economic phenomena in the developing countries, since it is based on preconceived notions about basic social and economic relationships concerning development. It is not an easy task to adapt existing quantification methods to the economies of developing countries so as to take account of their heterogeneous structures. The need for standardization often distorts much of the statistics collected and militates against accuracy.

8. Furthermore, even financial and human resources are often inadequate for the collection of extensive statistics, and there is often scepticism about building up any organization for that purpose. Failure in the implementation of many development plans in African countries stems in part from the weakness or non-existence of statistical foundations.

9. Bearing in mind all these limitations, the ECA secretariat considers the model-building exercise as useful and full of future promise for the following reasons:

(a) Every African Government frequently needs to project the future course of its economy in order to formulate its foreign and domestic policy measures like taxation, customs duties, wage rates, etc. Individual countries have to estimate their future revenue and expenditure and decide on the monetary measures they will be required to take. All these activities are essential yearly functions for most Governments and public bodies. The exercise carried out by the ECA secretariat should help to identify what can be included in their policy packages.

(b) The results produced by models provide useful guidelines in identifying bottle-necks, imbalances and steps required to bring about structural changes.

(c) When actual development objectives are defined, the use of a model helps in improving the statistical framework of the policy.

(d) Simulations carried out through the model illustrate many possible alternatives as well as feasibility and implications of various structural changes.

2. Quantitative analysis of the economic structure in African countries

10. In African states model-building is carried out generally to help shape government policy on industrialization, raising of the standard of living, maintenance of stability in prices, management of the demand for and supply of foreign goods and the direction in which the authorities want to guide the growth process as well as general objectives such as self-reliance and regional co-operation, as outlined

in the Lagos Plan of Action. The possibility of intervention in the economy is to a great extent determined by the structure of the economy and the role of the State in this economy. In addition, the interactions between the different sectors of the economy also depend to a large extent on the structure of the economy. To take an example, 90 per cent of the working people in the private subsistence sector will have very little sectoral interaction, and therefore the main objective of modelling such economies for policy purposes will be to forecast the behaviour of the subsistence sector in a given set of circumstances. The more specialized and diversified an economy is, the more amenable it is to modelling, as the data necessary to build the model apply largely to the monetized sectors.

11. Thus, in the analysis of African economies three broad types of economic sturctures may be distinguished. The first is the economy in its most primitive form, with subsistence production dominating and a monetized market economy operating only on the fringe of the economic process. The second type is the more usual one, with a substantial subsistence sector existing side by side with a fairly strong monetized sector. The third type is the most modern: there is a fairly large subsistence sector, but the monetized sector is dominant in its influence.

12. In devising sectoral models for the first type of economy special emphasis must be given to the subsistence sector and its interaction with the non-subsistence sector. For practical policy purposes such economies deserve separate treatment. For the other two, we shall for the time being specify only so much detail as will involve the subsistence sector in a minor role.

13. When reviewing experience in the building of macro-economic models one comes naturally to the question of how far multisectoral models are a necessary follow-up to macro-model-building.

14. Two path-breaking approaches in economics were developed between the two world wars. The first was the Keynesian approach of visualizing a national economy through a system of national accounts and formalizing the economic mechanism on the basis of the interaction of highly aggregated economic activities broadly defined in the framework of the national accounts. The approach thus immediately forced one to consider the problems of consistency and interaction between diverse economic activities like production, consumption, saving and investment, and to link those activities with official policies. But the Keynesian approach omitted the question of production structure altogether. It only considered households, final consumers and suppliers of labour, and private enterprises which took up the function of production, employment and investment. The developed economies which Keynes had as a reference point consisted of a well-defined production structure where in normal cases most production decisions were taken by private entrepreneurs motivated by profit, so that productive efforts were guided by profit motive as the sole concern. Production structure was thus considered irrelevant in the macro-analysis in detail for government policy formulation.

15. Leontief, however, emphatically brought into the picture the other side of the economic machinery: the structure of production. Leontief showed that an economic system has a well-defined production structure, and that equilibrium or disequilibrium often arises because the interaction of the production structure within itself and with the final demand structure is ignored.

16. The two aspects together help to provide a comprehensive picture of the sectoral ramification of the problems of development in an under-developed economy. To a policy-formulating body especially in a country seeking to change the economic

structure, the structure of production in detail is as much a necessary adjunct to the study as final demand. Even details of the structural aspects of final demand are of great importance in policy formulation. It is not enough to assume that GNP growth at a certain rate. It is also necessary to know the structure of the GNP and how it is moving particularly for countries where some diversification of economic activity is a sine qua non for self-sustaining growth.

17. Logically, therefore, the more aggregated macro-model exercise leads to the more elaborate approach of multisector economic models. The purpose of the present study is to outline some of the possible approaches to multisectoral analysis and to illustrate them by results of specific country studies presented in annex II.

3. Objectives of sectoral analysis in the African context

18. The main objective is to complement the macro-economic models by means of detailed forecasts of production, final demand components, factor inputs (i.e. employment, productivity, capital, etc.) and foreign trade in goods and services. It was felt that the results would help in throwing light on some sectoral options. In other words, once the objectives of a development plan are set and the global macro-economic framework defined in terms of quantitative targets, multisectoral analysis helps in (a) disaggregating these targets, thus pointing out the various options with respect to factor inputs, production and investment, and (b) ensuring over-all consistency with the framework already defined in the macro-economic model.

19. It should be noted, however, that not all the analytical tools presented in this study are designed to meet all the requirements necessary for in-depth sectoral analysis. Most of the models presented do not address employment issues as well as prices in great depth, and some of them are not disaggregated enough to single out all important activities or sectors. As is explained below, these limitations often stem from the lack or unreliablility of data.

20. The analytical tools presented in this study should therefore be seen mainly as instruments which may be used in the planning process. They can in no way be taken as substitutes for plan formulation itself, since as is well known the process of plan formulation should start with identification of the basic factors of the "system" to be described and planned (i.e the national economy). Such factors include human resources, natural resources, managment and technical skills, etc. Such a "system analysis" is aimed at bringing to light instrumental variables which might be important for the action to be undertaken in the framework of development objectives and strategies laid down by policy makers. It is at this stage that analytical tools such as those presented in the study should help in formalizing the links between various economic sectors.

21. In the applications presented in section B and in annex II, an attempt is made to use the sectoral models in making a detailed assessment of the implications of some global targets and policies indicated in the development plans of the countries concerned. In view of some of the results presented, it is hoped that such analytical methods could be used in the process of plan preparation in African countries.

22. In considering multisector projection models, several versions of the same case can be described, and different types of these models are applicable to different types of economies. Generally, however, we can classify the multisector models along the following lines:

(a) Short-term types of projection model

23. These types of model try, in an input-output format to carry the financial flows as far as possible so as to make forecasts embracing not only the real inter-industrial sectors but also the financial side and the government side. Of necessity these models cover a somewhat shorter range, and their prime objective and application is forecasting for the short-to-medium term. This type of short-term forecasting tool will be taken up in the studies to be carried out by the ECA secretariat in 1982/83.

(b) Medium/long-term types of projection model

24. There are various types of model in this category.

(a) The simplest type of accounting models do not assume elaborate relationships between the variables but try to set up approximate magnitudes and obtain a consistent set of social accounts based on a set of assumptions.

(b) The second group of models relate to a more complex economy, but assume fairly simple relationships between the variables and try to obtain over-all consistency under a more rigourous condition than mere guesses adjusted by trial and error. Of necessity such models depend a great deal on historical series of national aggregates, and also on economic theories regarding relationships between different economic and other variables.

(c) Thirdly, there is a set of macro-models based essentially on the open input-output model approach using the input-output methodology along with econometric macro-model methods to establish final demand.

(d) The fourth set goes a step further and tries to use the input-output model more completely by considering the elements of final demand in many classes as part of the inter-industrial set-up. This gives a picture however approximate, of the income distribution, and of the relationship between production structure, consumption structure and employment structure.

(e) Further development along the same lines brings us to the dynamic input-output models and other dynamic multisector models of different degrees of sophistication which further limit open-endedness by introducing the capital matrix.

25. Section B of this paper describes a variety of models for medium/long-term projections along with indications of their possible application to African economies.

B. THE SECTORAL MODELS AND THEIR APPLICATION

1. A simple "closed" Feldman-Mahalanobis growth model 2/

(a) Specification

26. Originally, this type of growth model assumed that in any economy there is an initial value added and an initial investment which generated that value added - that is, an initial ratio of total investment to value added. In its original form,

2/ This model, originally developed by Feldman, was later applied to the Indian economy by Mahalanobis. What the latter did was to divide the basic breakdown into investment goods and consumption goods and then develop a four-sector linear system for these sectors.

the model assumed that there are two producing sectors in the economy, one producing capital goods and the other consumer goods, and that initial total investment is allocated between these two sectors. It further assumed an initial output-capital ratio for each of the two sectors. Then, from these initial assumptions, the growth of value added (GDP) for the next period will depend on the initial investment, the fixed output-capital ratios for the two sectors and their investment allocation. The consumption goods and investment goods are given from the supply side. If the goods supplied by the different consumption sectors do not match demand at a given price, adjustment is made either through a change in the price or through an adjustment in the allocation.

27. This two-sector model was broadened to cover several investment goods sectors and several consumption goods sectors by assuming that the sum of the ratios of allocation to the investment goods sector and the consumption goods sector is equal to one. The related output-capital ratios in each sector were fixed. Hence, the output as value added in each capital goods sector and consumption goods sector are estimated and projected on the basis of a given allocation of investment and a given set of output-capital ratios. This is a completely self-sustained growth model which does not take into account the foreign aid sector.

28. The model starts with initial values for a given base-year and the value added figures for subsequent years are derived or calculated after allowance has been made for investment and its allocation by sector. Thus, in the present formulation, there is no estimation of historical parameters. The projection of the over-all economy is based on the initial values of output and incremental capital-output ratios (ICORs) for the base-year, and not on the historical estimated parameters, assuring that the ICORs remain constant over the medium-term period of projections (five years).

(b) Application

29. The "closed" growth model has been applied using Ethiopian data for investment and income in 1978 as the initial year and a provisional allocation of investment, since the Ethiopian economy is modelled on a centralized socialist planning system. In this system, investment is not allocated between sectors through the market mechanism but through a central decision, so that expansion of consumption goods or investment goods derives from the supply side.

30. The Ethiopian economy was disaggregated into five main sectors: three global investment goods sectors, namely mining, transport, communications and power, and, thirdly, export-oriented agriculture, metal, tools, cement and education; and two global consumption goods sectors: manufactured consumption goods, and other consumption goods sectors and residuals. This level of disaggregation was constrained by the availability of data on sectoral investment and sectoral ICORs.

31. The Ethiopian economy experienced many problems and constraints during the 1970s. First of all, a severe drought during 1970-1974 depressed economic activities in the country in several respects. Secondly, a revolutionary transformation of its socio-economic structures fundamentally changed its major institutions. 3/ With such profound changes, past trends cannot be used as good guidelines for projecting the future. That is why a trial run of this growth model was applied to the Ethiopian economy because among other reasons, it does not take into account or necessitate past parameters for the projection of the future trend of the economy. Rather, an inter-industry coefficient matrix is used to derive future values from an initial set of values.

3/ E/CN.14/748, sect. VII.9.

(c) Data requirements

32. Data pertaining to the model, at this stage, are very simple and can be found in the national accounts statistics. In the Ethiopian example the figures for all the sectors for the initial base-year 1978 were provided by the Central Planning Services of Ethiopia. It is to be noted that the third sector is a mixed sector in the sense that some of the goods it produces are exported and the returns used to build up investment. The share flowing back in investment was initially derived from trade statistics.

33. The only difficulty arose in obtaining data for sectoral initial capital stock and sectoral ICORs, and the non-availability of an input-output table for Ethiopia. To remedy this difficulty, sectoral ICORs for the United Republic of Tanzania, a neighbouring country with similarities in the type of development, were used; their values are given in annex II, table 2.1. The Ethiopian inter-industry coefficients were similarly derived from the Tanzanian input-output table.

(d) Results and policy implications

34. Using the generalized growth model with the ICOR values for the United Republic of Tanzania for the five main sectors and the initial given output-capital ratios, the growth path of investment is derived using the periodic allocation for each year. The results of this calculation are given in annex II, table 2.2. Annex II, table 3 gives the derivation of the corresponding value added. It was then assumed that the ratios of value added to intermediate flows in the Tanzanaian input-output table aggregated to the five sectors as in the Ethiopian case were the same as in the Ethiopian experiment. Using the above ratios with the Ethiopian value added for each sector as derived in table 3 produces a matrix for the capital and consumption goods coefficients for the first projection period (1979 - see table 5) and for the last one, 1984 (see table 6).

35. Notable use of this multisector growth model has been made in analysis of the capital resource requirements of industrial mobilization and economic development. While this model looks very simple, its advocates point to its usefulness in avoiding bottle-necks by ensuring that the levels of output of industries (sectors) are consistent with one another and with the available resources. This method, which has been successfully used in the Indian economy, could also be usefully applied to other developing countries, particularly those which have no inter-industry statistics (input-output tables) and whose economies have been faced by major structural changes or transformations in the past. It allows such countries to construct more suitable input-output tables as a basis for analysis and projections of economic development. It should, however, be emphasized that, especially in view of the fact that the investment component of the model incorporates the international supply of investment goods, the closed nature of the model implies a fairly strong assumption about African economies which are not yet self-sufficient in capital goods production. But this part of the model may easily be expanded by including in investment both national and imported components.

2. The disaggregated macro-economic model with variable relationships

(a) Specification and methodology

36. The specification of a disaggregated macro-economic model depends on its purpose and objectives. In other words, the subdivision of aggregates or sectors must be effected in order to account for the main activities in each sector, or at least the most important ones (e.g agriculture, industry, external trade, etc.). However, there should not be too many such sectors, as this increases the difficulties related to the problem of estimation of the parameters of the model.

37. The methodology to be applied follows the same pattern as for macro-economic models. Most of the equations of a disaggregated macro-economic model are obtained through the use of regression techniques. It should be noted, however, that increasing the number of equations on both supply and demand sides may increase the possibility of serial correlation and its associated bias. It becomes difficult to determine stable regression coefficients, and this will reduce the suitability of the model as an instrument for policy analysis. Moreover, the existence of a large number of subsectors or activities increases the difficulties with respect to the deflation index that has to be constructed in order to establish the series at constant prices.

38. Because of the difficulties involved in relating all endogenous variables in a disaggregated macro-model to other variables (endogenous and/or exogenous) through stochastic equations, the decision is often taken to build into the model policy equations based on the objectives and policies laid down in the development plan of the country concerned. The larger the number of such policy equations in a model, the more suitable it is for simulating alternative policy scenarios for the formulation of the sectoral targets of a development plan. In other words, a disaggregated macro-model should contain (a) stochastic equations reflecting what is more or less the historically determined structure of the economy in the short/medium run and (b) policy equations representing the desired or targeted policies, and the desired relationships between them.

(b) Application

39. The disaggregated macro-model approach was applied to the economy of Benin, a country where intersectoral linkages are not traced through an input-output framework. Hence, the only possible way to analyse the behaviour of the main sectors was to disaggregate the macro-model constructed for Benin in 1979-1980 in accordance with the relative importance of various sectors.

40. On the supply side, the disaggregation was focused on the rural and manufacturing sectors. Since in recent years the rural sector has accounted for about 43 per cent of gross domestic product, it was divided into three subsectors, namely food crops. industrial crops and other crops (i.e. livestock, forestry, fishing, etc.). As table 1.1 in annex I shows, while gross output in the food crops subsector is obtained by means of a regression equation, gross output for industrial crops as well as values added in all subsectors are obtained using empirical parameters derived either from historical and present patterns or from intended policies.

41. Although the share of the manufacturing sector in total GDP is relatively small (about 8 per cent) it was felt that, because of the role of industrialization in the structural transformation of any economy and the objectives laid down by Benin's policy makers, an attempt should be made to isolate those activities which play a very important role in the sector. The manufacturing sector was therefore divided into two groups, textile, beverage and vegetable oil industries, and other industries. The first group was related to accumulated investment in the industries concerned, while the second group is assumed to represent a certain share of total sectoral value added. However, in projecting the model to 1985, account was taken of the likely increase in that share due to the completion of the two cement and sugar industry projects.

42. The remaining components of GDP by industrial origin (i.e. construction, transport and communications, commerce and other services and public administration etc.) were not disaggregated because of the scarcity of data.

43. On the expenditure side, the disaggregation relates to the external trade sector as well as to investment. Separate equations were estimated for imports of consumer goods and imports of capital goods, and total imports of goods were derived from those two components. Similarly, total exports of goods were related to exports of industrial crops, which were assigned a planned annual growth rate. However, it was found that, because of substantial re-exporting activities in Benin, total exports of goods and services were closely related to recorded imports of goods. Total investment was taken as a policy variable and a proportion (changing overtime) was assumed to be investment in textile, beverage and vegetable oil industries.

44. Annex I contains a table giving the functions used for each sector in its proper cell from the supply and demand sides. It can easily be seen that enormous gaps in the data must be filled before a compact picture of the national economy in many sectors can be estimated in a consistent way.

(c) Data requirements

45. Since the disaggregated macro-model approach is the simplest of the multisector macro-models, its data requirements are relatively easy to satisfy as national accounts data are often available. However, there remains the problem of disaggregating certain elements of final demand such as investment, consumption and exports. In the case of Benin, investment figures were found only for some activities in the industrial sector, namely textiles, beverages and vegetable oils. Investment figures in activities such as construction, transport and communications, sugar and cement would have contributed to better understanding of the pattern of growth in those sectors. Similarly, disaggregation of consumption into various kinds of goods would have helped in analysing the consumption pattern.

46. Overall, the data on the economy of Benin are rather scanty, and this has prevented a detailed breakdown. Moreover, the national accounts data were obtained mainly through estimates, making it difficult to obtain stable and reliable regression coefficients. More specifically, data on food crops were derived using estimates of cultivated land. Similarly, because of the large volume of unrecorded exports (including cereals, imported and locally produced manufactured goods, etc.), data on total exports of goods and services were also only estimates. However, the most important aspect as far as data were concerned was the difficulty in computing price indices in order to construct appropriate sectoral deflators as well as unit values of imports and exports.

(d) Use of the disaggregated macro-model in planning and policy analysis

47. The main use of a disaggregated macro-model in planning is its suitability in obtaining the national accounting balance, and particularly the saving-investment gap and the trade gap. Although there is no two-way flow showing how goods and services originate (outputs) and where they go (inputs), it is possible from various disaggregated final demand components to estimate values added in those activities and hence their likely growth paths.

48. Annex II, table 2.6 contains the details of the results for Benin. In general it was found that under a set of assumptions derived from the objectives, strategies and policies outlined in the country presentation of Benin for the 1980s, the growth pattern in Benin would be such that there would be significant structural changes in production, with the share of agriculture in total GDP declining from 38.3 per cent in 1979 to around 30 per cent in 1985, while the manufacturing sector would increase to over 10 per cent of GDP by 1985 from 8.3 per cent in 1979. The share of the commerce and services sectors would not change drastically because of the

country's traditional trade links with neighbouring Nigeria and Togo and the transit sevices rendered by the port of Cotonou. Thus, non-factor services are expected to contribute very significantly to the health of the balance of payments.

3. Static input-output analysis

(a) Specification

49. The static input-output model discussed here links sectoral analysis and macro-analysis so that more disaggregated growth forecasts can be obtained.

50. An assumption implicit in the specification of static input-output analysis is that each sector of the economy produces a single good which can be used interchangeably for intermediate demand, for consumption, for investment, as an export or as any other component of demand. Since each input-output sector produces many goods, price and quantity indices at the sectoral level are often constructed in terms of purchasers' (users') prices net of commodity taxes in order to unify these goods into a single sector. Competitive imports into each sector are classified in terms of world prices plus tariffs. The application of input-output techniques is thus based on inverting the inter-industry coefficient matrix to find gross output requirements based on a projection of final demands and competitive imports. If one makes the additional assumptions that capital, labour and non-competitive intermediate imports are tied to outputs by proportionality relationships, static input-output analysis provides a basis for finding out what quantities of these inputs are required given some vector of final demands.

51. The methodological procedures used in static input-output analysis, which are presented in the flow chart in annex II, involve in the first place the estimation of the parameters of the macro-model and making macro-projections up to 1985 4/ The macro-model includes the following variables of final demand: private consumption; government consumption; domestic fixed capital formation; increase in stock or inventories; exports; and imports. The private consumption and import functions are related to GDP at market prices; government consumption is taken as residual; and the remaining variables are regressed on the time trend. On the basis of the historical parameters thus obtained, the macro-variables of final demand are projected up to 1985. After estimation of the macro-model and macro-projections up to 1985, the next steps are manipulation of the input-output model by the calculation of the technical coefficient matrix, calculation of the Leontief inverse matrix, estimation of final demand employing some auxiliary models with an industry-by-industry breakdown, calculation of domestic output employing the inverse matrix and final demand, calculation of total gross output, calculation of value added by industries and finally estimation of demand for primary inputs (e.g employment).

4/ Actually, the simulations were made up to 1990. The projections for the period 1985-1990 may be considered indicative.

(b) Application

52. Algeria was selected as a trial example for input-output application not simply because of the wealth of statistical data available in the country but also because of the relatively stable growth of the economy. During the second four-year plan period, 1974-1977, average annual growth in GDP was estimated at 6.1 per cent in real terms. Excluding the hydrocarbon sector, whose performance was rather uneven, growth in value added averaged 9.2 per cent between 1974 and 1977, which was near the minimum growth target of the plan. Expansion was particularly rapid in manufacturing and construction, reflecting the high level of investment. In 1978, real growth in GDP was about 12 per cent, propelled by an acceleration of growth in industry and construction in which investment continued to be the most dynamic final demand element. In 1979, according to preliminary ECA estimates, GDP growth was about 5 per cent because of a slow-down in growth in hydrocarbon output and a decrease in import duties.

53. With regard to expenditure indexes which are relevant to model construction, investment and public consumption were the most dynamic domestic demand components between 1967 and 1978. Public consumption increased at an average rate of 15 per cent a year, reflecting expansion of public employment and services. Private consumption, which was estimated as a residual in the national accounts, rose by about 9 per cent in real terms, reflecting substantial employment creation and wage increases. After the 1974 peak, where exports were the leading growth factor, the terms of trade deteriorated, falling to 13 per cent below the 1974 level in 1977 Overall, following the surplus which occurrred in 1974, the resource gap, adjusted for changes in the terms of trade, averaged 9.6 per cent of GDP in 1975-1977.

(c) Data requirements

54. The data situation in Algeria is fairly good. Six independent input-output tables have already been published, indicating rather advanced experience in the construction of tables. The tables are:

1957	number of sectors	(98x25)	at purchasers' prices, published	1960
1963	" "	(12x13)	" " "	1965
1964	" "	(11x12)	" " "	1965
1967	" "	(14x15)	" " "	1972
1974	" "	(20x21)	" " "	1977
1974	" "	(68x65)	" " "	1977

55. The 1974 input-output table with 20x21 sectors was used as a basis for projection. Other official statistical data pertaining to macro-analysis are found in various Algerian Government publications. 5/

56. In Algeria as in many other developing countries, the statistical infrastructure is still far from fully developed. For instance, no complete breakdown of fixed investment and inventory investment by industry exists, and no sectoral annual distribution of other components of final demand (private and public consumption, exports and imports) is readily available. The sectoral time-series data for all the

5/ For example, Annuaire statistique de l'Algérie 1972 (Algiers, Secrétariat d'Etat au Plan, Direction des Statistiques, Juin 1973); Annuaire statistique de l'Algérie 1974 (Algiers, Secrétariat d'Etat au Plan, Direction des Statistiques et de la Comptabilité Nationale, October 1978); Annuaire Statistique de l'Algérie 1975 (Algiers, Secrétariat d'Etat au Plan Direction des Statistiques et de la Comptabilité Nationale, December 1976); Annuaire Statistique de L'Algérie 1976 (Algiers, Secrétariat d'Etat au Plan, Direction des Statistiques et de la Comptabilité Nationale, December 1977); Statistiques 1967-78 (Algiers Direction des Statistiques et de la Comptabilité Nationale, August 1980) and Bulletin trimestriel de statistiques générales, various issues.

components of final demand were constructed on the basis of their respective weights in the 1974 input-output table, which it was assumed would remain constant over the period of the estimation.

57. It was further assumed that the input coefficients would remain unchanged over the period of projection. But in the real world, the observable input coefficients change for reasons such as technological progress, changes in the weights of minor sectors, changes in the basket for each sector and changes in relative prices. However, the approximate trend of changes will be revealed through comparison of several comparable input coefficient matrices. Unfortunately, the previous input-output tables are not available for all the sectors for purposes of comparison. Consequently, the 1974 input coefficient matrix was applied to projections up to 1985. For longer-term projections greater attention will have to be paid to possible modification of the coefficients.

(d) Results and policy implications

58. The trial application of static input-output techniques to the Algerian economy, though still of a preliminary nature, produced some interesting results and raised some noteworthy problems of projection methodology. The findings of the exercise, which are detailed in annex II, can be summarized as follows:

(a) The simple macro-model projection revealed the potential for future economic growth in Algeria. Gross domestic output is expected to increase from 120,465.6 million constant 1974 dinars in 1980 to 159,385.1 million in 1985, an average annual growth rate of 5.8 per cent. This projected rate of growth can be said to hinge upon the hypothesis of slow growth of exports in the future (about 3 per cent a year), which reflects the measures taken by the Algerian Government to conserve the country's most precious natural resource, hydrocarbons.

(b) According to the macro-projections under the second scenario (annex II, table 2.9), growth in the control total of each final demand component is as follows: government consumption will reach 1.49 times the 1980 value in 1985, private consumption 1.51 times gross fixed capital formation 1.42 times, inventory changes 1.45 times and imports 1.63 times. Accordingly the sum of final demand will increase 1.232 times by 1985, that is at an average growth rate of 5.7 per cent a year during 1980-1985, almost the same growth rate as that of gross domestic output.

(c) In the case of government consumption and fixed investment, a fixed pattern of industries was assumed. For projections of other final demand components some auxiliary models were used for private consumption, exports and imports (see Annex II, table 2.10). Finally, inventory changes were determined on the basis of plausible hypotheses as residual. According to these manipulations and the changes in control totals, the final demand for products of various industries is expected to change as follows during the period 1980-1985: an increase of over 40 per cent for agriculture, energy and water, housing, services, and public works for the petroleum sector, agro-industries, textile industries, hides and skins, transport and communications, hotels, banks and insurance and services for households; and an increase of less than 40 per cent for hydrocarbons, chemicals and wood and paper. Mining and quarrying, iron industries, construction materials and services to enterprises may decline.

(d) In Algeria several inter-industry tables are available, as was indicated earlier. The 1974 table was chosen as the base since it is the most recent.

(e) On the basis of these values for final demand and the technical coefficient matrix, it was projected that domestic gross production would increase 1.33 times by 1985 compared with 1980. Total value added is expected to be 1.32 times the 1980 figure in 1985, growing by 5.8 per cent a year during the period. (see annex II Table 2.13).

(f) Assuming constant employment coefficients, total demand for employment will increase 9.3 times by 1985 over the 1980 figure, with an average annual growth rate of 5.5 per cent. Since the population and the labour force are expected to increase on average 1.45 times, concealed unemployment is expected to decrease markedly by 1985. According to these projections, wage employment in several sectors is expected to increase by more than 30 per cent by 1985 (see annex II, Table 2-14).

59. Some further revision of the macro-model appears to be necessary in order to make more accurate projections of the control totals.

60. At a minimum, it will be necessary for population, debt burden, external flows and other financial aspects to be introduced explicitly into the model as variables to ensure that economic trends in Algeria are more accurately reflected.

61. On the basis of available statistical data, some breakdown of fixed investment and inventory investment by industries appears to be indispensable. It is also possible to supplement the monetary or nominal side of projections by projecting export and import prices, the terms of trade, etc.

62. The simple assumption of fixed technical coefficients for the future needs to be reconsidered. These coefficients can be changed for the following detailed comparison of input-output tables pertaining to different periods of time. Beyond this comparison in time, international comparison of tables would also be quite useful. It would also be useful to combine the static input-output approach with linear programming techniques in order to determine, through various sectoral allocations, optimal growth for final demand components as well as for wages. Similarly, in the case of Algeria, where a variety of activities have been pursued to produce the same type of output, the use of alternative vectors representing different techniques of activity analysis would help to determine the optimal input-output structure.

63. In conclusion, what planners are trying to achieve in static input-output analysis is to ensure that in each industry demand plus imports shall equal home supply minus exports, given that the sum of outputs and the sum of the foreign balance are already fixed. In this process it is implied that consumer demand is sacrosanct, given the level of consumer purchasing power; if any industry is out of balance, adjustment must be made by altering output, imports or exports, but not by altering demand. If demand is too high, the commodity in question can simply be taxed or rationed if demand is too low, it can be subsidized or advertised. This is the path followed by many input-output planners in various countries; for them, the aim of an economic system is to provide consumers with what they want; adjustments are therefore made to output, imports or exports, but not to consumption.

4. An econometric model with inter-industry linkages

(a) Specification and methodology

64. Methodology. The model incorporates some well-known macro-economic equations of the econometric type, plus a detailed system of inter-industry linkages. The production structures are obtained through the open-type Leontief model linking production to direct and indirect demand. Consumption is determined by income, and sectoral investment is a function of the sectoral incremental capital-output ratios derived from the Development Plan for 1979-1983. Sectoral exports are also taken from the plan. Commodity imports (agricultural products and food, oil, chemicals, machinery and equipment and other imported goods) are affected by sectoral production, consumption and investment. Indirect taxes and import duties are also functions of these three items. Sectoral income and employment are defined by sectoral production. The parameters of the model are forecast values; some of them are derived from the development plan, while the rest are estimates based on cross-section analysis of the related data of countries which are somewhat more developed than Kenya, the country chosen.

65. Model specifications. Except for the employment relationship, all the other equations are measured at 1976 constant prices in the same way as in the development plan. Several versions of the model were tested. In the first version the economy is broken down into three producing sectors (agriculture, industry and services). The second version has a nine-sector breakdown of inter-industry relationships (agriculture, light and food manufacturing, other manufacturing, electricity and water, building and construction, trade, transport, services, other sectors). The third and fourth versions investigate the investment process in two different forms. In the third version the sectoral capital stock is not permitted to decrease, while in the fourth version a marginal decrease in the sectoral capital stock is allowed (disinvestment). In the remaining versions the question of the determining sector was tested. The determining sector is one of the producing sectors of the economy in which growth is determined not by the model but by a priori assumption. (During the tests its actual value was derived from the development plan itself). The majority of the sectors were tested to determine whether they could be the determining sector of the Kenyan economy.

(b) Application

66. This model which was first applied to Kenya seems to be suitable for application in planning in many African countries with well-established internal linkages, such as, Algeria, the Ivory Coast, Senegal, Tunisia, Zambia, Zimbabwe, etc. Similar models are proposed by other United Nations bodies for more developed economies. ECA should try to combine the econometric model with the open inter-industry model to determine its usefulness in the African context. A short mathematical description of the model appears in annex I section 4, and the results are in annex II, tables 2.15 to 2.17.

67. The economy of Kenya is one of the most balanced in East Africa. The per capita gross national product was $US 380 in 1979. According to the World Bank, the population was 15.3 million and its annual growth rate about 4 per cent in 1979. Since independence the country has enjoyed one of the highest growth rates among the low-income developing countries in Africa. As a result, in 1981 Kenya was reclassified into the group of middle-income countries, joining Angola, Egypt, Ghana, Senegal, Zimbabwe, etc.

68. Agriculture, the most important sector, provides a livelihood for 78 per cent of the population. Agricultural production grew at an average annual rate of 4 per cent between 1969/1971 and 1977/1979. The growth of food production in the same period was 2.9 per cent a year (less than the growth of population). Mining is a relatively small sector which contributed only 0.6 per cent of the gross domestic product in 1980. Manufacturing output has recorded a high growth rate, averaging about 7.8 per cent a year between 1971 and 1980. The manufacturing sector is still heavily oriented towards import substitution. Private and public consumption increased by 3 and 6.8 per cent respectively in 1971-1980.

(c) Policy implications

69. The model seems to be adequate to analyse the implementation of existing plans, and particularly well suited to the formulation of new medium-term development plans for the African countries named above. It is vital to be in permanent contact with the planning authorities of the country concerned when applying this model, to ensure that the exercise is realistic and in keeping with the country's policies, but that unfortunately proved impossible in the present exercise because of lack of funds. It is also desirable to extend the number of sectors if possible.

(d) Data requirements

70. The data requirements of the model are exactly the same as for the preceding model.

5. The dynamic input-output model

(a) Specification and methodology

71. The dynamic input-output models are in fact an extension of static systems, but unlike them they introduce rates of change over time. In this regard, capital formation is no longer given exogenously as part of final demand, but has to be determined within the system. The output of a particular time period should not only sustain the changes in the final demand and inter-industry requirements but also meet stock requirements in order to increase final demand by changes in the output levels of the various activities. In this context, investment is defined as the addition to stock-holding required by each industry in order to ensure a rise in output from year t to year t+k.

72. Such models, in contrast to macro-analysis, are specifically designed to solve problems of resource allocation, and are highly powerful analytical tools for use in long-range projections of economic growth. In fact, they are indispensable tools for studies of the changing structure of output.

73. The model is specifically an extension of the inter-industry approach to cover not only current outputs but also increments to capacity. The model thus uses a set of ratios not only for current output levels with existing capacity but also for the future additions to capacity.

(b) Application

74. The model has been applied to Nigeria, taking into consideration the special characteristics of an oil-exporting country with adequate investible oil surpluses. Huge investment has been undertaken since the early 1960s and this has resulted in a considerable and rapid structural change.

75. During the last decade the Nigerian economy has grown fairly rapidly as a result of the rapid expansion of petroleum production. Oil, being the dynamic growth factor, has sustained the growth of the investment vector. Equally, the improvements in the terms of trade due to oil price increases gave a tremendous boost to investment, which rose ever faster during the 1970s. Consequently, manufacturing expanded significantly relative to other sectors of the economy. Under the third development plan, from 1974/75 to 1979/80, it was planned for the contribution of manufacturing to GDP to increase by 2.2 percentage points and the share of agriculture and mining to fall by 4.4 and 8 percentage points respectively. The substantial and rapid expansion of manufacturing would create stronger linkages and lead to some balancing structural adjustments among other sectors of the economy.

76. In these circumstances it is more realistic to investigate, in a disaggregative manner, the dynamic aspect of the structural change and the degree of technological transformation underlying the economy. The most suitable analytical tool for this purpose would of course be dynamic input-output models for long-range projections of economic growth, as they take more account of the changing production structure. The model would then investigate possible growth paths open to such a dynamic economy with a given set of changes in policy variables.

77. Two approaches were considered"

(a) Forecasting the likely future path and pattern of development on the basis of historical performance in time series data using mainly growth elasticities;

(b) Constructing planned scenarios for a more efficient and higher rate of development, taking acoount of changes in real variables in the system by imposing indicated or planned policy changes. The planned scenarios were mainly based on the possibilities of future growth and/or on the growth targets set for the Third United Nations Development Decade and the Fourth Development Plan targets. The scenarios were structured in such a way as to generate growth simultaneously in all sectors, thus emphasizing the need for balanced development. Therefore, various programmes were pursued with varying rates of growth in the components of the exogenous vector.

78. The model is centred on the structure of the investment vector, which signifies growth, and its past effects on capacity. Because of this explicit role of investment in the formulation, the investment vector in the input-output table was treated in a dif different way from the traditional static models. The investment vector was partitioned into productive and non-productive investment. In the scenarios, induced investment was treated as endogenous and an integral part of the system with a role in the creation of extra capacity in the various economic sectors in each successive round. Autonomous investment, defined as investment in social services and distributive trades was retained in the final demand as an independent vector influenced by decisions outside the system.

79. In absence of a capital coefficient matrix for Nigeria, an indicative table of the same order as the input-output table (18x18) was constructed for 1973. In this process use was made of the available information on the composition of gross capital formation by type of asset at constant 1973/74 purchaser's values. The classification by type of investment goods contained in the Industrial Surveys of 1968-1970 and 1971-1972 was changed into a classification of investment by industry. By applying the weights used in the surveys, gross fixed investment was distributed among manufacturing activities on the assumption that their capital structure was the same as in 1971, indicating a negligible increase in capacities between 1971 and 1973. Similarly, the values of assets were not adjusted to replacement costs on the assumption that there was no significant change in the relative prices of assets between 1971 and 1973.

80. With the technological parameters of 1973, and the investment structure of 1980, the economic structure of Nigeria was examined in terms of changes in policy variables for 1980 depicting income generation in the economy and revealing feasible efficient growth paths. This was done with the help of the capital coefficient matrix for 1973 and an updated g vector of growth for 1980. Changes in the capital structure by 1980 were incorporated in the model to sustain increases in demand for final use vectors.

81. The initial equations of 1980 were then updated for 1985 with changes in the ICOR due to changes in the production structure, i.e in the profitability of induced investment. This means that withs the huge growth in investment, it would seem that the Nigerian economy by 1985 will have a fairly sound structure, with less dependence on oil.

82. The above model was basically designed to solve for the following:

(a) Extra capacities created in each sector as a result of the injections of investment;

(b) Various growth rate vectors under different investment programmes;

(c) Sectoral creation of employment opportunities;

(d) Various rates of investment allocation among industries;

(e) The desired level of exports to offset the growth in import requirements.

83. Such a model can be fairly applied to economies which undergo certain drastic structural changes as a result of the abundance of one dynamic factor of growth such as oil, as in the case of Algeria, and to some extent Angola and the Republic of Cameroon. With some modification the modelccan also be applied to other oil-producing countries.

84. The application of the model could also be extended to countries with a strong mineral base that influences the growth of the investment vector, like Botswana, Zaire and Zambia. Moreover, applications of such models are not generally restrictive in character, so that this one could safely be applied to fairly well-structured economies (with strong linkage sectors like manufacturing) such as Egypt, Kenya and Zaimbabwe. However, the model is not applicable to countries with a weak economic base, a dominant agricultural sector and a tiny manufacturing sector.

85. It should be noted that this study is only a physical feasibility study that indicates feasible growth rates on some reasonable assumptions about policy variables. Although sufficiently disaggregated, this is not a complete plan, as prices do not appear in its formulation. Therefore any comparison with actual plans, or any economic variables derived, merely serve to indicate magnitudes and help decision-makers and planners to spot and to trace the economic effects and the impact on their various policy formulations.

(c) Data requirements

(i) Types of data generally needed for dynamic input-output models

(a) An input-output table of sufficient disaggregation;

(b) A capital coefficient matrix of the same order as the input-output table;

(c) Sectoral time series data for the econometric model, for private and public consumption expenditure, exports, imports, distribution of autonomous investment, distribution of employment, non-wage vector, implied incremental capital-output ratios and a vector of growth rates of GDP and investment.

(ii) Data used in the case of Nigeria

87. The existence of some basic data for Nigeria considerably facilitated the experimental application of the model. Except for the absence of a capital coefficient matrix, which was eventually constructed, data are available in sufficient detail with an adequate degree of disaggregation. Many sources were used for collating the statistical data. The most important are listed below, together with the type of data available.

(a) Input-output models

(i) Input-output table for the Nigerian economy, 1973 (at producers' values) with- 25x25 sectors;

a For manageable operation, the size of the production matrix is aggregated to the order of 18x18 sectors;

b Final demand, which is composed of 5 column vectors for final deliveries (imports are excluded), is reduced to only 4 by assigning gross fixed capital formation and increase in stocks (working capital) to the production matrix only, keeping a vector pertaining to autonomous capital expenditure.

(ii) A constructed capital coefficient matrix for 1973 (at producers' prices).

(b) Econometric models

(i) ECA data

a Data on GDP by industry of origin (1970-1979)

b Data on expenditure on GDP (1970-1979)

c Import price indices (1970-1979)

d Export price indices (1970-1979)

(ii) Third Development (1975-1980)

a Data on GDP by industry of origin (1979/1980)

b Data on expenditure on GDP (1979/1980)

c Sectoral distribution of investment (1975/76-1979/80)

d Analysis of capital programmes by the government (1979/80)

e Private sector indicative capital programmes (1975-1980)

f Analysis of government expenditure (1975/76-1979/80)

g Balance of payments (1975/76-1979/1980)

h Implied incremental capital-output ratios.

(iii) Other sources

a Actual data on exports of crude petroleum (1970-1980)

b Exchange rates

c World oil imports

d Data on exports of non-hydrocarbons

e Consumption elasticities with respect to income for Algeria and Morocco.

(iii) Variables in the system

88. (a) Dynamic input-output model

(i) Endogenous

a Sectoral extra capacities

b Sectoral value added

c Sectoral induced investment

d Sectoral employment

e Sectoral non-competitive imports

f Growth rates in demand for new investment

(ii) Exogenous

a Private consumption by industry

b Government consumption by industry

c Exports by industry

d Total imports by industry

e Autonomous capital expenditure by industry

(b) Final demand econometric models

(i) Endogenous

a Private consumptionexpenditure

b Government final consumption

c Exports of oil

d Non-oil exports

e Imports of intermediate inputs

f Imports of capital goods

g Autonomous expenditure

(ii) Exogenous

a Export price indices

b Import price indices

c Current transfers

d Net factor income from abroad

e World oil imports.

(d) Policy implications

89. Dynamic input-output models offer many advantages in influencing and guiding policy formulation and decision-making as well as in solving practical problems faced by planners.

90. They give the planner when examining various investment programmes, a wide spectrum of growth possibilities reflecting various policy decisions regarding the

desired level of private and public expenditure, export promotion and import substitution policies, etc. Such interdependent systems with sufficient disaggregation will enable the planner to trace the impact of such policies on the working of the entire economic system, and thus bottle-necks and constraints in each individual sector can easily be detected.

91. Secondly, they enable the planner to consider in a systematic manner the most efficient pattern of resource allocation to be adopted in the development plan, by experimenting on various possible investment programmes.

92. Thirdly, by treating investment as endogenous and an integral part of the system, the models show the possible future path of the economy with less dependence on a single factor of growth such as oil.

93. Fourthly, as they relate individual production sectors to final demand and to sectoral investment allocations they build a mechanism of vital importance in constructing consistent development plan targets.

94. Lastly, besides showing the profitability of ensuring the efficient allocation of investment to industries, they reveal the extent to which each sector can provide employment, and the desired level of exports to sustain the demand for new investment.

6. A multisectoral model for structural analysis

(a) Specification and methodology

95. In general this model can be specified for any number of real production sectors for which an input-output table exists, plus one additional sector for the allocation of investment in the form of equipment and machinery produced by the different sectors. Among the real production sectors for which specific production functions are defined, one sector, construction, is defined in such a way that it produces buildings, factories, etc. which constitute part of investment.

96. The specification of the model can be described in five categories: inputs and output of each sector; capital composition (including depreciation) in each sector; consumption and exports; prices; and macro-totals of the economy. Each is discussed briefly below.

(i) Inputs and output of each sector

97. Gross production in each sector is specified with a production function, with labour and capital assumed to be substitutable factors of production. The model is specified with Cobb-Douglas production functions including rates of increase in productivity within each sector. For each sector, two other types of input are defined, intermediate deliveries from other sectors (based on technical coefficients of an input-output table), and imports of raw material inputs.

(ii) Capital composition

98. For each sector two types of capital stock are distinguished: stock of buildings and plant, and stock of capital equipment, machinery, tools, etc. The sum of the two is the total capital stock. Depreciation rates are applied to each type of capital stock, and total depreciation of capital is obtained as the sum of the two.

(iii) Consumption and net exports

99. Total final consumption of goods delivered by each sector (including consumption of competitive imports of the corresponding goods) is defined to be a function of the total population, total consumption expenditure and the price indices of the goods of each sector. Exports for each sector constitute the second component of the model's final demand part. These are taken to be net of competitive imports of the corresponding types of goods. In the specification of the model net exports are exogenous.

(iv) Prices

100. Via the consumption function defined in (iii) above, the model includes price variables in the form of indexes. The two types of prices are prices of non-competitive imports and domestic sellers' prices of goods. The price of imports is exogenous to the model, while all domestic prices are endogenous.

(v) Macro-totals

101. For the model to be consistent some specifications are made regarding macro-totals for the economy as a whole. These include identity specifications, namely: total employment is equal to the sum of sectoral employment totals; the total capital stock of buildings and stock of equipment are obtained as a sum of the respective sectoral components; total gross output in each sector must be equal to the sum of intermediate deliveries to other sectors plus final consumptions and net exports of the goods of that sector.

102. The model's specification as outlined above cannot be solved directly in linear form as it requires a differential solution. However, this complication can be avoided by reducing the model to a system of difference equations which can be solved linearly in terms of growth rates (relative to a set of base year values). The final reduced form of the model is given in more detail in annex I.

103. In the form in which the model is solved, the set of endogenous variables includes: the employment rates in each sector, the investment rates, the gross output of each sector, prices indices (sellers' prices) and final consumption rates. The exogenous variables include total capital stock and labour growth rates, growth of population, changes in productivity rates for each sector, increase in exports of each sector and the rate of increase in the prices of imports.

(b) Application of the model to a developing country

104. The specification of the model discussed above was first outlined by Johansen and applied to the economy of Norway using 1950 as the base.6/ Its bold adaptation to some aAfrican developing countries is considered to be useful since it gives a relatively well interlinked multisectoral framework for a variety of policy analyses. The present application was mainly exploratory, being aimed at finding ways in which the specifications could be better tailored to the characteristics of African economies and the scarcity of data. The choice of countries for which the model could be applied was based on a variety of criteria, among

6/ Johansen, A Multi-Sectoral Study of Economic Growth (Amsterdam, North-Holland Publishing Co., 1974).

which are the existence of a detailed input-output table and other relevant data, the diversity of the economy in terms of strong linkages between sectors, the openness of the economy especially as regards the market structure and freedom of price movements, changes in sectoral investment, etc. It is believed that the model can be fruitfully applied to economies such as those of Algeria, Egypt, the Ivory Coast, Kenya, Morocco, Nigeria and Zimbabwe. The example given in annex II Table 2.22 is an application the model to Morocco using the input-output table of 1975.

105. The exploratory application was based on aggregating the Moroccan input-output table for 1975 into eight production sectors: agriculture, phosphates, other mining, manufacturing, energy (including electricity and water), transport, commerce and services and construction. Public administration was excluded from the input-output framework as independent treatment was thought more appropriate. This disaggregation was thought to be the most convenient and realistic at the present preliminary stage, since more detailed disaggregation would require very extensive work on establishing appropriate production functions, cross-price elasticities and sectoral capital structures which could not be easily eastablished in greater detail given the scarcity of data. As the 1975 input-output table for Morocco does not give specific data on depreciation, some rates based on experience in various countries were applied to the capital to derive the depreciation rates in each sector.

(c) Data requirements

106. Given the fact that the model has a variety of interlinkages in the production and demand structures of the economy, its data requirement as regards quantity and quality are high. Quantitatively, the model requires inter alia specific data on the input-output structure for a base period, sectoral employment, sectoral capital stock separated into equipment and machinery and buildings, the aggregate price indices of the various sectors, import content for the output of each sector, the returns to capital in each sector, income and cross-price consumption elasticities wages in each sector.

107. The most problematic data for the application of the model relate to capital stock, prices and consumption elasticities. The total capital stock in 1975 was estimated using an average capital-output ratio for 1975. This capital stock was then broken down by sector on the basis of shares in annual investment. Subsequently additional quantitative information was used to separate capital into machinery and equipment, with the proviso that the figures should be in line with the proportions given by the official statistics with respect to the separation of investment into these two components. 7/ Price changes were based on the data given for selected product indexes for various Moroccan towns along with the cost-of-living indexes for the major sectoral groups. 8/ To obtain the required measures of consumption elasticities for each sector's products use was made of the 1960, 1964 and 1975 input-output tables, from which , with similar sector aggregation figures for sectoral consumption and output for the different periods were compiled and used to derive the relevant elasticities of consumption with respect to income.

7/ See Annuaire statistique du Maroc 1973 (Rabat, Direction de la Statistique), p. 210.

8/ The data were obtained from various issues of the Bulletin mensuel de statistique and of Indice du coût de la vie.

(d) Policy implications

108. The model could be put to a variety of uses both in analysing the structure of the economy and in deriving appropriate policy implications. In applying the model to a given economy two approaches can be used in generating policy implications. The first approach relates to changes in values of exogenous variables and how these affect the endogenous variables. With this approach the model can be used to analyse the impact on the major economic variables and sectoral structure resulting from changes in such factors as:

(a) Prices of imported goods;

(b) Total investment expansion in a given period;

(c) Population growth;

(d) Export growth rates and the diversification of these exports.

109. These factors, either singly or in subsets, can be taken as targets in a given period, and then the model will generate patterns of sectoral growth in terms of the absorption of capital and labour in each sector, gross output and the likely price changes.

110. The second approach to using the model in analysing policy implications would be to simulate a structural change and then analyse what the impact of this change would be on the pattern of growth. The simulation of such structural changes would be done in terms of the parameters of the model, for example the production function parameters. Analyses can be made, say, of the implications of making the economy more capital intensive, or less. Similar analyses of the implications of structural changes can be made on consumption patterns through changes in consumption elasticities, cross-price elasticities, etc.

ANNEX I

MATHEMATIC FORMULATION OF THE MODELS

1. The Closed Growth Model

With the assumption for a given base-year, the path of value added investment and consumption in the closed growth model is given by the following formulae for two sectors:

$$1.\quad Y(t) = y_o + \alpha_o Y_o \frac{B_k \lambda_k + B_c \lambda_c}{B_k \lambda_k} (1 + B_k \lambda_k)^t$$

$$2.\quad I(t) = I_o (1 + B_k \lambda_k)^t$$

$$3.\quad C(t) = Y_o - \alpha_o t_o \left(1 + \frac{B_c \lambda_c}{B_k \lambda_k}\right) + \alpha_o y_o \left(\frac{B_c \lambda_c}{B_k \lambda_k}\right) (1 + B_k \lambda_k)^t$$

where

$Y(t)$ = Total Value Added at time t

$I(t)$ = Total Investment at time t

$C(t)$ = Total Consumption at time t

B_k = Ratio of output to capital in producers goods sector

B_c = Ratio of output to capital in consumers goods sector

λ_k = Coefficient for allocation of investment to the producers' goods sector

λ_c = Coefficient for allocation of investment to consumers' goods sector

α_o = Total investment to total value added ratio

$\lambda_k + \lambda_c = 1$

Generalising the above two-sector formulae into four sectors (two sub-sectors for investment goods and two sub-sectors for consumer goods), the growth path of total investment I(t) may be derived as follows for:

$$4.\quad I(t) = I(t-1) + \beta_{k_1} \lambda_{k_1} \cdot I(t-1) + \beta_{k_2} \lambda_{k_2} \cdot I(t-1)$$

$$= (1 + \beta_{k_1} \lambda_{k_1} + \beta_{k_2} \lambda_{k_2}) \cdot I_{t-1}$$

$$= (1 + \beta_{k_1} \lambda_{k_1} + \beta_{k_2} \lambda_{k_2})^t \cdot I_o$$

The sectoral outputs are now derived from the formulae:

$$5.\quad Y_{k_i}(t) = y_{k_i}^{(t-1)} + \beta_{k_i} \lambda_{I_{k_i}} \cdot (t-1) \qquad i = 1,2$$

$$6.\quad Y_{c_i} = y_{c_i}(t-1) + \beta_{c_i} \lambda_{I_{c_i}} \cdot (t-1) \qquad i = 1,2$$

The sectoral I_{k_i} investments are derived from the allocation ratios, so that:

$$7.\quad I_{k_i}(t) = \lambda_{k_i} \cdot I(t) = \lambda_{k_i} (1 + \lambda_{k_i} \beta_{k_i} + \lambda_{k_2} \beta_{k_2})^t \; I_o \qquad i = 1,2$$

The sectoral outputs are then projected for t as follows:

$$8.\quad y_{c_i}(t) = y_{c_i}(t-1) + \beta_{c_i} \cdot \lambda_{c_i} \cdot I(t-1) \qquad i = 1,2$$

$$= y_{c_i}(t-1) + \beta_{c_i} \cdot \lambda_{c_i} (1 + \beta_{k_i} \lambda_{k_i} + \beta_{k_2} \lambda_{k_2})^{t-1} \cdot I_o \qquad i = 1,2$$

2. The Disaggregated macro-econometric model

The simplest of the multi-sector macro-model is illustrated by the following sets of equations and identities used for Benin where 9 sectors are considered (1) food, (2) industrial crops, (3) other crops, (4) textile, beverage, vegetable oil, (5) other manufacturing, (6) construction, (7) commerce and services, (8) transport, (9) public administration.

$$1.\quad X_F = a_o + a_1 \log Ac_F + a_2 \log L_F$$

where Ac_F denotes acreage devoted to food crops and L_F denotes labour force in agriculture given exogenously.

$$2.\quad X_{INC} = \sum_i A_c^i \cdot \bar{Y}^i$$

where A_c^i denotes the acreage devoted to ith industrial crop and $\bar{Y}^i$ is its corresponding yield per acre attained exogenously.

3. $YFCR = q_o XFCR$ and $YINC = u_o XINC$

In foods crops and industrial crops, the value added is simply imputed as a ratio of gross outputs based on previous records. For other activities in the rural sector, a simple growth rate is assumed.

4. $YLFF = (1 + m_o)\ YLFF_{-1}$

For textile, beverage and vegetable oil industries which form at present the largest component of industry, a production function is used as follows:

5. $Y_{TBV} = b_o + b \sum_{o}^{t-1} I_4$ where I_4 is investment in those activities.

6. $YOMF = mYTBV$

Other manufactures is taken as a given ratio of the value added in the major group, e.g textile and beverage.

7. $Y_{Con} = c_o + c_1 \cdot I_{\Sigma}$

For construction, total investment is used

8. $Y_{cos} = d_o + d_1\ YMAF$

Commerce and services are regressed with the value added in manufactures.

9. $YADM = e_o + e_1 . YDMP_{-1}$

Public Administration is computed from GDP in the previous year.

10. $Y_{TRA} = l_o + l_1 \cdot Y_{CON}$

Transport is thus regressed on commerce and services.

11. $CGOV = n_o + n_1 \cdot YDMP$

$CPRV = p_o + p_1 \cdot YDMP$

For consumption only a composite regressor is used and private or government consumption are estimated as functions of GDP at market price.

Same procedure is followed for imported consumption goods and investment goods.

12. $MCGO = g_o + g_1 \ YDPM \ ; \ MCPG = m_o + m_1 \ INVF$

A functional form is used to estimate total import of goods regressed on imported consumption and investment goods:

13. $MREG = s_o + s_1 \ (MCOG + MCPG)$

Any residual element is assumed to be re-exported.
No sectoral estimates are available for indirect taxes but only a total indirect tax is obtained from GDP at factor cost.

14. $XPIC = (1 + r) \ XPIC_{-1}$

Exports are estimated for industrial crops on a simple growth rate basis.
Re-exports are obtained as a residual.

15. The national accounts balance is obtained as follows:

$$Y = C + I + E - M$$

and the trade gap B

$$M - E = B$$

as also the saving-investment gap SG

$$SG = I - S = I - Y + C$$

Definition of Variables and Symbols

ACFC = Cultivated Land of Food Crops
LRUA = Total Labour Force in Rural Area
XFCR = Gross Output of Foods Crops
XINC = " " of Industrial Crops
XPAL = " " of Palm Products
XCOT = " " of Cotton
XGRN = " " of Groundnuts
YFCR = Value Added in the Food Crops Sector

Model for Benin in the national accounting framework and the data gaps

Sectors	Food crops (1)	Industrial crops (2)	Others (3)	Textiles beverages veg. oil (4)	Other manufacture (5)	Construction (6)	Commerce & services (7)	Transport (8)	Public administ. (9)
Food crops	-	-	-	-	-	-	-	-	-
Industrial crops	-	-	-	--	-	---	-	-	-
Others	-	-	-	-	-	-	-	-	--
Textiles, beverage & veget. oil industries	-	-	-	-	-	-	-	-	-
Other manufacturing	-	-	-	-	-	-	-	-	-
Construction	-	-	-	--	-	-	---	-	-
Commerce and services	--	-	--	-	-	-	-	-	-
Transport and communications	-	-	-	-	-	-	-	-	-
Public adm.	-	-	-	-	-	-	-	-	-
Imports	-	-	-	-	-	-	-	-	-
Value added	YFCR = 0.9XFCR	YINC = 0.7XINC	YLFF = 1.036 x $YLFF_{-1}$	YTBV = - - 1.2276 + 0.44645 ITBV	YOMF = 0.95YTBV	YCON = - 1.79547 + 0.2631 INVF	YCOS = 8.53421 + 2.24836 (YTBV + YOMF)	YTRA = -6.77735 + 0.14136 YCOS	YADM = -0.08832 + 0.096($YDMP_{-1}$)
Taxes net subsidies	-	--	-	-	-	-	-	-	-

Model for Benin in the national accounting framework and the data gaps (continued)

Sectors	Government cons. (10)	Private cons. (11)	Investment (12)	Export (13)	Total (14)
Foods crops (1)	-	-			XFCR = 3.95941 + 0.53080 log ACFC + 0.76721 LRUA
Industrial crops (2)				XPIC	
Other food & ag. (3)				$\frac{YINC}{YIN-1} \times XPIC_{-1}$	
Textile, beverage and veg. oil indus. (4)			INVF = 1.07 ΔINVF$_{-1}$	-	-
Other manufact. (5)	CGOV = 4.76169 + 0.0954 YDMP	CPRIV = 7.41131 + 72456 YDMP		-	-
Construction (6)				-	-
Commerce & serv. (7)				-	-
Transp. & com. (8)				-	-
Public adm. (9)				-	-
Imports (10)	MCGO = -1.21162 + 0.22348 YDMP		MCPG = -4.99113 + 0.64314 INVF	XRXPG	MGOS = 11.47911 + 1.15673(MCOG+MCPG)
Value added (11)				XPGS = -39.21744 + 1.5822 MREG YDFC	
Taxes net subsidies					ITS = 2.21619 - 0.09113YDFC

Δ indicate summation

YINC = Value Added in the Industrial Crops Sector
YLFF = " " in Livestock, Forest and Fishing
YTBV = " " in Textile, Beverage and Vegetable Oil Industries
YOMF = " " in Other Manufacturing Industries
YCON = " " in Construction
YCOS = " " in Commerce and Services
YTRA = " " in Transports and Communications
YADM = " " in Public Administration and Defense
YDFC = GDP at Factor Cost
ITS = Indirect Taxes less Subsidies
YDMP = GDP at Market Prices
MCOG = Import of Consumer Goods
MCPG = Import of Capital Goods
MGOS = Imports of Goods and Services
XPIC = Export of Industrial Crops
RXPG = Re-export of Goods
XPGS = Exports of Goods and Services
INVG = Investment
CGOV = Government Consumption
CPRIV = Private Consumption
ITEV = Investment in Textile, Beverage and Vegetable Oil Industries.

3. The Static Input-Output Model

The input-output model of the open type divides the national economy into two parts, intermediate production and final production. The elements in the final product still follow the overall balance rule for each sector and as a whole so that if Y_i refers to the value added in the ith sector, C_i, I_i, e_i refers to consumption, investment and exports, m_i being imports consisting of non-competitive imports m_{ic}, m_{inc}:

$$1.\quad Y_i = C_i + I_i + e_i - m_{ic} - m_{inc}$$

$$2.\quad \Sigma Y_i = \Sigma_i C_i + {}_i\Sigma I_i + {}_iI_i + \Sigma_i e_i - \Sigma_i mic - \Sigma m_{inc}$$

In m_i there may be some components of imports which are strictly non-competitive and which do not go into final demand independently but are incorporated in the product.

The first stage consists of estimation and projection of the macro-model of the final demand. This model can be described as follows:

$$1.1 \quad YDF_t = a_o + a_1 \sum_{j=1}^{t-1} IF_j$$

$$1.2 \quad YD_t = YDF_t + (G - T)_t$$

$$1.3 \quad \ln(G - T)_t = b_o + b_1 t$$

$$1.4 \quad C_t = c_o + c_1 \cdot YD_t$$

$$1.5 \quad CP_t = d_o + d_1 YD_t$$

$$1.6 \quad CG_t = C_t - CP_t$$

$$1.7 \quad \ln IF_t = e_o + e_1 t$$

$$1.8 \quad \ln INV_t = f_o + f_1 t$$

$$1.9 \quad \ln X_t = g_o + g_1 t$$

$$1.10 \quad M_t = h_o + h_1 YD_t$$

where YDF = Gross Domestic Product at Factor Cost
YD = Gross Domestic Product at Market Prices
IF = Gross Fixed Capital Formation
G = Government Transfer
T = Indirect Taxes
C = Total Consumption
CP = Private Consumption
CG = Government Consumption
INV = Inventory Stocks
X = Exports
M = Imports
t = time

The next stage is the gross balance relation for each sector: If X_{ij} is the output of the ith sector going to the jth sector and X_i the total gross output of the ith sector, then the gross output balance is written as:

$$2.1 \quad X_i = \sum_j X_{ij} + C_i + I_i + e_i - m_i$$

So that gross output equals the total disposal of the outputs into intermediate sectors as inputs denoted by X_{ij} and into sectoral final demands.

For each sector, a simple production function is envisaged e.g the input into any sector is a fixed proportion of the output, so that:

$$2.2 \quad X_{ij} = a_{ij} X_j$$ where a_{ij} is a given fixed constant estimated at a point of time through an input-output table which satisfies the overall balance (equation 2.1).

Replacing X_{ij} by $a_{ij} X_j$, we get the relation:

$$2.3 \quad X_i = \sum_j a_{ij}X + C_i + I_i + e_i - m_i$$

$$2.4 \quad X_{11} = a_{11}X_1 + a_{in}X_n + C_1 + I_1 + e_1 - m_1$$

$$X_{n1} = a_{n1}X_1 + \ldots + a_{nn}X_n + C_n + I_n + e_n - m_n$$

$$Y = a_{11}X_1 + a_{12}X_2 \ldots a_{1n}X_n$$

$$M_{nc} = a_{m1}X_1 + a_{m2}X_2 \ldots a_{mn}X_n$$

It is to be noted that $X_1 \ldots X_n$ denote outputs of domestic production sectors of goods and services, Y the total value added by each sector, M_{nc} the non-competitive imports sectors.

In matrix form:

$$2.5 \quad (I - A)X = C + I + E - M_{nc}$$

$$2.6 \quad A_L \cdot X = Y$$

$$2.7 \quad A_{nc} \cdot X = M_{nc}$$

Since the matrix A and vectors A_L and A_{nc} are known, and A is a square matrix, we have by inverting the matrix (I - A) and denoting it by $(I - A)^{-1}$:

2.8 $X = (I - A)^{-1} (C + I + E - Mc)$

2.9 $Y = A_L \cdot (I - A)^{-1} (C + I + E - Mc)$

2.10 $M_{nc} = A_{nc} (I - A)^{-1} (C + I + E - Mc)$

Thus, the unknowns of the system are either the vector X or the vector C + I + E - Mc.

4. The Model with Interlinkages in Industry and Final Demand

$CP = a_o + b_o YD$

$CG = a_1 + b_1 YD$

$Y_i = (1 + r_o)^t + Y_{io}$ $\quad i = \bar{i}$

$YDF = Y_i / YS_i$ $\quad i = \bar{i}$

$Y_i = YDF + YS_i$ $\quad i = 1,2,\ldots,n$

$CP_j = f_j CP$ $\quad j = 1,2,\ldots,n$

$CG_j = c_j CG$ $\quad j = 1,2,\ldots,n$

$INV_i^* = ICOR_i (Y_{it} - Y_{i(t-1)})$ $\quad i = 1,2,\ldots,n$

$INV = \sum_i INV_i^*$

$INV_j = h_j INV$ $\quad j = 1,2,\ldots,n$

$EXP_{jt} = EXP_{jo} (1 + r_j)^t$ $\quad j = 1,2,\ldots,n$

$EXP = \sum_i EXP_j$

$F_j = CP_j + CG_j + INV_j + EXP_j$ $\quad j = 1,2,\ldots,n$

$$X_i = \sum_j g_{ij} F_j \qquad i = 1,2 \ldots,n$$

$$Mk = \sum_j m_{kj} X_j + m_{kc} CP + m_{kI} INV \qquad k = 1,2,\ldots,n$$

$$L = \sum_i l_i XW_i$$

$$ITS = \sum_i g_i X_i + g_c CF + g_I INV$$

$$YD = YDF + ITS$$

$$S = YD - CP - CG$$

$$SG = INV - S$$

$$= \sum_k H_k$$

$$TG = M - EXP$$

5. The Dynamic Input-Output Model

In this section, we are specifically considering a multi-sectoral approach which is open to more exogenous influences where the process of growth of the economy considered in all sectors and their interactions are integral parts of the model. We start again with the basic balancing identity:

$$X_i = \sum_{j=1}^{n} a_{ij} \ldots X_j + C_i + I_i + R_i - M_i$$

The consumption vector C_i is treated in two ways:

Total private consumption C_p is given by a function of the form:

$$C_p = f(YNT)$$

where $YNT = YDT + \frac{(PX - 1)}{PM} + \frac{YF}{PM} + \frac{TF}{PM}$

and where:

YNT = Gross National Product at market prices
YDT = Gross Domestic Product at market prices
PX = Export-price indices
PM = Import-price indices
YF = Net Factor Income from Abroad
TF = Current Transfers

Then sectoral consumption is adjusted with sectoral income elasticities.

Government consumption C_g is estimated by a lagged function of the form:

$$C_g^t = \alpha_o + \alpha_1 R^{t-1}$$

where R is the export earnings of a specific sector.

The export vector E_i is determined by an exogenous element e.g world demand for oil viz.

$$E_i = \theta_o + \theta_1 WD$$

Imports M_i are determined as functions of I_i in cases of imports of capital goods and Y_i of specific sectors for imports of industrial inputs based on the intensity of these industries to deliver these commodities domestically.

This gives all the components of X_i except the investment vector I_i.

In our previous static formulation investment was taken up exogenously and no attempt was made to estimate sectoral investments and sectoral output expansion. We have now developed a methodology for transforming the investment into output expansion in multi-sectoral models by developing in an analogous way the capital co-efficient matrix. The relation of output expansion in a sector to investment is done in the following way:

$$\Delta X_i = b_{11}^{-1} I_{i1} + b_{12}^{-1} I_{i2} + \ldots + b_{in}^{-1} I_n$$

where X_i is the output expansion of the ith sector expressed as a function of the investments done into the sector from all the other sectors in a specific way so that we write:

$$I_i = b_{i1} \Delta X_1 + b_{i2} \Delta X_2 + \ldots + b_{in} \Delta X_n$$

Here, the investment vector is treated in two ways:

Public investment I_p is given as a function of oil:

$$I_p = h_o + h_1 X_o$$

Private investment I_c is given as a function of incremental income:

$$I_c = \gamma_o + \gamma_1 \overset{*}{y}$$

where $\overset{*}{y} = (y^{t+1} - y^t)$

The investment vector is then partitioned into:

autonomous investment I_s which is retained as a final demand vector and induced investment in a matrix form of:

$$I_r = B\Delta X$$

Then the system can be rewritten as:

$$X = AX + C_p + C_g + I_r + I_s + E - M$$

Substitution and rearranging we get a simultaneous difference requation system of the form:

$$X - (AX - B\Delta X) = C_p + C_g + I_s + E - M$$

Assuming a constant growth rate g_i for each sector so that:

$$B\ x = B\ \hat{g}x$$

where $\hat{g}$ is a diagonal matrix consisting of g's.

$$X - (AX - \hat{g}BX) = C_p + C_g + I_s + E - M$$

Solving for the consistent output growth path for given C_i, I_s, E_i and M_i, we get:

$$X = (I - 1 - gB)^{-1} (C_p + C_g + I_s + E - M)$$

For assumed changes in g_i's and in the capital structure of industries, the system will trace out the expansion path of the economy according to specific policy along with the resultant growth of income. The extra income generated in the economy δy will thus be given as:

$$\delta y = \lambda . (I - A - gB)^{-1} \quad \left[\delta(C_p + C_g + I_s + E - M)\right]$$

where λ is a row vector of value added coefficients.

This model has been illustrated for Nigeria in the appended paper.

6. Model for Multi-Sectoral Structural Analysis in a Competitive Economy

For countries with a relatively more diversified and a competitive market economy, growth models may constructed on neo-classical lines by taking into consideration market forces, e.g prices, demand and supply while maintaining balance relations and intermediate linkages as in input-output models. Such a model originally pioneered by Lief Johansen for

the Norweigian economy has been applied with a fair degree of realism in the case of Morocco.

The model has a Gobb Douglas type production function of the form:

1. $X_i = Ae^{Pit} \cdot L_i^{\alpha_i} K_i^{\beta_i}$ $\quad i = 1, \ldots, n$

where

X_i = Gross Output in Sector i

L_i = Labour Inputs in Sector i

K_i = Capital Inputs in Sector i

P_i = Productivity rates of change in sector i

2. $M_i = \mu_i X_i$

where

M_i = Imported inputs in output of X_i

Consumption is defined as below for the ith sector:

3. $C_i = Ng_i \ (Pi \ \ldots \ P_{n-2} \ P_n \ \ C/N)$

which brings sectoral prices into the system along with total consumption.

4. $Di = di \ ki$

- depreciation is proportional to capital in every sector

5. $I = dk/dt$

- investment equals rate of change of capital stocks.

Then there are balance equations and definitional relations as follows:

6. $\sum K_i = K$ Total capital stock equals sum of sectoral capital

7. $\sum L_i = L$ Total labour employed equals sum of sectoral labour inputs.

The final sectoral balance is given by:

8. $X_i = \sum X_{ij} + C_i + E_i - M_i$

where E_i is export.

In fitting the model recourse is taken to differentiating the equation and expressing the relations as rates of growth of labour, capital, output and consumption, etc.

Through some transformations and with some simplifying assumptions the equations 1 to 8 can be transformed into difference equations with the form of:

9. $By = Cx$

where y = a vector of endogeneous variables in incremental values

x = a vector of exegeneous variables in incremental values.

B, C = matrices of coefficients.

From these different equations the set of endogeneous variables y would be solved by a dimultaeous system solution.

10. $y = B^{-1} Cx$

ANNEX II

PROJECTION MODEL FOR THE ETHIOPIAN ECONOMY

(Summary of results)

The Ethiopian economy is modelled on a centralised socialist planning system. Investments are allocated between sectors by a central decision so that expansion of consumption goods or investment goods are given from the supply side. If there is any disequilibrium this can arise from the fact that the goods supplied by the different consumption sectors do not match the demand at the price fixed by the state or alternately the price system fails to balance the demand and supply sectors satisfactorily, the remedy being either a change in the price or an adjustment of the allocation.

The model which is being tried out for Ethiopia is a generalised form of the Feldman Mahalanobis model.

Instead of the two sector growth model of Mahalanobis a model has been developed involving five sectors of which one is purely a consumption sector and two are purely investment sectors, the rest being mixed sectors. The model has been discussed in Annex 1.

Two scenarios have been tried out. One uses the investment allocation ratios and the base period investment fund as given in the Ethiopian official programme (1). The following sectors are delineated in the above mentioned documents. ICORs have been taken approximately as in Tanzania for these sectors.

Table 2-1. Investment allocation and related capital output ratios

Sectors	Per cent of total allocation of investment*	Proposed capital output ratio
Mining, energy, water-supply, construction	20	7.8
Transport and communications	26	10.4
Manufacturing	15	4.2
Education, housing and social services	15	3.6
Agriculture	20	2.9

(1) Ten year investment programme 1980/81-89/90
Government of Ethiopia.

* The shares do not add to 100 because of other investments. See ten-year investment programme 1980/81-1989/90 page 21.

Using the formulae developed in Annex I we get the following table for the growth of investment over 1980-85.

Table 2-2. Growth of investment by sectors (1980-1985) (values in million Birr)

Sectoral Investments	Base year 1980	1981	1982	1983	1984	1985
Total investment	874.4	954.06	1 040.99	1 135.84	1 239.32	1 352.34
Minin, etc.	174.88	190.81	208.20	227.17	247.86	270.47
Transport and communication	227.34	248.06	270.66	295.32	322.22	351.61
Manufacturing	131.16	143.11	156.15	170.38	185.90	202.85
Eduation, etc.	131.16	143.11	156.15	170.38	185.90	202.85
Agriculture	174.88	190.81	208.20	227.17	247.86	270.47

The above table shows the growth of investment in each sector over the period on the assumption that during the period no additional foreign capital inflow takes place. Of course if it does, this has to be added to the corresponding year and later years recomputed by the formulae for growth of investments.

Table 2-3 gives the growth of value added or national income over the period as derived from the formulae.

Table 2-3. Growth of value added (1980-1985)

Value added by sectors	Base year 1980	1981	1982	1983	1984	1985
Minin	363	381.5	414.2	443.3	475.1	509.7
Transport and communication	355	378.9	404.9	433.3	464.3	498.1
Manufacturing	831	865.1	902.3	942.8	987.1	1 035.4
Education, etc.	2 208	2 247.8	2 291.2	2 295.1	2 346.7	2 403.1
Agriculture	3 872	3 937.8	4 009.6	4 087.9	4 173.4	4 266.7
	7 629	7 711.1	8 022.2	8 202.4	8 446.6	8 713.0

The total value added seems to grow at constant price of 1979-80 from 7,629 million Birr to 8,713 million Birr, an average annual growth rate of 2.7 per cent.

It was subsequently though that Ethiopian capital output ratios were lower than those of Tanzania and a revised lower set of capital output ratios of 5, 9, 3, 2.9 were taken for the four sectors, mining etc., transport and communications, education etc, agriculture etc. It was assumed that manufacturing output entirely consists of consumption goods and has the same capital-output ratio as before. On that revised basis, the following table gives the flow of investments and the corresponding flow of value added in millions of Birr in 1979-80 prices.

Second scenario

Table 2-4. Flow of investments (in millions of Birr at constant 1979-80 prices)

Investment by sectors		1980	1981	1982	1983	1984	1985
Total investment		874.4	980.40	1 099.24	1 232.50	1 381.91	1 549.42
Mining, etc.	$I_{k1} = (k_1 I)$	174.88	196.08	219.85	246.50	276.38	309.88
Transport and communication	$I_{k2} = k_2 I$	227.34	254.90	285.80	320.45	359.30	402.85
Manufacturing	$I_{k3} = c_1 I$	131.16	147.06	164.89	184.88	207.29	232.41
Education, etc	$I_{k4} = k_{c1} I$	131.16	147.06	164.89	184.88	207.29	232.41
Agriculture	$I_{k5} = k_{c2} I$	174.68	196.08	219.85	246.50	276.98	309.88

Table 2-5. Corresponding value added (in million of Birr at constant 1979-80 prices)

Value-added by sectors	1980	1981	1982	1983	1984	1985
Mining, etc	363	402.22	446.19	495.49	550.77	612.74
Transport and communication	355	391.41	432.24	478.02	483.57	541.12
Manufacturing	831	866.81	905.27	949.29	998.65	1 053.98
Education, etc	2 208	2 257.02	2 311.90	2 373.61	2 442.71	2 520.16
Agriculture	3 872	3 939.61	4 015.42	4 100.42	4 195.73	4 302.58
Total	7 629	7 856.27	8 111.10	8 396.83	8 671.43	9 030.60

The growth rate of total national income on reduced capital-output ratios is from 7,629 to 9,030 million Birr revealing a growth rate of 3.7 per cent.

Further scenarios can of course be developed with alternate vectors of allocation and capital-output ratios. An input-output matrix of coefficient may also be used to build up the intermediate flows and the final demand flows to bring out the sectoral consistency. As there is no input-output table for Ethiopia this exercise has been put off for a later time.

The tables reveal that owing to the low initial investment base and the need of infrastructural developments which are capital intensive still higher growth rates will have to depend on injections from outside.

SUMMARY OF PROJECTION RESULTS FOR BENIN

The disaggregated macro-econometric model which was formulated for Benin was explained in annex 1. Because of data constraint, the disaggregation was limited only to the rural sector, the manufacturing sector, investments, imports and exports of goods.

The scenario which is presented in the following table is mainly based on the country programme presented by the Government of Benin for the United Nations Conference on Least Developed Countries. However, some structural characteristics which could not be assumed to change drastically in the period 1981-1985 were taken into account in the scenario. Hence, the results presented are, in some respect, different from the planned over-all and sectoral growth rates indicated in the country presentation.

The scenario assumes that the activities related to livestock, fishing and forestry will continue to expand at the historical trend while there will be some improvement in the industrial crops sub-sector, especially with respect to yield for palm products and cotton. Also, it is assumed that food crop production will improve slightly but not dramatically since (a) Benin has more or less reached the level of food self-sufficiency and will have mainly to maintain such level and (b) most of the measures indicated in the country presentation will materialize mainly in the second half of the 1980s since the related projects are expected to be financed by uncertain external sources. Such measures include inter alia the improvement of extension services through inputs from research projects and training, the provision of health and housing facilities in the rural area, the introduction of new types of seeds, etc. In the manufacturing sector, textile, beverage and vegetable oil industries are assumed to continue to be the leading activities. Hence, other important activities such as cement and sugar industries are assumed to expand at the same path as the three leading activities up to 1985 and will grow faster only during the second period of the decade. Such assumption is based on the fact that the domestic market for these growing activities (i.e cement and sugar) is such that a rate of expansion higher than that of textile, beverage and vegetable oil could not be envisaged unless it is based on the existence of a sub-regional market which is still to be worked out in the framework of CEAO or ECOWAS. Also, these new industrial activities, as well as the existing ones, still suffer from the difficulties encountered by most infant industries in developing countries with respect to raw materials, technology, management and cost of production. As it was explained in annex 1, the growth of the remaining sectors, except construction which is related to investment, would follow that of the above basic activities, more or less on the basis of the present economic structure.

On the expenditure side, the scenario assumes an investment plan similar to the indication given in the country presentation which will affect the pattern of imports of capital goods and consequently that of total imports of recorded goods. As for exports, it is assumed that the present pattern of re-export of imported manufactured goods will be reduced as a result of some rationalization measures envisaged by the Government. However, exports of non-factor services will continue to expand thus bringing about a substantial release in the current account balance.

On the basis of the model presented in annex 1 and the above scenario, and using some targets and policies outlined in the country presentation of Benin, it was projected that the over-all average annual growth for Benin in the period 1981-1985 would be about 7.8 per cent and 7.7 per cent for GDP at factor cost and market price respectively.

While the rural sector will continue to grow slightly higher than in the recent past, (about 3.2 per cent per annum), there will be a much faster growth in the manufacturing sector with an average annual growth of about 13.3 per cent. The sector of commerce and services will continue to be, to some extent, the leading sector with an average annual growth of about 11.2 per cent. Such growth pattern would bring about significant structural changes by 1985, with the share of the rural sector dropping to about 31.4 per cent in 1985 against 38 per cent in 1979 and that of the manufacturing sector reaching over 13 per cent in 1985 against 8 per cent in 1979, the share of commerce and other services remaining more or less at its level of 1979 (about 33 per cent).

The pattern of expenditure of GDP also shows some marked improvement. The elasticity of consumption with respect to GDP will remain below 1, thus bringing about an increase in the saving rate which will reach about 13 per cent by 1985. Though investment is planned to grow at a relatively high rate of about 7 per cent yearly, the domestic resource gap will represent only 5 per cent of total GDP by 1985 which is a manageable level. Also, in spite of substantial increase in imports of goods (about 7.7 per cent per annum) resulting from high annual rates of growth of imports of consumer and capital goods (about 8 per cent and 9 per cent respectively), the sustained re-exports activities in Benin coupled with a surplus in the services balance would keep the share of trade gap in total GDP at around 6 per cent by 1985.

Over-all, the scenario points to an increasing self reliance of Benin with respect to (a) its capability of financing its development; (b) its move towards food self-sufficiency and (c) its effort in building some industrial base.

Table 2-6. Planned projections results for Benin - 1981-1985

Values added in:	Values in billion of 1975 CFA Francs						Average anjual growth rates (%)		
	1981 (est.) level	Share %	1983 level	Share %	1985 level	Share %	1981-1983	1983-1985	1981-1985
Food crops	34.60		26.75		39.04		3.07	3.07	3.07
Industrial crops	13.63		14.50		15.47		3.14	3.29	3.22
livestock, fish & forest	13.75		14.76		15.84		3.60	3.60	3.60
Sub-total	61.98	37.4	66.01	34.1	70.35	31.4	3.20	3.24	3.22
Textile beverage & veg. oil	8.96		11.67		14.75		14.1	12.42	13.27*
Other industries	8.99		11.86		14.75		14.1	12.42	13.27*
Sub-total	17.95	10.8	23.53	12.2	29.50	13.2	14.1	12.42	13.27*
Construction	7.25	4.4	8.58	4.4	10.10	4.5	8.79	8.50	8.64
Consumption & services	48.90	29.5	60.99	31.5	74.87	33.4	11.68	10.30	11.23
Transport	13.69	8.2	15.40	8.0	17.36	7.7	6.06	6.17	6.12
Public administration	16.07	9.7	18.89	9.8	21.93	9.8	8.42	7.75	8.08
GDP factor cost	165.84	100.0	193.40	100	224.11	100.0	7.99	7.64	7.82
GDP market prices	183.17	100.0	213.07		246.75	100.0	7.85	7.61	7.73
Government consumption	22.24	12.1	25.10	11.8	28.31	11.5	6.23	6.20	6.22
Private consumption	140.13	76.5	161.76	75.9	186.20	75.5	7.44	7.29	7.36
Total consumption	162.37	88.6	186.86	87.7	214.51	87.0	7.28	7.14	7.21
Investment	33.95	18.5	38.94	18.3	44.67	18.1	7.10	7.10	7.10
Import of consumption goods	39.72		46.40		53.93		8.08	7.81	7.95
Import of capital goods	16.85		20.06		23.74		9.11	8.79	8.95
Import of goods	63.52		73.82		85.53		7.80	7.64	7.72
Import of goods & services	76.91	42.0	88.35	41.5	101.32	41.1	7.18	7.09	7.13
Export industrial crops	8.26		8.79		9.37		3.16	3.25	3.20
Export of goods &services 1/	61.28	33.4	73.44	34.5	86.52	35.1	9.47	8.54	9%
Savings gap	13.16	7.1	12.78	6.0	12.43	5.0			
Trade gap	15.63	8.6	14.91	7.0	14.80	6.0			

1/ Including re-exports of goods.

SUMMARY OF PROJECTIONS RESULTS FOR ALGERIA

This note gives the results of the application of a static input-output model to the Algerian economy. The explanation of the model has already been given in the preceding text. Table 2-7 gives the empirical values of the parameters for the model which was used to project the final demand. Table 2-8 gives the results of projections based on historical trends. These projections show that if the historical trends and policies are maintained GDP will grow by 10.8 per cent per annum during the period 1980-1985 and total consumption will grow at about same rate; 1/ (12 per cent against 12.4 per cent). Investment will grow by 13.8 per cent per annum and inventory stock by 11.2 per cent. This trend is however not likely to be sustained as Algerian Government intends to pursue its policy for conservation of the country's hydrocarbon resources by reducing its exports and curtailing investment growth rates so as to achieve domestic and external equilibrium. In the light of these recent policy announcements a second set of projections given in Table 2-9 has been made, restricting investment to grow by 7.2 per cent yearly 2/ and export 2.7 per cent. This second scenario shows that by 1985 the domestic resource gap will be less than that obtained in the historical trend scenario.

Final demand estimates were made for the future up to 1985 (and 1990) as given in Table 2-10. Total final demand projection is obtained by summing projection for government consumption, private consumption, fixed domestic investment, inventory changes and exports and by substracting imports. Table 2-11 shows the calculation of domestic gross output as obtained by the input-output model. Sectoral value added ratios of 1974 to gross output, is used to project the corresponding valued added. These results are presented in Table 2-12.

The employment coefficient vector(L) was computed from the original input-output data for 1974 by dividing domestic gross product by the number of people employed in the particular sector. The results of this computation are presented in Table 2-13

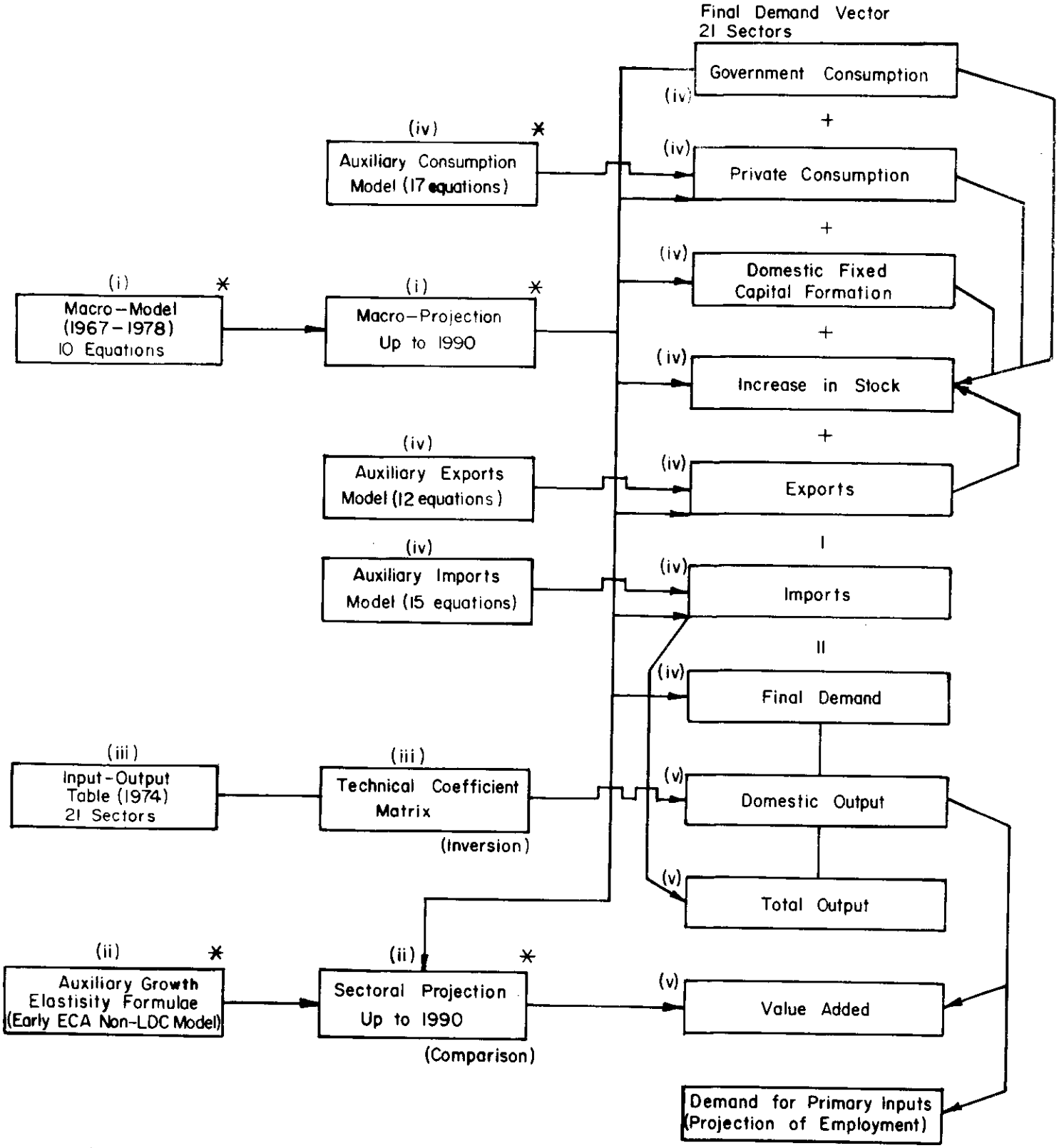
The value added and employment estimates show that labour intensive industries will have an edge in the growth rates compared to capital intensive sectors. Thus high-growth rates are projected for agriculture, energy and water, housing, agro-industries, services, etc. but hydrocarbon sector, mining, iron and steel industry, construction, etc, are projected to grow at lower arates. The second scenario thus envisages diversification of the economy to a more labour intensive and consumption good oriented direction than to a heavy-industry development on capital intensive lines on a priority basis. Particularly, oil is duly conserved as a matter of policy to help in achieving a stable growth rate in the future in slower but more steady way.

Table 2-7. Empirical macro-model for Algeria, 1967-1978

Equations	R^2	S.E.	D.W.
1. Production function			
$YDF_t = \underset{(40.75)}{50.364} + \underset{(20.83}{0.20273} \sum_{j=-1}^{t-1} IF_j$	0.9797	2.3538	2.9567
2. Conversion adjustor			
$\ln (G-T)_t = \underset{(18.65)}{7.64558} + \underset{(2.44)}{0.06775}\ TIME$	0.4272	0.2529	1.2664
3. GDP market prices			
$YD_t = YDF_t + (G-T)_t$			
4. Total consumption			
$C_t = \underset{(-3.00)}{-8.71500} + \underset{(17.13)}{0.73191}\ YD_t$	0.9697	2.2559	1.6162
5. Private consumption			
$CP_t = \underset{(-3.19}{-7.20659} + \underset{(17.88)}{0.56879}\ YD_t$	0.9697	1.7541	1.6506
6. Government consumption:			
$CG_t = C_t - CP_t$			
7. Fixed gross investment			
$\ln IF = \underset{(12.79)}{1.35022} + \underset{(16.99)}{0.13826}\ TIME$	0.9665	0.973	1.4088
8. Inventory stock function			
$\ln INV_t = \underset{(-1.17)}{-0.81930} + \underset{(2.19)}{0.11828}\ TIME$	0.3245	0.6454	1.5150
9. Export function			
$M_t = \underset{(26.19)}{20.054} + \underset{(3.23)}{0.59856}\ YD_t$	0.9005	3.4706	1.6798
10. Import function			
$M_t = \underset{(-4.48)}{-20.054} + \underset{(9.51)}{0.59856}\ YD_t$	0.9005	3.4706	1.6798

Source: Direction des Statistiques et de la comptabilite nationale, statistiques 1967-1978, August 1980

GENERAL SCHEME OF PROJECTIONS FOR ALGERIA



* See E/CN.14/737
E/CN.14/PSD.1/7

Table 2-8. Projection of macro-variables (historical trend scenario) (in billion of 1974 constant dinars)

Macro-variables	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Average annual growth rates 1980-1985	Average annual growth rates 1985-1990
GDP factor costs	68.2	75.1	83.1	92.0	102.3	114.0	127.4	142.4	159.7	179.3	201.7	10.9	12.1
GDP market prices	73.4	80.3	88.1	97.0	107.5	119.1	131.4	146.0	162.8	181.7	206.3	10.2	11.6
Consumption	46.8	51.9	57.9	64.6	72.3	81.0	90.9	102.2	115.0	129.6	149.5	11.6	12.5
- Private	36.1	40.2	44.7	50.0	55.9	62.7	70.4	79.2	89.2	100.5	116.3	11.6	12.5
- Government	10.7	11.7	13.2	14.6	16.4	18.3	20.5	23.0	25.9	29.1	33.2	11.4	12.4
Investment	31.4	39.1	44.5	50.6	57.6	65.6	74.7	84.9	96.7	110.1	125.3	13.8	13.8
Inventory stock	7.8	8.8	9.7	10.8	12.0	13.5	15.0	16.8	18.9	21.3	23.8	11.2	12.3
Exports	15.3	15.7	16.1	16.6	17.5	17.9	17.9	18.4	18.9	19.4	19.9	2.7	2.7
Imports	30.9	35.2	40.1	45.6	51.9	58.9	67.1	76.3	86.7	98.7	112.2	13.7	13.7
Saving gap/GDP	0.36	0.35	0.34	0.33	0.32	0.32	0.31	0.30	0.29	0.29	0.27	-2.5	-3.4
Trade gap/GDP	0.21	0.24	0.27	0.30	0.32	0.34	0.34	0.37	0.40	0.44	0.45	10.0	5.8

Source: Projection made by the ECA secretariat.

Table 2-9 Projection of macro-variables (Planned scenario)a/ (in billions of 1974 constant dinars)

Macro-variables	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Average annual growth rates 1980-1985	Average annual growth rates 1985-1990
GDP factor costs	61.4	64.9	68.6	72.7	76.7	81.2	86.2	91.3	96.8	102.6	108.6	5.8	6.0
GDP market prices	63.7	67.3	71.1	75.4	79.4	84.1	89.3	94.5	100.2	106.1	112.6	5.8	6.0
Consumption	44.6	48.5	52.7	57.2	61.9	67.1	72.6	78.5	84.9	91.6	98.9	8.5	8.1
- Private	34.4	37.5	40.7	44.2	47.9	51.9	56.2	60.8	65.7	70.9	76.6	8.5	7.9
- Government	10.2	11.0	12.0	13.0	14.0	15.2	16.4	17.7	19.2	20.7	22.3	7.3	7.9
Investment	25.4	27.3	29.2	31.4	33.6	35.9	38.8	41.4	44.4	47.6	50.9	7.2	7.2
Inventory stock	7.6	8.2	8.9	9.6	10.3	11.2	12.1	13.1	14.1	15.1	16.5	8.2	7.9
Exports	15.3	15.7	16.1	16.6	17.0	17.5	17.9	18.4	18.9	19.4	19.9	2.7	2.7
Imports	29.2	32.4	35.8	39.4	43.4	47.6	52.1	56.9	62.1	67.6	73.6	10.3	9.1
Saving gap/GDP	0.30	0.28	0.26	0.24	0.22	0.20	0.19	0.17	0.15	0.14	0.12	-7.8	-9.7
Trade gap/GDP	0.22	0.25	0.28	0.30	0.33	0.36	0.38	0.41	0.43	0.45	0.48	10.3	5.8

Source: Projection made by the ECA secretariat.

a/ Gross fixed investment is planned to grow by 7.2 per cent per annum while maintaining the growth rate of export to 2.7 per cent.

Table 2.10. Projection of the final demand components (in millions of 1974 constant dinars)

Sectors		Government consumption vectors			Private consumption vectors			Gross fixed investment vectors		
		1980	1985	1990	1980	1985	1990	1980	1985	1990
A.	Agriculture	1 140.9	1 702.2	2 497.0	9 187.1	13 863.6	20 455.9	203.5	288.1	407.8
B.	Energy and water	621.4	927.1	1 359.9	378.5	571.2	842.8	-	-	-
C.	Hydrocarbon	621.4	927.1	1 359.5	1 032.3	1 557.7	2 298.4	-	-	-
D.	Mining and quarrying	-	-	-	34.4	51.9	76.6	-	-	-
E.	Iron industries	264.9	395.2	379.7	1 341.9	2 025.0	2 987.9	10 683.3	15 123.1	21 411.6
F_1	Construction materials	213.9	319.2	468.2	137.6	207.7	306.5	-	-	-
G_2	Housing	40.8	60.8	89.2	-	-	-	10 301.7	14 583.0	20 646.9
G	Petrol services	-	-	-	-	-	-	2 543.6	3 600.8	5 097.9
H.	Chemicals	1 273.4	1 899.2	2 786.9	2 133.3	3 219.3	4 750.1	-	-	-
I.	Agro-industries	1 619.7	2 416.6	3 544.9	7 741.9	11 682.8	17 239.2	-	-	-
J.	Textiles industries	213.9	319.2	468.2	3 922.6	5 919.3	8 733.9	-	-	-
K.	Hides and skins	142.6	212.8	312.1	1 273.1	1 921.2	2 834.7	-	-	-
L.	Woods and papers	743.6	1 109.5	1 627.5	894.6	1 350.0	1 991.9	432.4	612.1	866.7
M.	Other industries	234.3	349.6	512.8	206.5	311.5	459.7	-	-	-
N.	Transports	539.9	805.5	1 181.6	1 307.5	1 973.1	2 911.3	-	-	-
O.	Communications	336.2	501.6	735.7	172.1	259.6	383.1	-	-	-
PQ.	Commerce	-	-	-	-	-	-	-	-	-
R.	Hotel	509.4	759.9	1 114.7	-	-	-	-	-	-
TA.	Banks and insurances	122.2	182.4	267.5	1 238.7	1 869.3	2 758.1	-	-	-
TB.	Service enterprises	1 039.1	1 550.3	2 274.1	1 926.9	2 907.7	4 290.4	1 271.8	1 800.4	2 548.9
UV.	Services household	509.4	759.9	1 114.8	1 479.6	2 232.7	3 294.4	-	-	-
	Total	10 186.9	15 198.5	22 294.9	34 408.5	51 923.5	776 140.0	25 436.3	36 007.5	50 979.9

Table 2-10 (Cont'd)

Sectors		Export vectors			Import vectors			Inventory stocks vectors		
		1980	1985	1990	1980	1985	1990	1980	1985	1990
A.	Agriculture	413.4	471.4	709.2	4 015.1	6 633.5	10 322.8	287.7	216.5	620.5
B.	Energy and water	-	-	-	-	-	-	-	-	-
C.	Hydrocarbon	14 025.3	15 815.6	24 034.8	665.7	1 101.2	1 713.6	363.4	526.1	783.8
D.	Mining and quarrying	132.9	280.9	288.6	189.4	312.9	487.2	128.7	186.3	277.6
E.	Iron industries	139.7	182.0	238.9	12 233.6	20 177.2	31 391.5	3 770.4	5 458.6	3 131.6
F_1.	Construction materials	-	-	-	641.8	909.8	1 287.9	166.6	241.1	359.2
G_2	Housing	-	-	-	-	-	-	-	-	-
G	Petrol services	-	-	-	-	-	-	-	-	-
H.	Chemicals	100.1	96.2	112.2	3 507.4	5 806.8	9 051.4	961.5	1 392.1	2 073.7
I.	Agro-industries	78.9	104.9	134.5	2 909.8	4 790.8	7 466.2	620.8	898.8	1 338.9
J.	Textiles industries	21.9	38.4	47.5	349.9	569.5	892.8	348.3	504.2	751.1
K.	Hides and skins	20.6	27.1	36.2	41.2	51.3	79.7	476.9	690.5	1 028.7
L.	Woods and papers	21.1	27.6	36.8	1 518.6	2 514.9	3 904.7	870.7	1 260.5	1 877.8
M.	Other industries	-	-	-	941.2	1 563.4	2 433.0	7.6	10.9	16.3
N.	Transports	160.3	227.4	268.8	185.1	264.2	371.9	-	-	-
O.	Communications	-	-	-	-	-	-	-	-	-
PQ.	Commerce	-	-	-	-	-	-	-	-	-
R.	Hotel	-	-	-	-	-	-	-	-	-
TA.	Banks and insurances	89.8	113.5	145.9	538.3	889.4	1 383.9	-	-	-
TB.	Service enterprices	114.5	143.5	184.5	1 418.9	1 989.1	2 832.9	-	-	-
UV.	Services household	-	-	-	-	-	-	-	-	-
	Total	15 311.5	17 458.5	26 238.9	29 154.0	47 573.0	73 619.5	7 571.0	10 961.0	16 328.5

Source: Projections made by the ECA secretariat.

Table 2-11. Projection of overall final demand vectors (in millions of 1974 constant dinars)

Sectors		1974 final demand vector		1980 Final demand vector	1985 Final demand vector	1990 Final demand vector
		Amount	%			
A.	Agriculture	5 295.7	10.1	7 543.4	10 725.9	15 192.5
B.	Energy and water	367.0	0.7	1 033.3	1 550.2	2 280.7
C.	Hydrocarbon	13 003.4	24.8	15 429.1	18 014.7	21 166.7
D.	Mining and quarrying	471.9	0.9	156.6	148.7	131.9
E.	Iron industries	8 703.9	16.6	2 548.9	1 00.3	-1 170.2
F.	Construction material	681.6	1.3	-298.5	-559.1	-927.0
G_1	Housing	4 247.1	8.1	10 337.8	14 636.9	20 729.3
G_2	Petrol services	2 464.4	4.7	2 542.5	3 599.0	5 096.3
H.	Chemicals	2 726.5	5.2	1 220.4	1 376.6	1 595.1
I.	Agro-industries	4 351.9	8.3	7 374.2	10 727.3	15 452.3
J.	Textiles industries	2 307.1	4.4	4 179.0	6 247.2	9 163.9
K.	Hides and skins	629.2	1.2	1 447.1	2 171.0	3 191.5
L.	Woods and papers	1 520.6	2.9	1 555.8	2 091.8	2 851.5
M.	Other industries	157.3	0.3	326.1	477.7	691.8
N.	Transports	1 730.3	3.3	1 840.0	2 685.2	3 871.8
O.	Communications	157.3	0.3	507.7	761.2	1 119.5
PQ.	Commerce	-	-	-	-	-
R.	Hotels	629.2	1.2	1 328.1	1 907.7	2 722.2
TA.	Banks and insurances	838.9	1.6	2 048.9	3 090.1	4 558.2
TB.	Services enterprices	1 625.4	3.1	623.5	539.9	419.7
UV.	Services household	576.8	1.1	1 988.1	2 992.6	4 410.3
	Total	52 433.0	100.0	63 732.0	84 184.9	112 548.0

Source: Projections made by the ECA secretariat.

Table 2-I2. Projection of sectoral gross output (in millions of the 1974 constant dinars)

Sectors	1974 input-output gross output		1980 Gross output vector	1985 Gross output vector	1990 Gross output vector	Growth rates per annum	
	Amount	%				1980-85	1985-90
A. Agriculture	4 763.4	6.9	14 194.2	20 322.3	28 936.2	7.5	7.3
B. Energy and water	770.7	1.1	1 714.1	2 455.3	3 500.3	7.5	7.4
C. Hydrocarbon	22 878.9	33.5	18 350.5	21 669.5	25 799.0	3.4	3.6
D. Mining and quarrying	527.0	0.8	3 243.8	3 882.5	4 724.1	3.6	4.0
E. Iron industries	2 786.2	4.1	12 906.0	13 434.5	14 186.9	0.8	1.1
F. Construction	510.4	0.7	1 198.9	1 493.9	1 911.9	4.5	5.1
G1. Housing	7 494.2	11.1	10 732.9	15 174.9	21 468.1	7.2	7.2
G2. Petrol services	3 189.1	4.7	5 794.0	7 759.2	10 487.3	6.0	7.8
H. Chemicals	1 395.6	2.0	9 126.7	12 282.4	16 723.1	6.1	6.4
I. Agro-industries	4 965.0	7.3	12 172.7	17 659.6	25 389.4	7.4	7.5
J. Textiles industries	2 907.9	4.3	6 635.5	9 877.5	14 449.6	8.3	7.9
K. Hides and skins	792.3	1.2	1 740.6	2 611.1	3 838.3	8.5	8.0
L. Woods and papers	1 177.4	1.7	3 763.3	5 123.1	7 046.5	6.4	6.6
M. Other industries	100.5	0.1	475.4	676.6	960.7	7.3	7.3
N. Transports	3 283.2	4.8	4 564.6	6 241.0	8 589.1	6.4	6.6
PQ. Commerce	6 653.2	9.7	3 078.6	4 218.1	5 821.9	6.5	6.7
R. Hotels	743.7	1.1	1 615.1	2 266.2	3 180.3	7.0	7.0
TA. Banks and insurances	1 516.0	2.2	2 414.8	3 585.1	5 234.5	8.2	7.9
TB Services enterprises	615.6	0.9	3 718.1	4 594.8	5 817.1	4.3	4.8
UV. Services household	1 044.3	1.5	1 988.1	2 992.6	4 410.3	8.5	8.1
Total	68 409.6	100.0	120 165.5	159 385.1	214 001.0	5.8	6.1

Source: Projection made by the ECA secretariat.

Table 2-13. Projection of sectoral value added (in million of 1974 constant dinars)

Sectors		1974 input-output gross output		1980	1985	1990	Growth rates per annum	
		Amount	%	Gross output vector	Gross output vector	Gross output vector	1980-85	1985-90
A.	Agriculture	3 576.9	8.12	10 658.4	15 259.9	21 728.2	7.5	7.4
B.	Energy and water	603.8	1.37	1 342.9	1 923.5	2 742.1	7.5	7.4
C.	Hydrocarbon	18 418.2	41.80	14 772.1	17 443.9	20 768.2	3.4	3.5
D.	Mining and quarrying	372.8	0.85	2 294.7	2 746.5	3 341.9	3.6	4.0
E.	Iron industries	1 083.4	2.46	5 019.2	5 224.7	5 517.3	0.8	1.1
F.	Construction	338.5	0.77	795.1	990.8	1 267.9	4.5	5.1
G1.	Housing	3 972.2	9.02	5 688.4	8 042.7	11 378.1	7.2	7.2
G2.	Petrol services	1 434.5	3.26	2 606.1	3 490.1	4 717.2	6.0	6.2
H.	Chemicals	531.3	1.21	3 474.5	4 675.9	6 366.5	6.1	6.4
I.	Agro-industries	1 567.0	3.56	3 841.7	5 573.4	8 012.0	6.4	7.5
J.	Textile industries	901.7	2.05	2 057.7	3 063.0	4 488.8	8.3	7.9
K.	Hides and skirs	288.0	0.65	632.7	949.1	1 395.2	8.5	8.0
L.	Woods and papers	512.4	1.16	1 637.8	2 229.6	3 066.6	6.4	6.6
M.	Other industries	40.2	0.09	190.2	270.6	384.3	7.3	7.3
N.	Transports	2 276.5	5.17	3 165.1	4 327.5	5 956.7	6.4	6.6
O.	Communications	238.7	0.54	596.1	860.5	1 233.5	7.6	7.5
PQ.	Commerce	4 838.3	10.89	2 238.8	3 067.4	4 233.7	6.5	6.7
R.	Hotels	453.4	1.03	984.7	1 381.7	1 939.0	7.0	7.0
TA.	Banks and insurances	1 444.2	3.28	2 300.3	3 415.2	4 989.4	8.2	7.9
TB.	Services enterprises	399.6	0.91	2 409.7	2 977.9	3 775.7	4.3	4.8
UV.	Services household	767.9	1.74	1 461.8	2 200.5	3 242.9	8.5	8.1
	Total	44 059.5	100.0	68 168.1	90 222.9	120 528.4	5.8	6.0

Source: Projection made by the ECA secretariat.

Table 2-13. Projection of sectoral value added (in million of 1974 constant dinars)

Sectors		1974 employment persons	1974 employment %	1980 Employment vector	1985 Employment vector	1990 Employment vector	Growth rates per annum 1980-85	Growth rates per annum 1985-90
A.	Agriculture	36.81	7.72	146.20	209.32	299.04	7.5	7.3
B.	Energy and water	8.20	1.70	18.17	26.03	37.10	7.5	7.3
C.	Hydrocarbon	39.70	8.22	31.20	36.84	43.86	3.4	3.6
D.	Mining and quarrying	15.50	3.21	95.37	114.14	139.89	3.6	4.0
E.	Iron industries	59.60	12.34	276.19	287.50	303.60	0.8	1.1
F.	Construction	15.90	3.29	37.41	46.61	59.65	4.5	5.0
G1.	Housing	150.30	31.12	215.73	305.02	431.51	7.2	7.2
G2.	Petrol services	-	-	-	-	-	-	-
H.	Chemicals	8.60	1.78	56.59	76.15	103.68	6.1	6.4
I.	Agro-industries	32.60	6.75	80.34	116.55	167.57	7.7	7.5
J.	Textiles industries	29.50	6.11	67.68	100.75	147.39	8.3	7.9
K.	Hides and skins	6.30	1.30	13.92	20.89	30.71	8.5	8.1
L.	Woods and papers	16.40	3.40	52.35	71.21	97.95	6.4	6.6
M.	Other industries	5.20	1.08	24.58	34.98	49.67	7.3	7.2
N.	Transports	42.50	8.80	58.88	80.57	110.80	6.4	6.6
O.	Communications	-	-	-	-	-	-	-
PQ.	Commerce	-	-	-	-	-	-	-
R.	Hotels	-	-	-	-	-	-	-
TA.	Banks and insurances	15.90	3.29	25.36	37.64	54.96	8.2	7.9
TB.	Services enterprises	-	-	-	-	-	-	-
UV.	Services enterprises	-	-	-	-	-	-	-
	Total	483.00	100.0	1 199.93	1 564.18	2 075.38	5.5	5.8

Source: Projection made by the ECA secretariat.

SUMMARY OF PROJECTIONS RESULTS FOR KENYA

The Kenyan multisectoral model, which was explained in annexl, was simulated using inter alia a scenario close to the revised development plan 1979-1983. The results are presented below with some related policy implications.

Overall, gross domestic product is projected to grow by 5,3 per cent per annum during the period 1976-1983 with the two main sectors namely agriculture and manufacturing growing yearly in the average at 4.2 per cent and 6.2 per cent respectively.

Table 1 shows detailed projection of the gross domestic product by industrial origin. It should be noted that the projected increase in the agricultural output is expected (a) to maintain or even slightly improve the present level of per capita food consumption; (b) to increase the availability of agricultural products for the manufacturing sector and (c) to expand exports of agricultural products.

As it may be seen from table 1, there would not be significant changes in the structure of production as agriculture and services will continue to be the leading sectors. However, the share of the manufacturing sector will slightly increase to about 14 per cent of GDP in 1983 compared to 13 per cent in 1976 which denotes a slow down in the growth of that sector compared to 9.4 per cent average growths reflecting the policy currently underway of releasing industrial protection since some industries are no longer in the stage of infancy and could compete successfully against imports.

Another aspect which is worth noting is the relatively high share of trade and services in total output of Kenya - 37.6 per cent and 39.2 per cent in 1976 and 1983 respectively. Actually, the model has proved that these two sectors are the determining sectors as it was explained in part 2. For example the scenario which was analysed assumes an exogenous growth of the trade sector and then derives - the growth of other sectors through the model structure. Such assumption has proved realistic since most of the results are close to the actual figures indicated in the 1979-1983 development plan

Table 2-15. Gross domestic product (GDP) by industrial origin actual 1976; projected 1983

i Sectors	K£ million in 1976 prices				Annual growth 1976-1983 (per cent)
	1976 values	Share %	1983 values	Share %	
1. Agriculture	463.7	35.8	618.1	33.2	4.19
2. Light and food manufacturing	89.3	6.9	136.0	7.3	6.19
3. Other manufacturing	77.0	5.9	117.4	6.3	6.20
4. Electricity and water	14.2	1.1	21.1	1.1	5.79
5. Building and construction	46.2	3.6	61.9	3.3	4.26
6. Trade	119.2	9.2	173.4	9.3	5.50
7. Transport	61.0	4.7	94.3	5.1	6.42
8. Services	367.5	28.4	558.0	29.9	6.15
9. Other sectors	57.9	4.5	84.1	4.5	5.48
GDP at factor cost (YDF)	1 296.1	100.0	1 864.1	100.0	5.33
Indirect taxes minus subidies (IT-S)	109.0		163.0		5.92
GDP at market prices (YD)	1 405.2		2 027.1		5.37

Note: Slight discrepancies in total (YD) are due to rounding

Source: Kenya, Central Bureau of Statistics and ECA secretariat..

The stability which was noted in the structure of production, also characterizes the expenditure pattern. Except for fixed capital formation which share in total GDP declined from 20.7 per cent in 1976 to 18.4 per cent in 1983, the ratios of other components to total GDP remain almost constant from 1976 to 1983. Hence, both the shares of saving and trade gaps in total GDP remain in 1983 at their levels of 1976. However, the saving gap being slightly larger than the trade gap in 1983 there is need for reducing the consumption elasticity with respect to GDP since investment growth could not be reduced from its projected low level of only 3.6 per cent per annum.

Table 2 indicates the pattern of Kenya's expenditure in 1976 with projection to 1983. It may be noted that GDP at market prices would grow annually in the average by 5.4 per cent and that the elasticity of total consumption with respect to GDP would be about 1.07 during the period 1976-1978. As for the fixed capital formation, its projected low rate of growth stems from three main reasons. Firstly the excess capacity which existed in 1976 would be fully utilized by 1983 and the growth of production in the period 1976-1983 would not require large additional investment. Secondly, emphasis was put in the development strategy of Kenya on more efficient capital formation characterized by low incremental capital output ratios. Thirdly, the flow of external financial resources is expected to be substantially reduced over the planning period.

As a consequence of the above investment pattern, imports elasticity with respect to GDP would remain at a relatively low level of 0.96. As it is shown in table 3, such implied moderate rate of growth of imports (5.15 per cent per annum) is a result of relatively low rate of growth of imports of machinery and equipment as well as imports of services.

Table 2-16. Gross domestic product by expenditure

	K£ million in 1976 prices				Annual growth 1976-1983 (per cent)
	1976 values	Share %	1983 values	Share %	
Private consumption* (CP)	913.5	65.0	1 344.6	66.3	5.68
Government consumption (CG)	253.8	18.1	382.6	18.9	6.04
Total consumption	1 167.3	83.1	1 727.2	85.2	5.76
Fixed capital formation (FMV)	290.4	20.7	372.5	18.4	3.62
Saving gap (SG)	52.5	3.8	72.6	3.6	
Exports (EXP)	451.6	32.1	649.8	32.0	5.31
Imports (M)	-504.1	35.9	-716.3	35.3	5.15
Trade gap (TG)	52.5	3.8	67.5	3.3	
GDP at market prices (YD)	1 405.2	100.0	2 027.1	100.0	5.37

Note: Discrepancies in total GDP are due to methodology.

* Including changes in stocks.

Source: Kenya, Central Bureau of Statistics and ECA secretariat.

Table 2-17. Imports by commodities

k Commodity	K£ million in 1976 prices (M_k) 1976	1983	Annual growth (per cent) 1976-1983
1. Food and other agricultural products	27.4	40.5	5.74
2. Crude oil	113.0	169.7	5.98
3. Chemicals	64.1	93.8	5.58
4. Machinery and equipment	179.7	248.3	4.73
5. Other goods and services	119.9	164.0	4.58
Total import (M)	504.1	716.3	5.15

Source: Kenya, Central Bureau of Statistics and ECA secretariat.

RESULTS OF THE MULTISECTORAL DYNAMIC MODEL FOR NIGERIA

Nigeria is the most populous country in Africa as well as one of the most endowed with enormous oil reserves. The abundance of human resources and the huge inflow of capital from exports of oil had spearheaded the economy towards rapid and sustained economic growth in the 1970s. During this period Nigeria was not only enjoying a trade surplus but also a current budgetary surplus. At the close of the decade the picture had reversed when Nigeria turned from a net capital exporter to a net capital importer due to the slack in world demand for oil. The over-supplied oil international market, culminating in the present oil glut, would depress prices even further, resulting in serious deficit on both accounts and would eventually hamper the huge development programme Nigeria is currently pursuing in its Fourth Development Plan. Nevertheless, in our planned scenario we have still retained the importance of foreign trade as the leading sector in the economy, and for the purpose we have advocated a balanced programme for developing export simultaneously in key sectors.

Against this background, the economy of Nigeria has been examined under various growth packages, independently and simultaneously, as to indicate the likely pattern of the development path the economy may follow given certain changes in policy formulations. The first set of these changes relates to the historical growth pattern of the final demand components, employing regression techniques, to trace their effects in output and income determination. Projecting on a historical basis of growth for 1980 and 1985, the output path reveals an average annual growth rate of 6.5 per cent in real terms against 6.2 per cent in the period 1974-1980, provided agriculture is able to grow by 3.8 per cent, manufacturing by 5.3, exports by 10.6 per cent and imports by 11.7 per cent. However, this growth programme is not on the high side when it is realized that the economy only achieved a mere growth of 2.5 per cent in real terms in 1980. Oil shows the highest growth in exports of 10.3 per cent on an annual average during 1980-1985 but relatively lower than the 14 per cent average annual growth attained during 1974-1980. Nonetheless, oil has still maintained the largest share in total exports but its contribution declines substantially from the plan target of 96 per cent in 1979/80 to 79 per cent in 1985, indicating a positive move towards balanced development. In spite of this, the trade balance which was exhibiting significant surpluses of 3,760.4 million Naira during 1974-1980 will be 4,611.9 million naira during 1980-1985.

Table 2 clearly indicates that it is profitable to develop first manufacturing, followed by oil industries and then agriculture. On the whole, capacity creation will increase in the manufacturing sectors during 1980-1985 by 38.3 per cent, oil by 33.1 per cent and agriculture by 17.4 per cent only. All programmes have more or less indicated this result in capacity creation, except for the programme on growth of private consumption where priority is given to the development of agriculture of 71.9 per cent increases. Similarly, the value added generated shows the same pattern of output creation except for minor changes in magnitude.

Table 3 shows the possible investment allocation programmes among industries during 1980-1985. In all growth programmes, except that for exports, it had been clearly indicated that it is more profitable that the largest share of planned investment should be directed towards the development of transport, electricity generation, construction and manufacturing. Nevertheless, it is a logical outcome to lay first the supportive infrastructure for the balanced development of the other economic sectors. Both the shares of agriculture and oil in total investment will decline from 3.8 per cent and 4.9 per cent in 1980 to 2.6 per cent and 3.8 per cent

in 1985 respectively, while the share of manufacturing will rise marginally from 7.4 per cent in 1980 to 7.6 per cent in 1985. The programmed growth of private consumption as a matter of policy (which is more dependent on agriculture), has showed that more investment is needed for the development of agriculture in 1980. However, the sequence is reversed in 1985 when the conducted programme on growth on private consumption favours more investment in manufacturing than in agriculture reflecting the changing pattern of consumption with respect to growth in income.

As the foreign trade, banked on oil, is the impetus of economic growth and the leading sector which gears growth towards self-sustainment, export promotion policies have been taken as an indication of possible future changes. Therefore, in our development scenario and with assumed changes in the capital structure of industries, we have allowed a higher rate of export growth than has been actually observed. In the programmed growth in exports for 1985 we have assumed a growth of 12 per cent for oil and 7.5 per cent, targeted for the Third United Nations Development Decade, for exports of non-oil with minor proportionate changes in growth rates in key sectors. It may be noted that a large part of the phenomenally high possibilities of this programmed growth of exports may be due to the assumption that the programmed export requirements could be sold in international markets.

The results obtained showed that the economy by adjusting to this scenario will be able to achieve 7 per cent growth in output in 1985 compared to a growth of only 6.5 per cent under the past growth trend scenario. With this scenario, the extra capacity created as well as the income generated in the oil industry have indicated an increase of more than one and a half times that obtained under the historical performance scenario. Capacity creation in the agricultural sector have increased by more than five-folds of the earlier observed increase depicting another structure for export diversification. However, capacities created in the manufacturing sectors decreased tremendously reflecting the relatively small dependence of exports on the sector.

Similarly, the investment pattern follows the same path of output development. The most significant changes came in agriculture and oil industries. Both sectors, together, claim more than two-thirds of the planned investment, while with the historical trend scenario for exports their share have only accounted to about more than half. In an effort towards export diversification, the share of agriculture in total investment has increased by more than three-fold from the one originally observed under the historical trend of exports.

The findings also reveals that agriculture still remains the largest employer in the economy providing more than 50 per cent of the additional jobs needed to broaden the base and to strengthen the capacities of exporting industries. The planned export growth programme has indicated that for the development of agriculture for exports it is necessary that the sector should at least sustain four-fold increases in jobs than has been actually observed with the historical growth in exports. On the other side, employment opportunities in oil industry have indicated relatively smaller increases in job creation of only 26.7 per cent during 1980-1985.

It should, however, be noted that this study is only a physical feasibility study that gives the possibility of growth under some reasonable assumptions about the real policy variables. It aims to provide a methodology and the results are more illustrative than substantive. Although, sufficiently disaggregated, this is not a complete plan, as financial implications and prices do not come up in its formulation. Therefore, any comparison done with actual plans or any economic variable derived is just to show the order of magnitude and to help planners to trace the impact of their various policy decisions.

Table 2.18 Changes in activity levels due to various programmes of growth in policy variables capacity creation and income determination during 1974-1980 (in million

Scenario: Past trends

Sectors	Capacity created						Value added					
	Total final demand	Priv. cons. exp.	Govt. final exp.	Autonomous capital exp.	Exports	Imports	Total final demand	Priv. cons. exp.	Govt. final exp.	Autonomous capital exp.	Exports	Imports
1. Agriculture	699.0	901.2	46.2	7.7	71.0	327.1	649.5	837.5	42.9	7.2	65.9	303.9
2. Livestock, forestry and fishing	416.9	496.3	40.8	6.2	14.7	142.0	404.1	482.1	39.6	6.0	14.3	137.9
3. Oil mining	1869.8	153.4	19.5	2.9	1827.3	133.3	1692.9	138.9	17.7	2.6	1654.4	120.7
4. Other mining	257.2	304.0	2.6	0.1	3.1	52.6	171.4	202.6	1.7	0.1	2.1	35.1
5. Food beverages and tobacco	567.5	1093.7	124.7	16.9	69.6	737.4	267.3	515.2	58.7	7.9	32.8	347.4
6. Textile & leather	236.3	272.3	20.9	1.0	5.9	63.8	68.9	79.5	6.1	0.3	1.7	18.6
7. Wood products	-15.2	48.4	0.1	0.2	6.3	70.2	-6.9	22.3	0.1	0.1	2.9	32.3
8. Paper products	133.5	222.9	31.8	4.3	14.0	133.5	59.9	95.6	13.6	1.8	6.0	57.3
9. Chemicals	-118.6	353.9	13.1	0.8	11.8	498.2	-64.8	193.6	7.2	0.4	6.5	272.6
10. Rubber and plastic	156.6	198.7	30.2	3.8	8.6	84.7	55.8	70.8	10.8	1.4	3.1	30.2
11. Metal products	-164.3	146.0	15.2	-0.4	13.5	339.0	-38.7	34.4	3.6	-0.1	3.2	79.9
12. Machinery	-1517.0	113.9	-115.8	-11.5	194.0	1697.6	-481.9	36.2	-36.8	-3.7	61.6	539.3
13. Other manufacturing	-388.2	101.4	1.9	0.1	2.0	493.6	-209.5	54.7	1.1	0.1	1.1	266.4
14. Electricity & water	101.3	123.6	23.4	2.4	5.6	53.7	66.2	80.7	15.3	1.6	3.7	335.1
15. Building and construction	3027.2	3541.4	715.3	92.6	239.7	1561.8	1396.4	1633.6	329.9	42.7	110.6	720.5
16. Transport and communications	978.7	1060.9	168.9	25.7	68.5	345.3	638.5	692.1	110.2	16.8	44.7	225.3
17. Distribution and Finance	1522.1	1633.2	118.1	173.4	55.5	458.3	1307.2	1402.6	101.4	148.9	47.7	393.6
18. Services	3331.6	1585.1	1045.0	816.6	19.7	134.8	3030.4	1441.8	950.5	742.8	17.9	122.6

Table 2-19. Changes in activity levels due to various programmes of growth in policy variables: capacity creation and income determination during 1980-1985 (in millions of nairas)

Sectors	Capacity created						Value added					
	Total final demand	Priv. cons. exp.	Govt. final exp.	Autono-mous capital exp.	Exports	Imports	Total final demand	Priv. cons. exp.	Govt final exp.	Autono-mous capital exp.	Exports	Imports
1. Agriculture	820.8	1549.5	68.1	16.6	74.4	887.7	762.8	1439.9	63.3	15.4	69.0	824.9
2. Livestock, forestry and fishing	576.4	877.1	60.1	13.4	17.6	391.8	559.9	851.9	58.4	13.0	17.1	380.6
3. Oil mining	2489.5	320.7	28.7	6.3	2336.8	203.0	2253.9	290.4	25.9	5.7	2115.7	183.7
4. Other mining	239.0	385.8	3.8	0.3	3.7	154.6	159.3	257.1	2.5	0.2	2.5	103.0
5. Food, beverages and tobacco	589.8	2498.1	183.9	36.5	77.7	2206.4	277.9	1176.8	86.6	17.2	36.6	1039.4
6. Textile and leather	390.6	599.0	30.8	2.2	6.3	247.7	114.1	174.9	8.9	0.6	1.8	72.3
7. Wood products	-51.6	94.8	0.2	0.4	7.6	154.8	-23.8	43.6	0.1	0.2	3.5	71.3
8. Paper products	230.2	483.9	46.9	9.3	17.1	327.0	98.8	207.6	20.1	4.0	7.3	140.3
9. Chemicals	-1127.5	775.3	19.3	1.7	13.4	1937.2	-616.9	424.2	10.6	0.9	7.3	1059.8
10. Rubber and plastic	310.4	437.2	44.6	8.3	10.6	190.3	110.5	155.7	15.9	3.0	3.8	67.8
11. Metal products	-832.7	298.0	22.4	-0.8	16.9	1169.2	-196.4	70.3	5.3	-0.2	4.0	275.6
12. Machinery	-2441.0	-228.8	-170.8	-24.9	245.3	2620.1	-775.5	-72.7	-54.2	-7.9	77.9	832.4
13. Other manufacturing	-2846.6	168.6	2.9	0.2	2.2	2020.7	-996.6	90.9	1.6	0.1	1.2	1090.6
14. Electricity and water	265.3	346.5	34.6	5.1	6.9	127.8	173.3	226.3	22.6	3.3	4.5	83.5
15. Building and construction	6088.2	8260.2	1054.7	200.1	286.6	3713.4	2808.5	3810.4	486.5	92.3	132.2	1713.0
16. Transport and communications	1845.7	2235.0	249.1	55.5	85.8	779.7	1204.1	1458.1	162.6	36.2	55.9	508.6
17. Distribution and finance	2504.1	3059.0	174.1	374.8	67.6	1171.4	2150.5	2627.1	149.6	321.9	58.1	1005.9
18. Services	4520.1	2404.2	1540.8	1765.1	24.7	214.7	5021.1	2186.9	1401.5	1605.5	22.5	195.3

Table 2-20. Programmes of investment allocation among industries under various packages of growth in final demand components: 1974-1980 and 1980-1985

Scenario: Past trends

Sectors	1974 - 1980						1980 - 1985					
	Total final demand	Priv. cons. exp.	Govt. final exp	Autono-mous capital exp.	Exports	Imports	Total final demand	Priv. cons. exp.	Govt final exp.	Autono-mous capital exp.	Exports	Imports
1. Agriculture	0.0308	0.5260	0.0117	0.0038	0.0372	0.0365	0.0257	0.0489	0.0149	0.0072	0.0343	0.0440
2. Livestock, forestry & fishing	0.0236	0.0303	0.0108	0.0032	0.0080	0.0165	0.0188	0.0289	0.0138	0.0061	0.0085	0.0203
3. Oil mining	0.0495	0.0044	0.0024	0.007	0.4659	0.0072	0.0379	0.0049	0.0031	0.0013	0.5257	0.0049
4. Other mining	0.0050	0.0064	0.0002	0.0001	0.0006	0.0021	0.0027	0.0043	0.0003	0.0001	0.0006	0.0027
5. Food, beverages & tobacco	0.0444	0.0917	0.0455	0.0119	0.0524	0.1181	0.0265	0.1133	0.0579	0.0227	0.0516	0.1572
6. Textile and leather	0.0114	0.0142	0.0047	0.0004	0.0027	0.0063	0.0109	0.0168	0.0060	0.0009	0.0026	0.0109
7. Wood products	-	0.0040	0.0001	0.0001	0.0046	0.0109	-	0.0042	0.0001	0.0002	0.0049	0.0108
8. Paper products	0.0092	0.0170	0.0105	0.0028	0.0096	0.0194	0.0094	0.0199	0.0134	0.0053	0.0103	0.0211
9. Chemicals	-	0.0344	0.0056	0.0007	0.0103	0.0926	-	0.0409	0.0071	0.0012	0.0103	0.1601
10. Rubber and plastic	0.0095	0.0129	0.0085	0.0021	0.0050	0.0105	0.0108	0.0025	0.0026	0.0007	0.0016	0.0016
11. Metal products	-	0.0061	0.0028	-	0.0051	0.0272	0.0188	0.0008	0.0006	-	0.0011	0.0029
12. Machinery	-	0.0065	-	-	0.0988	0.1841	-	0.0011	-	-	0.0277	0.0260
13. Other manufacturing	-	0.0097	0.0008	0.0001	0.0017	0.0906	-	0.0088	0.0010	0.0002	0.0017	0.1649
14. Elect. & water	0.0322	0.0422	0.0347	0.0069	0.0171	0.0350	0.0486	0.0640	0.0444	0.0129	0.0186	0.0371
15. Building and construction	0.0749	0.0940	0.0825	0.0206	0.0571	0.0792	0.0866	0.1185	0.1052	0.0394	0.0602	0.0837
16. Transport & communications	0.2679	0.3115	0.2155	0.0635	0.1805	0.1936	0.2906	0.3549	0.2749	0.1209	0.1994	0.1945
17. Distribution & Finance	0.0638	0.0734	0.0231	0.0656	0.0224	0.0394	0.0604	0.0744	0.0294	0.1250	0.0241	0.0447
18. Services	0.3697	0.1887	0.5406	0.8176	0.0210	0.0306	0.3523	0.0928	0.4252	0.6559	0.0169	0.0124

Table 2-21 Planned growth in export vector basic indicaters - 1985

Scenario: Planned export programme of growth of 11.8 per cent
- Oil 12 per cent
- Non-oil 7.5 per cent

	Extra capacity created ₦ million	Extra income generated ₦ million	Investment allocation	Employment ratios
1. Agriculture	377.5	350.8	0.1204	0.5751
2. Livestock, forestry and fishing	28.0	27.2	0.0093	0.0426
3. Oil mining	3 721.6	3 406.8	0.5783	0.0251
4. Other mining	9.2	6.1	0.0011	0.0001
5. Food, beverages and tobacco	31.0	14.6	0.0142	0.0404
6. Textile and leather	9.8	2.9	0.0028	0.0128
7. Wood products	4.3	1.9	0.0019	0.0056
8. Paper products	8.8	3.7	0.0037	0.0115
9. Chemicals	5.0	2.7	0.0027	0.0065
10. Rubber and plastic	12.0	4.2	0.0043	0.0156
11. Metal products	16.0	3.8	0.0037	0.0208
12. Machinery	45.1	14.3	0.0139	0.0588
13. Other manufacturing	81.0	43.7	0.0426	0.1057
14. Electricity and water	3.8	2.5	0.0071	0.0002
15. Building and construction	5.5	2.5	0.0001	0.0004
16. Transport and communications	104.0	67.8	0.1669	0.0484
17. Distribution and Finance	34.0	29.2	0.0084	0.0259
18. Services	27.6	25.1	0.0179	0.0042

RESULTS FOR THE MULTISECTORAL STRUCTURAL ANALYSIS MODEL FOR MOROCCO

The model for multisectoral structural analysis was estimated and some scenarios run for the Morocco economy for the period 1980-1985. The scenarios attempted were undertaken with the aim of illustrating how the model could be used in policy choices of a structural nature and hence, the results should be interpreted as being indicative of the likely patterns of growth under certain structural changes.

Table 1 below summarises the projected growth under different sets of rates of change in productivity during the period 1980-1985 in the different sectors along with given different rates of increase in total investment in the same period. Two rates of growth of investment were used: a high rate of 10 per cent yearly based on a relatively high investment rate achieved between 1975-1980 and a moderate rate of 7 per cent yearly based on some improvement over the relatively slow rate of investment expansion during the 1978-1980 period. It is expected that the total investment rate planned in the Moroccan Quinquennal Plan 1981-1985 will fall within this interval 1/ All these simulations were based on the structure of intersectoral flows as estimated from the 1975 input-output table.

Although the results in the table 1 are only indicative, they reveal some interesting features. Firstly, the results show that during the 1980-1985 period, the most dynamic sectors - i.e sectors which in real terms will grow fastest - are likely to be agriculture, mining other than phosphates and manufacturing. On the other hand, the model simulates low growth for the phosphates sector as well as for the services sectors of transport and commerce. Further, the model's results point to a very low or even a negative growth rate in the construction sector. This feature is supported by the fact that during the past few years value added in construction has actually been declining, a trend apparently captured by the model simulation for the 1980-1985 period.

Secondly, the results show relatively little elasticity between output and changes in productivity. This feature may be explained by the fact that the productivity parameters in the model relate to elements of modernisation and technological changes. It would therefore appear that during the 1980-1985, the economy of Morocco need not undergo extensive modernisation in the various sectors in order to achieve high rates of growth. In other words, the model results show that the Moroccan economy is presently based on a fairly modern technological base. However, it should be emphasised that some sectors like mining (excluding phosphates) and agriculture show a fair response to increase in the rates of change of productivity implying that these sectors can benefit from further modernisation during 1980-1985.

Overall, under the assumption of historical structural relationships, the results point to a likely growth of around 6.5 per cent for GDP in real terms (although this estimate does not include the rate of growth of public administration). This growth would require a total average annual rate of increase in investment of about 10 per cent yearly, a rate which is just slightly less than the historical 10.8 per cent average annual increase in capital formation during 1975-1980.

As noted earlier, the application of the model was exploratory and as such it is thought pertinent to outline some of the problems encountered and to outline some possible improvements that are proposed to be made on the model so as to make it more applicable to the African economies

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1/ By the time, the model simulations were made the Moroccan Quinquennal Plan for 1981-1985 was not yet available.

Table 2/2 Structure of growth under different productivity and idifferent investment rates scenarios: 1980-1985

Parameters sectors	Scenario 1	Sectoral growth rates under scenario of:		Scenario 2	Sectoral growth rates under scenario of:		Scenario 3	Sectoral growth rates under scenarios of:	
	Low inc. in prod. Pi %	Low inc. in invest. I=7 %	High inc. in invest. I=10 %	Medium rates of increase in prod. Pi %	Low inc. in invest. I=10 %	High inc. in invest. I=10 %	High rates of inc. in Prod Pi %	Low inc. in invest. I=7 %	High inc. in invest. I=10 %
1. Agriculture	1.5	6.6	7.9	1.5	8.5	9.6	3.0	8.9	10.0
2. Phosphates	1.5	0.2	0.3	3.0	0.4	0.5	4.0	0.4	00.5
3. Other mining	1.0	9.7	12.0	4.0	12.7	14.9	4.0	13.3	15.4
4. Energy	1.0	4.7	5.8	3.0	6.4	7.5	4.0	6.8	7.8
5. Manufacturing	2.0	6.0	7.4	3.5	7.9	1.1	5.0	9.1	9.5
6. Transport	1.5	2.4	3.1	3.5	3.1	3.9	4.0	3.4	4.1
7. Commerce	0.5	1.8	2.2	2.5	2.3	2.6	2.5	2.4	2.7
8. Construction	1.5	-0.3	1.9	3.5	-0.5	1.5	5.0	-0.3	2.2
GDP a/		4.2	5.1		5.5	6.5		5.7	6.6

a/ Including public administration.

Pi = Annual average rate of change in the productivity of sector i.

I = Average annual rate of increase in total investment.

The first major problem of applying the model to Morocco related to the availability of certain critical data namely: (a) sectoral employment data including averages wages data on these variables was not readily available for Morocco; so that estimates of sectoral labour inputs and labour productivity in the production functions were very difficult to obtain with reliability. In most cases only crude estimates of these parameters could be obtained although every effort was made to supplement such parameters with data from countries with similar economic structures; (b) the consumption elasticities and cross-price elasticity data. In spite of quite a few simplifying assumptions with regard to the demand structure, the price data presented a major bottleneck in the estimation of demand coefficients especially (i) derivatives of demand with respect to total consumption expenditure; (ii) derivatives of demand with respect to prices of each sector; (c) the capital depreciation rates and sectoral outlay. As the 1975 input-output table gave no values for depreciation, it was difficult to obtain the necessary values for capital depreciation in each sector. However, since capital is fairly similar in many countries the relevant information was estimated from data of countries, e.g Kenya, Algeria, with comparable economic structures. The estimation of the distribution of capital stock to different sectors was relatively easy due to the fact that Morocco has fairly good national accounts detailing, in quite a few cases, the allocation of annual fixed capital formation to the different sectors.

The data problem was further compounded by the fact that consumption behaviour in developing countries still has to be explored and its determinants more fully analysed. Actually, the weakness of the data base on the demand structure and other problems resulted in a poor performance of the model with respect to price variables which in a majority of the simulations were not meaningful. In view of the fact that price projections is notoriously hard this is not surprising. A lot of trial experimentation has to be attempted before reasonable price projections are also obtained. For limitation of time therefore this part of the projection has been left for further improvement before being presented. It is suggested that the model should be usefully reformulated to enable a more straight forward and realistic treatment of the consumption patterns in developing countries.

The second problem in the application of the model to an economy like that of Morocco, relates to the fact that the model does not directly address the major problem of balance of payments deficits and how such deficits affect the level pattern of production, especially in the long-and-medium term. It would therefore also seem important in any future adaptation of the model for application to developing economies to incorporate in a more explicit manner, the relationship of external financial resource scarcity with domestic production and demand structure.