STRUCTURAL FACTORS IN THE

MACRO-ECONOMIC PLANNING PROCESS

STRUCTURAL FACTORS IN THE MACRO-ECONOMIC PLANNING PROCESS: A STUDY OF PLANNING IN NIGERIA

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ABSTRACT

This study is a search for an analytical framework within which the structural factors constraining the Nigerian development process can be highlighted.

We examine the input-output method and its relationship to planning a less developed country. The input-output table available for Nigeria is analysed using conventional techniques. Certain indices are derived in an attempt to throw some light on the evaluation of the development process. The importance of designing an input-output table within the context of the particular problem to be solved is emphasized.

A comparative analysis is made of the Nigerian table and an input-output table for Zambia, to highlight the relationship between the design and the use of an input-output table in the planning process. Furthermore, the elements involved in designing a table that would come to grips with the question of structural transformation, are discerned. In particular, the need to relate the classification of economic activities in an input-output matrix to the planning problem emerges.

The data provided in the Nigerian table are used to illustrate the sort of basis on which an input-output table could be built if there is to be a link between a formal description of the economy and the simulation of change.

The study illustrates the extent to which the development process depends on the planners' recognition of the relationship between the problem of transformation and the nature of structural constraints in the economy. In this way, it is possible to isolate systemic malfunctions in the economy and identify in connection with these, the areas of weakness in the

planning process.

It is also seen that if the input-output model is to be useful in planning structural transformation, it must be able to accommodate radical changes in the structure of production and a normatively determined pattern of demand. The scope of the conventional model must be broadened to allow the planner to emphasize target groups of people in relating the structure of production to the pattern of demand.

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ECA	Economic Commission for Africa
FAO	Food and Agricultural Organization
GATT	General Agreement on Tariffs and Trade
IBRD	International Bank for Reconstruction and Development
IMF	International Monetary Fund
LDC	Less developed country
NBER	National Bureau of Economic Research
NJESS	Nigerian Journal of Economic and Social Science
OECD	Organization for Economic Cooperation and Development
UN	United Nations

CHAPTER I

STRUCTURAL FACTORS IN THE PLANNING PROCESS

A.- INTRODUCTION

In a general sense, planning aims at moving a society from an existing state to another, more desirable state. The transition of the society towards this desirable state can be called development. Development then, would depend on both the objective conditions characterizing the existing state and the human response to these conditions. Objective conditions refer broadly to those factors which affect man's practice of life and which must themselves be changed if man desires a different practice. The economist's notion which comes closest to the notion of an objective condition is the concept of "structure". The process of changing the dimensions of "structure" can be called structural transformation.

According to Fritz Machlup,[1] one of the clearer meanings of structure in economics is the set of outcome-determining but not outcome-determined conditions often assumed in economic analysis:

> Thus for certain economic problems we take as given and unchanged for the duration [of the adjustment process in question] (a) the stock of productive resources (the so-called initial endowment), (b) the production functions, (c) the legal, moral, political and social institutions relevant to the problem. Change of prices, absolute and relative, or incomes, money or real, of resource allocation, production and product distribution are all supposed to leave the mentioned ("fundamental") conditions unchanged.[2]

In the neo-classical economy, with perfect knowledge, perfect substitution in factor and commodity markets and corresponding homeostatic adjustment of factors of production, it is possible to abstract from consideration of changes in fundamental (objective) conditions. It could be said that this economy is at a "desired" state in terms of those forces which affect its people's practice of life. But the less developed country (LDC) is not as flexible an economy as that implied by the neo-classical assumptions. The constraints which objective conditions in the LDC impose on the practice of life are severe enough for planners to have started articulating the need for structural transformation.

This thesis stems from the assumption that a study of the planner's cognition of structural factors and his choice of analytical tools may be an important element in any attempt at understanding the development process. The analysis of a specific situation should provide substantive clues on the process of structural transformation. For this study, Nigeria provides the specific situation. As a frame of reference, it is necessary first to give an overview of structural transformation in a planning context. The following section leans heavily on Clive Thomas' analysis of "Dependence and Transformation."[3]

B. THE MEANING OF STRUCTURAL TRANSFORMATION IN A PLANNING CONTEXT

The essence of Thomas' thesis is that the underdeveloped nature of an economy is linked to two forms of divergence. First, there is a divergence between the pattern of domestic resource use and the pattern of domestic demand. Second, there is a divergence between the pattern of demand and the pattern of needs. These divergences must be seen in a historical context.

The divergence between resource use and demand stems from the externalization of economic decision-making which is part of the colonial heritage of most LDCs. This divergence refers to the export by the LDC of a limited range of agricultural and/or mineral products not consumed locally in return for a variety of manufactured (mainly consumer) goods. It could be argued that divergence is characteristic of most countries engaged in international trade on a major scale. Thomas' position is that the developed country generally exports commodities that are also consumed locally in significant quantities. On the other hand, the commodities exported by the LDC are not usually consumed locally, i.e., exports are not in general an extension of domestic consumption.

More precisely, the trade position of the developed country could be said to be the market outcome of a set of producer and consumer maximizing decisions. In effect, it would reflect relative factor scarcities. On the other hand, the general pattern of production in the LDC is not entirely the outcome of their internal maximizing decisions. The decisions that led to the present pattern of specialization in most LDC's were made in a colonial situation. Consequently, the decisions reflected the needs of the metropolis more than those of the colony. For instance, there is some evidence that certain types of manufacturing activities considered viable by the private trading houses which dominated Nigeria's external trade picture until the middle of this century, were actively discouraged by the Colonial Government.[4] The textile and palm kernel processing industries are examples. With respect to textile mills, the World Bank Mission of 1953 was compelled to recommend that "proposals of this type warrant active consideration by the authorities concerned rather

than the cool and overcautious reception which they appear to have received".[5]

Divergence between demand and needs reflects an external orientation also in consumption. The pattern of production together with the low per capita income of about twenty-five pounds per annum and a highly skewed distribution of income creates a divergence between demand and needs. Demand is dominated by the minority in whose favour income distribution is skewed. In contrast, large segments of the population live in absolute poverty defined in terms of simple physiological needs. The reason for emphasizing needs as opposed to demand is that the existing level of demand reflects the low level of income and consequent concentration of consumption on a few high-carbohydrate, protein-deficient staples, the cassava and yams. The Nigerian Federal Ministry of Agriculture and Natural Resources estimates that average calorie intake is 2,200 which is only slightly below the FAO estimated minimum requirement of 2,300-2,400. However, average protein intake is only 58.7 grams as against a minimum requirement of 70 grams. Moreover, animal protein is less than one-third of this protein intake.[6]

The income elasticity of demand for imports tends to be much higher than the income elasticity of demand for domestic consumption goods. This is in part an effect of the external model mentality.[7] In short, the colonial link determines in part the pattern of income distribution and the pattern of consumption. The beneficiaries of the existing structure of production tend to spend more in foreign markets. Thus, they contribute little to the integration of the economy. Meanwhile, the poor have little access to the organized market economy.[8]

The basis of a rational planning norm must, therefore, be in the initiation of the process by which domestic resource use, domestic demand and the needs of the population are aligned. This process will be referred to hereafter as convergence. To the extent that the inherited system lies at the logical heart of the development problem, planning must be concerned with initiating the process by which it would be altered. Thus, planners must be prepared to choose a vector of goods for final demand that is sensitive to needs derived from biological and social criteria. Efforts would have to be made then to alter the structure of production so that commodities deemed to be desired by the low income groups are produced.

To achieve convergence, production and consumption have to be planned simultaneously. Consumption needs as opposed to demand would provide the initial basis for planned transformation. In broad terms, transformation would involve orienting agricultural production towards higher quality mass-consumption goods. Allowance must, of course, be made for the fact that modern agriculture tends to be both skill- and capital-intensive and requires a certain degree of land-consolidation. Arrow and others showed that agriculture could be more capital-intensive than the activities usually assumed to be highly capital-intensive; e.g., iron and steel, machinery, transport equipment, etc.[9] Furthermore, historical evidence suggests that the present fragmentary system of agricultural production may have to change to take advantage of large scale production and distribution.[10] This in turn will encourage greater specialization in production. The present multiple-cropping system in Nigeria reflects a rational mini-max agricultural strategy, because

existing production possibilities involve a great deal of uncertainty due to climatic and other conditions.

Some implications for the industrial sector become obvious: the process of agricultural transformation must involve certain industrial inputs - farm tools, improved seeds, fertilizers, and pesticides, etc. At the same time, greater specialization in agriculture would make higher production of industrial raw materials possible. Thus, planned industrialization must be integrated with planned agricultural development. The industrial strategy calls for the development of an indigenous technological basis for production. Once the desired profile of consumption is plan-integrated with a set of rational consumption norms,[11] some specific industrial needs would become obvious. The major resource and industrial content of the consumption profile must be ascertained and integrated into the plan.

C. OBJECTIVES OF THE STUDY

In this study, the hypothesis that planning in Nigeria has cost more than it should, is examined. A direct test of this hypothesis cannot be undertaken because it is impossible to isolate that part of social change in Nigeria which can be attributed entirely to planning. This analysis, therefore, follows an indirect route. We shall study the Nigerian planners' cognition of the development process with a view to discovering if the planning strategy corresponds roughly to a direct assault on the problem of structural transformation. In the process it would also be necessary to examine the methodological stance of the planners. The planners' choice of a planning technology reflects both his cognition of the problem and his preconceived notions about the nature

of planning.

Planning in Nigeria has evolved from devising "major schemes" to provide basic social and infrastructural services to a more comprehensive type directed at the "power centres of economic and political decisions".[12] Thus from the 1970-74 plan, the "desirable state" can be identified in terms of three characteristics. First, there is a concern with acquiring a greater measure of control over the domestic economy. Second, there is a desire to raise per capita incomes. Third, there is a strong interest in achieving a balance in both personal and regional well-being.[13] Broad-based planning of this sort requires a detailed analysis of the commodity structure of demand, supply and international trade if the outcome of planned stimuli is to be correctly assessed. Yet in Nigerian planning to date, there has been neither a systematic examination of intersectoral relationships nor a deliberate attempt at isolating systemic malfunctions.

The result is that while national output has increased at a respectable pace over the last two decades, little progress has been made in terms of structural transformation. We see in Table 1.1 that the aggregate growth rate conceals vital differences among broadly defined sectors. Increases in output have arisen mainly in the relatively small modern sector. This sector's link with the rest of the economy is tenuous. Although it attracts, it does not absorb labour from the agricultural sector. This is due mainly to the capital-intensive nature of activity in the modern sector because the techniques used here are imported from countries using capital-intensive techniques. The use of capital-intensive techniques is often reinforced by government policies.

Table 1.1: Sectoral Growth Rates (Percent)

	Shares in 1962/63	Average Annual Over Period, in Real Terms			
		1950-57	1958/59 to 1962/63	1962/63 to 1966/67	1966/67 to 1970/71
GDP	100.0	4.1	6.4	5.5	5.5
AGRICULTURE	61.5	2.9	4.6	2.0	0.8
MINING	2.1	3.1	27.0	44.0	26.5
MANUFACTURING	5.8	5.6	13.9	10.5	9.7
POWER TRANSPORT & CONSTRUCTION	9.6	15.1	12.1	5.5	3.8
SERVICES	21.0	3.4	6.8	7.0	6.2

Source: International Bank for Reconstruction and Development. Nigeria: Options for Long-term Development. Table 1.1, page 12.

For instance, the tendency for wages in the modern industrial sector to move in line with the politically-determined wages of the government sector often makes labour even less attractive to the producers.[14] Consequently, the share of agriculture in employment is only slightly decreasing and most migrants from this sector either become unemployed in the towns or find employment in traditional manufacturing and service activities in which earnings are no higher than in agriculture.

Furthermore, much of value added in the modern industrial sector is exported because it is dominated, in terms of ownership and management, by expatriates.

In monitoring the economy over the years and attempting to control its evolution, planners are gradually realizing the need for a broad analytical framework. They are becoming increasingly aware of the advantages of input-output tables and multi-sectoral models. By the end of the plan-formulation exercise, the architects of the 1962-68 Plan had realized the usefulness of input-output tables.[15] Similarly, after the 1970-74 Plan was launched, an office of National Accounts was established separate from the Federal Office of Statistics, to prepare, among other things, an inter-industry matrix. But the design of an input-output table cannot be separated from the use to which it would be put. Furthermore, this use depends on the planners' cognition of the problem. It follows, therefore, that the plan-relevance of an input-output table must be ascertained. It is necessary then to evaluate the information obtained from manipulating an input-output table to determine its relation to the planners' questions.

An input-output table for Nigeria, prepared partly as a

response to the perceived needs of the designers of the 1962-68 Plan, provides a very useful illustration. An input-output table is merely a description. Like any description, this input-output table would reflect the perceptions of the observer. Nevertheless, certain indices can be derived from it which would give planners a feel for the sectoral linkages within the economy. In addition, the table can be manipulated to provide very useful answers to questions related to planned convergence. Certain difficulties which beset the interpretation of these answers will be dealt with in the context of the relationship between the design and use of an input-output table.

D. ORGANIZATION OF THE STUDY

Our two-level approach to the problem of structural transformation in Nigeria suggests a logical process of analysis. First, we examine the planning process in Nigeria to discover how planned emphasis has been related to the structural factors in the economy. Thus Chapter II is devoted to analysing the extent to which the planned pursuit of growth in Nigeria has led to structural transformation. Moreover, we examine the extent to which the plan framework could support broad-based planning. We turn briefly thereafter to the question of plan design. The premise is that the design and use of an input-output table in Nigeria should be in the context of structural constraints that are to be eliminated.

In Chapter III, the relationship between input-output analysis and the planning problem in a LDC, where the outputs of modern and traditional sectors overlap and where the absolute level of poverty is high, is analysed in terms of the only matrix that has been designed for Nigeria.

The structure of the Nigerian economy as portrayed in this table is examined in Chapter IV. The aim is two-fold. The first is to show how much plan-relevant information can be derived from an input-output table. The second is to see the limitations of a conventional input-output table as produced for Nigeria, with respect to the question of structural transformation in a LDC.

To study the changes that might be necessary in the design of an input-output table to accommodate the problem of transformation, Chapter V is a comparative analysis. The Nigerian table is compared with a modified input-output table for Zambia. The latter was designed in the context of a more broadly-based planning process.

In Chapter VI, we raise the question: what kind of classification of economic activities would be necessary in Nigeria to highlight the sort of questions raised in Zambia? In attempting to answer this question, the data from which the Nigerian table was constructed are used illustratively.

A brief summary of the main points and matters of interpretation is given in Chapter VII.

FOOTNOTES TO CHAPTER I

[1]Machlup, Fritz, Essays on Economic Semantics, Englewood Cliffs: Prentice Hall Inc., 1963.

[2]Ibid., p. 80.

[3]Thomas, C.Y., Dependence and Transformation, New York: Monthly Review Press, 1974.

[4]See Liedholm, C., "The Influence of Colonial Policy on the Growth and Development of Nigeria's Industrial Sector" in Eicher, C. and C. Liedholm (eds.), Growth and Development of the Nigerian Economy, Michigan State University Press, 1970.

[5]Quoted in Ibid., p. 57. Liedholm traces the discouragement of manufacturing to an important keystone of British colonial policy, the desire to secure and preserve markets for British-made goods. Thus there was a tendency to retard the establishment of manufacturing firms because they might reduce the market for British goods.

[6]See Guidelines for the Third National Development Plan, 1975-1980, Federal Ministry of Economic Development and Reconstruction, Lagos: 1974.

[7]The external model mentality refers to the tendency of the highly educated Nigerian and his expatriate counterpart, to emulate the highest standards of consumption in the Western World and the tendency of the less privileged Nigerian to emulate his "westernized" compatriot.

[8]Cf. Chenery, H.B. et. al., Redistribution with Growth, published for the World Bank and the Institute of Development Studies by Oxford University Press, 1974.

[9]Arrow, K.F. et. al., "Capital-Labour Substitution and Economic Efficiency", Review of Economics and Statistics, Vol. 43, August, 1961.

[10]For a further discussion of which, see Thomas, C.Y., op. cit., Ch. 5.

The Japanese experience suggests, however, that it is quite possible for small-scale farming to support a rapid development of agriculture if the institutional and organizational environment is modernized and simple technological improvements are introduced.

[11]The Soviet Academy of Sciences proposed a set of "ideal" rational norms of food consumption. Some examples are: meat, 73-91 kg. per annum, per capita; milk, 292-585 kg.; eggs, 175-370 units. See Thomas op. cit., p. 146.

[12]Second National Development Plan, 1970-74, Lagos: Federal Ministry of Information, 1970.

[13]Ibid.

[14]Cf. Kilby, P., "Industrial Relations and Wage Determination in Nigeria: The Failure of the Anglo-Saxon Model", Journal of Developing Areas, Vol. 1, July, 1967.

[15]See Hansen, L.M., "Methods of Economic Programming and Analysis in the Plan", Nigerian Journal of Economic and Social Science, Vol. 4, No. 2, July, 1962.

CHAPTER II

A CRITICAL EVALUATION OF THE PLANNING PROCESS IN NIGERIA

> Beware that you do not lose the substance by grasping at the shadow.
>
> Aesop

A. Introduction

Nigeria has had a relatively long history of development planning. The earliest attempt was made in 1946. Planning has come to be generally accepted as indispensable for decision-making on questions with major social and/or long range implications. But development is costly and one of the reasons for planning is to minimize these costs. The popular acceptance of planning does not prove its effectiveness, nor does it imply that it has been well done. It is important, therefore, to evaluate how well the limitations operating within the economy have been recognized in the planning process and how successful the attempts at minimizing development costs have been.

To attach an index to the degree of planning effectiveness or of development-cost minimization is a formidable task which will not be undertaken here. Planning in Nigeria has never been total in the sense of the Soviet model. This means that the number of variables that should be isolated in any attempt at correlating the planning and development processes is very large. It will be argued in this thesis that the more broadly a plan is conceived and the better coordinated its various proposals, the more effective it is likely to be. Inconsistencies between projects and between proposals can more easily arise the less clearly foreseen or correctly assessed is the pattern of structural

limitations. Additional resources required to correct these kinds of inconsistencies can be taken as an index of the level of development costs that are avoidable in principle.

If the socio-political superstructure is given, the crucial questions have to deal with the nature of the planners' arithmetical exercises. Thus the need to discover the analytical framework within which plan decisions were made and to discern a pattern in plan formulation becomes obvious. An examination of how well the planners recognized the need for balancing certain economic quantities ex ante (quantities of inputs and outputs, outputs of various sectors of the economy, total demand and supply, etc.) is much more important than an ex post rationalization of government activity.

The procedure adopted is to describe briefly the evolution of planning in Nigeria, to examine the process of plan formation and analyse the shifts in the relative importance attached to various sectors, to discuss the development strategy implied by the approach to planning, and finally to evaluate the need for an integrated operational framework for planning from the viewpoint of an expansion of the planners' choice-set. The major theme is that the existing process of plan formulation has become inadequate to cope with the area of choice with which planners are faced.

B. The Evolution of Planning in Nigeria

(1) The Early Stage 1946-1955

The first Nigerian plan was "A Ten Year Plan of Development and Welfare for Nigeria, 1946".[1] It was a direct result of the British Colonial Development and Welfare Act of 1940. This act, unlike its 1929

predecessor which "was devised as part of our own [British] scheme to solve our own unemployment problem",[2] established a deep sense of British responsibility towards the economic development of its colonies. On its reading in the House of Commons, it was emphasised that it was "the duty of taxpayers in this country to contribute directly and for its own sake towards the development, in the widest sense of the word, of the colonial peoples...".[3] As will be seen later, the objectives of this plan emerged vaguely from this attitude.

In 1944 a Central Development Board was established in Nigeria consisting only of senior officials.[4] The Development Secretary was chairman. The other members were the Chief Commissioners for each of the three groups of provinces and for the colony of Lagos, together with the Financial Secretary and the Director of Public Works. In addition, an Area Development Committee was established in each region with the Chief Commissioners as chairmen. Other members were the Residents in charge of the provinces, the regional heads of Central Government Departments and a few appointees of the Chief Commissioners. This machinery produced the 1946 plan in compliance with the previous years' Colonial Office request for ten-year plans, to guide it in the allocation of Colonial Development and Welfare Funds among colonies.

By 1951, it had become necessary to revise the plan partly because of constitutional changes but mainly because of a failure to execute stipulated projects. Elected government was introduced in 1951 and the country was divided into three regions. This did not seriously affect the machinery of planning because, although the relationship between the regions and the centre was not defined, the former were still de facto subordinate. "A Revised Plan of Development and Welfare

for Nigeria, 1951-56"[5] was, therefore, no different in character or emphasis from the 1946 plan. The main change was a reduction in its overall scope.

(2) Planning at Regional Level

In 1953 a mission of The International Bank for Reconstruction and Development (IBRD) visited Nigeria at the request of the Nigerian and United Kingdom governments. Its report, along with another fundamental change in the political structure, the adoption of a federal system, had a serious effect on planning thereafter. The mission was requested to "study the possibility for development in the major sectors of the economy and to make recommendations for practical steps to be taken, including the timing and the coordination of developmental activities".[6] The mission's report was submitted in September, 1954 after Nigeria had been formally established as a federation with two levels of governments having different areas of jurisdiction. There was an exclusively "federal list" and a "concurrent list" of matters of shared jurisdiction. All matters not specified in either list were to be handled at the regional level.

The mission's many recommendations included the establishment of a National Economic Council (N.E.C.) as a forum for top level discussion of development policies. This was established in 1955. For the period 1955-60 several plans or 'economic programmes' were prepared, one for each region and one for the federal government. There were important differences in coverage among the regions. The main reason for this was the change in resources at the regions' disposal brought about by the report of the (Chick) fiscal commission. The commission

had been appointed to review changes in revenue allocation necessitated by the change to a federal system.[8] Therefore, while the Western Region was able to devise a real economic programme, the Eastern Region was only able to publish an 'outline' of a plan. The Northern Region published "A Statement of Policy on the Development Finance Programme".

For this and other reasons it became clear by 1959 that the regional programmes were completely out of line with one another. The Western Region was formulating a 1960-65 plan whereas the East and North could only extend their plans to 1962. In an attempt to realign development efforts, the regions agreed to terminate their plans by March 1962 and begin on a national plan.

(3) The First National Development Plan

It was at the tenth meeting of the N.E.C. that the decision to launch a comprehensive plan was made. The N.E.C. had also appointed a Joint Planning Committee (J.P.C.) of officials in an advisory capacity in 1958. These two bodies were the main channels of regional coordination as there was no single body with ultimate responsibility for plan formulation.

However, the leadership of the planning process lay with the Economic Planning Unit (E.P.U.) of the Federal Ministry of Economic Development. In fact, Aboyade has argued quite convincingly that the main characteristics of the 1962-68 Plan could be traced to, and identified with, the views of Professor Stolper.[9] Stolper (and Lyle Hansen) were sponsored by the Ford Foundation as technical assistants to the Federal government. Stolper arrived to head the E.P.U. in late 1960.

At the regional level, the Western Region had had a Ministry of Economic Planning since the early 1950's. The Eastern Region established one in 1960. The formulation of the 1962-68 plan in the Northern Region was completed in the Ministry of Finance. These ministries and the Federal Ministry were responsible for the design of the plan though the leadership of the E.P.U. cannot be overstressed.

By 1965, it was clear that the plan was off-target. The reasons lay partly in political instability and partly in the plan's heavy dependence on foreign investment. Foreign investment was not forthcoming in the right amount at the right time and the cumulative deterioration in the political situation made matters worse. After a series of serious disruptions in the Economy in 1966, questions of national unity overshadowed all efforts at plan implementation. The old regions were reconstituted into twelve states in 1967 and civil war broke out in 1968. Thus it could be safely stated that the 1962-68 plan was cut short by two years.

(4) The Second National Development Plan

The civil war ended with the surrender of Biafra on January 14, 1970 and the Second National Development Plan (hereafter Second Plan) was launched on the first of April. Preparations for the plan, which was subtitled, "Programme for Post-War Reconstruction and Development", began in 1969. In March of that year an International Conference on National Reconstruction and Development was held at the University of Ibadan. It was attended by eminent scholars (mostly economists) from all over the world. The proceedings at this conference provided a

forum for the re-examination of planning problems. The need for increased public control over the economy was stressed.[10]

The plan document was prepared under abnormal circumstances. Released so soon after the war, the planners could not have been expected to cope completely with the developments in the country especially the gaps in information about the secessionist areas. However, the plan was prepared under the auspices of a military government. It is, therefore, reasonable to expect coordination of plan elements to have been better than in the past.

Against this background the process of plan formulation must now be examined. The discussion of scope and methods deals with the plans up to 1962 in less detail because they were not comprehensive plans and it is difficult to disentangle the plan process from the regular government budgeting process.

C. Plan Formulation in Nigeria

(1) The Planning Machinery

The preparation of the Ten-Year Plan and its Revision was the responsibility of the Central Development Board supported by the various other bodies mentioned above. It must be emphasised from the outset that there was a shortage of competent planning staff. This was due partly to the fact that planning as a concept was new and partly to the general post-war shortage of skilled labour in the metropolis. In addition, however, what staff was available in Nigeria reflected the British colonial practice of using generalist administrators. Since colonial problems are not necessarily identical with planning

problems, there was a tendency for planning to be concentrated in the hands of the top members of administrative units, e.g., public works, health, education, etc.

The plans, therefore, reflected the approach and biases of these specialists. Plan formulation started from a narrow departmental budgeting approach rather than from an approach that regarded departmental plans as parts of a common endeavour. This was reinforced, as Niculescu observed, by the tendency for the administrators to be very touchy about criticizing or being criticized by colleagues.[11] In principle, however, the design of these plans was based on both horizontal and vertical consultation, i.e., among government departments and up from the local government level. According to Aboyade:

> From the village level to the district, the division, the province and the regions, various proposals of welfare projects filtered upward to the editing Administrative Officer or Development Secretary in the Central Government. There was a sense of responsible participation and a feeling of positive identification at every principal level of political organization, even if these were more often expressed in terms of expected benefits than of cost obligations. 12

In short, both the 1946 Plan and its Revision were conceived of as national programmes.

With the adoption of a federal constitution, the regions gained a considerable amount of political autonomy. They were granted coordinate status with the federal government. Consequently, planning took on a regional character and the regional plans were formulated more or less independently by planning units in the regions. The situation did not work well because of the bitter rivalry which pervaded the political atmosphere. The only common reference point lay in the submissions of the IBRD. Although the regions had different planning and financial

capacities, there was close correspondence between the pattern of total planned expenditure and the recommendations of the IBRD, as Table 2.1 shows.

It is reasonable to suggest, therefore, that even these various programmes were conceived of in a national framework. How well it was done is a different question. This suggestion must be modified by a consideration of the fact that the mechanism for implementing and controlling the programmes lay at the regional level.

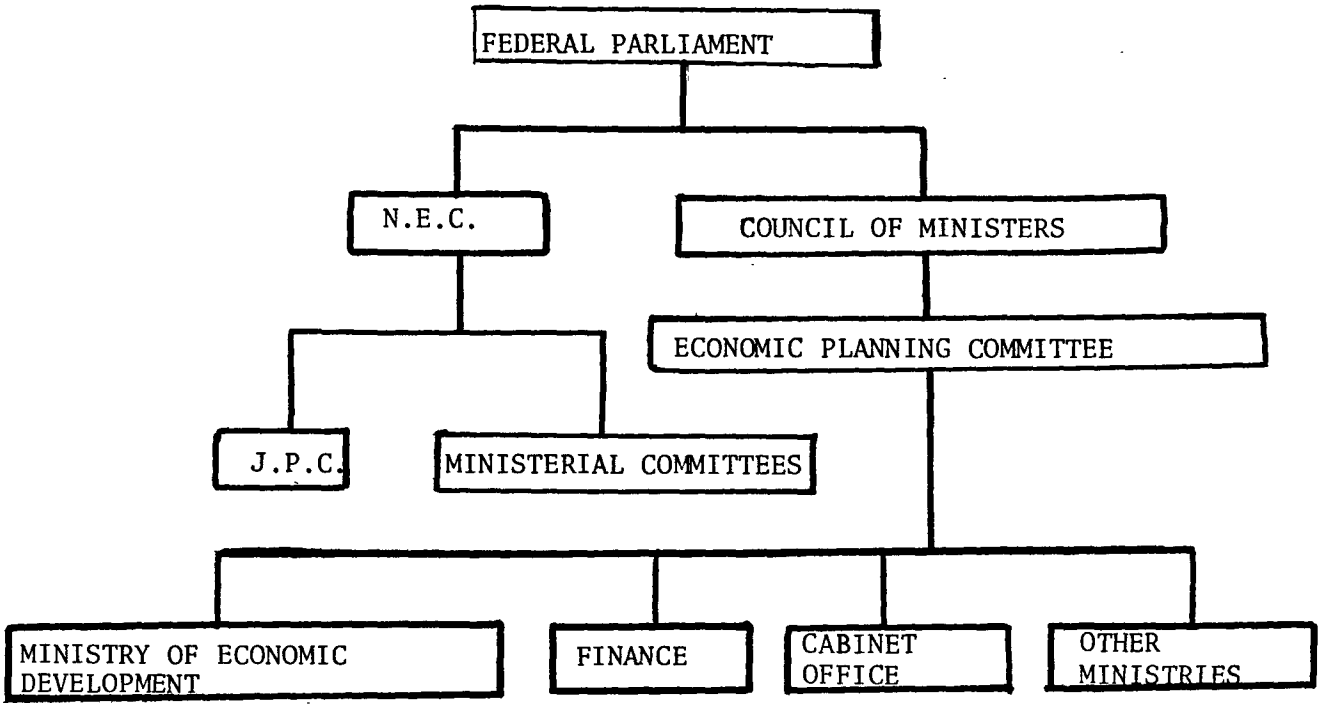
The 1962-68 Plan was a valiant attempt at comprehensive planning. In preparation, the J.P.C. had drawn up an "Economic Survey of Nigeria, 1959"[13] and had undertaken a review of various studies connected with the plan, including the report of the Ashby commission on higher education[14] and that of the Stanford Research Institute on transport coordination.[15] A considerable amount of relevant information was, therefore, available on which to base the plans. Against this, the planning timetable was such that the planning staff had to be reorganized and the plan formulated and passed through the Legislature in two years. In the end the "Federal and each of the three regional governments had to prepare and adopt plans for themselves, and then coordinate these into a national plan".[16] A great deal depended, therefore, on the intergovernmental planning machinery for coordinating the various simultaneous activities of plan formulation. Not surprisingly then, the 1962-68 Plan bears a striking resemblance to the 1955-62 exercises. The planning machinery was only slightly improved. The important parts of this machinery are shown in Chart 2.1.

Table 2.1 Comparative Table of Governments' Actual and Planned Capital Expenditure for the Period 1955-60 and the Sums Recommended in the Report of the I.B.R.D. Mission

Sectors	*Governments' Expenditure* £000	*I.B.R.D. Mission's Recommendations* £000	*Percentage of Total Governments' Expenditure*	*Percentage of Total Expenditure recommended by I.B.R.D.*
1. Administrative and General Services	27,522	—	14	—
2. Defence	4,750	5,125	2.6	4.1
3. Justice, Police and Prisons	4,068		2.2	
4. Roads	37,248	21,000	19.3	16.3
5. Waterways and Harbours	11,239	8,275	5.8	6.6
6. Water Supplies	11,593	9,000	6.1	7.2
7. Education	16,466	10,031	8.8	8.1
8. Medical and Health (including Chemistry)	8,486	19,000	3.9	15.3
9. Other Social Services (Housing/ Social)	10,141	1,250	5.9	1.0
10. Agriculture (including Department of Marketing and Exports)	3,870	3,006	2.02	2.3
11. Veterinary	1,071	132	0.5	0.1
12. Forests	210	421	0.12	0.3
13. Fisheries	151	49	0.08	0.03
14. Mining and Geology	31	489	0.02	0.4
15. Electricity	7,742	8,300	4.9	6.2
16. Industries	2,648	758	1.3	0.6
17. Public Works Organisation	5,454	10,940	2.8	8.7
18. Railways	8,869	3,600	4.6	2.3
19. Aviation	1,361	1,386	0.8	1.8
20. Postal Telecommunications and Broadcasting	12,590	4,791	6.7	3.8
21. Survey	807	90	0.4	0.07
22. Co-operatives	106	328	0.06	2.6
23. Capital Grants or Loans to Local Governments	1,449	3,980	0.8	3.2
24. Loans Unclassified	11,681	12,000	6.3	9.0
SUB TOTAL £000	189,553	123,951	100	100
Southern Cameroons £000	2,524	1,959	—	—
GRAND TOTAL £000	192,077	125,910	—	—

Source: Economic Survey of Nigeria, 1959, Appendix XI, Table 11A.

Chart 2.1. Planning Machinery, 1962-68



The machinery for the Second Plan was more sophisticated than ever, partly because the creation of more states strengthened the need for closer cooperation in planning. In drawing up the plan there was a series of Conferences of Planners from the various states and the federal government. The purpose was to decide on a format and criteria for the preparation of project proposals. In place of the then moribund J.P.C., a Joint Planning Board was established to:

"(a) harmonize and coordinate the economic policies and development activities of the Federal and State Governments and their agencies, and,

(b) examine in detail all aspects of economic planning and make recommendations through the appropriate authorities to the Supreme Military Council or the respective State Governments as the case may be".[17]

Membership comprised of the Permanent Secretary in the Federal Ministry of Economic Development (Chairman) and heads of the following units: the Federal Office of Statistics, the Central Planning Office,[18] the Nigerian Institute of Social and Economic Research, the Central Bank, and state ministries of economic planning.

The Supreme Military Council itself provided the forum for top-level discussion on planning and plan coordination.

In summary, there seems to have been a definite learning-by-doing effect on the Nigerian planning machinery. In the twenty-five years between the first attempts at planning and the Second Plan, the plan machinery became very sophisticated. It is now necessary to examine the broadening of the scope of planning and to discover if the method of planning has become correspondingly articulate.

(2) The Scope and Method of Planning, 1945-62

The 1946 Plan had no well-defined social or economic objectives. The only step in that direction was the vague statement that the plan aimed "to improve the general health and mental condition of the people, and to provide those physical facilities which may be regarded as the minimum necessary for the general improvement of the country".[19] It is easily inferred from this statement that the planners were more concerned with social and infrastructural services than with directly productive activity.

The Plan had a cost estimate of £ 53.4 million, 43 percent of which was to come from Colonial Development and Welfare Funds. Twenty-seven percent of the cost was to be borne by the Nigerian Treasury and the remainder was to come from loans, mainly external loans. It is obvious (see Appendix 1.A) that expenditure was devoted mainly to the provision of basic services. Provision was also made for the establishment of a Local Development Board. The allocation to agricultural development was small (3 percent) and even this seems to have been meant for the expansion of the Department of Agriculture; (see Appendix 1.B) Planned expenditure on industry was negligible.

Despite the organizational quality of the planning process, the plan was neither comprehensive nor were the various projects coordinated. Perhaps the most accurate summary judgement of the plan is provided by the British House of Commons Select Committee on Estimates. The committee observed that "the plan was a patchwork of individual projects, unrelated to any overall economic objectives and could not by its nature, however sound the individual projects, produce

any clearly foreseen effects on the economy as a whole".[20]

The elements of revision in the Revised Plan were mainly to take account of 'underspending'. By 1951 actual government outlay on the 1946 Plan was £ 21 million. Considering that the Colonial Office has also estimated a rise in the price level of about 65 percent between 1946 and 1951, and that the rate of expenditure was low in the first years, Schatz estimated that expenditure by 1951 was only 23 percent, in real terms, of expenditure planned for the ten-year period.[21] The 1951-56 Plan budgeted £ 34 million thereby keeping planned expenditure at the original level in nominal terms. Schatz again estimated this to be only 38% of expenditure originally planned for the five-year period. In real terms, therefore, total planned expenditure was reduced to 60 percent of the original budget. To this must be added the fact that the price level continued to rise and further underspending occurred.

The 1955-62 plans were not much different from previous plans. The most significant feature of the plans was their wider coverage. The Western Region was beginning to talk of comprehensive planning. There were also slight differences between the Federal and Regional plans to reflect areas of jurisdiction defined in the federal constitution. Thus, while the federal government planned to spend 56 percent of its budget on transport and communication, the regions focussed on other public services; water education, health, etc. In 1955, the Western region introduced a universal free primary education scheme. The Eastern region followed suit in 1957, although here it only lasted for a year. Even then, expenditure on education averaged 41.4 percent of total government expenditure in the Eastern region between 1955 and 1962.

Table 2.2 shows capital expenditure by Nigerian governments between 1955 and 1962. It is most relevant to note that 36 percent of the total expenditure for this period was devoted to transport development, i.e., roads, railways, waterways and harbours and civil aviation. It should be noted, however, that this table includes the expenditures of statutory corporations which were not included in plan calculations. In addition, the actual expenditures do not completely conform to planned expenditure because of the tendency to substitute projects for which funds have not been voted for some projects included in the plans.[22]

In summary, the approach to planning before 1962 was simply to list in as much detail as possible a series of projects to which funds would be committed. This listing and the assignment of funds were done within the regular departmental budgeting system. The most conspicuous aspect of this process was the absence of a need to explicate a set of goals. The heavy emphasis on flexibility which characterized the planning process was most compatible with the absence of explicit goals. The other characteristic is the absence of a systematic relationship between various projects, and also between these projects and overall objectives. The most important consequence of these factors is that it was impossible to trace the effects of the public expenditure programmes to private economic activity. This is all the more distressing since what constituted planning was really a series of public attempts to stimulate private activity. As Schatz pointed out, "when the effects of a government undertaking are not known, an alteration in the government program simply causes an unknown change in an undetermined economic effect".[23]

Table 2.2. Actual and Planned Capital Expenditure by the Federal and Regional Governments and Statutory Authorities, 1955-62

£ 000

	Actual Expenditure 1955/56	Actual Expenditure 1956/57	Actual Expenditure 1957/58	Estimated Expenditure 1958/59	Expenditure Authorised 1959/60	Balance of Programme planned to 1962	Total 1955-62	Per cent of Total of Items 1-24
1. Administration and General Services	2,986	4,306	4,232	8,243	8,806	6,912	35,485	10.7
2. Defence	393	1,252	918	916	1,271	1,305	6,055	1.8
3. Justice, Police and Prisons	688	550	649	1,105	1,076	1,063	5,131	1.6
4. Roads	3,423	6,376	7,537	8,343	13,439	14,586	53,704	16.3
5. Waterways and Harbours	463	1,593	1,590	4,087	6,538	5,408	19,679	6.0
6. Water Supplies	1,203	1,561	1,578	2,650	4,651	6,887	18,530	5.6
7. Education	2,642	3,055	3,424	3,642	4,954	6,196	23,913	7.2
8. Medical and Health (including Chemistry)	2,316	2,398	1,686	1,629	3,640	2,183	13,852	4.2
9. Other Social Services (Housing/Social Welfare)	584	1,692	1,809	5,026	2,920	7,979	20,010	6.1
10. Agriculture*	1,360	1,756	1,595	1,971	2,403	4,559	13,644	4.1
11. Veterinary	50	115	192	499	333	449	1,638	0.5
12. Forests	30	23	33	40	92	112	330	0.1
13. Fisheries	9	14	19	40	84	72	238	0.1
14. Mining and Geology	48	105	188	157	105	81	684	0.2
15. Electricity	2,037	1,627	1,799	2,644	4,322	5,200	17,629	5.3
16. Industries	689	707	449	930	4,885	2,702	10,362	3.1
17. Public Works Organisation	750	1,404	1,015	1,130	1,155	1,847	7,301	2.2
18. Railways	4,419	4,070	5,649	7,700	7,811	14,883	44,732	13.5
19. Aviation	299	285	211	242	326	939	2,300	0.7
20. Postal Telecommunications and Broadcasting	826	1,325	2,038	3,592	4,809	2,032	14,622	4.4
21. Survey	98	139	81	202	288	1,557	2,365	0.7
22. Co-operatives	41	5	2	5	91	82	226	0.1
23. Capital Grants or Loans to Local Governments	313	220	230	529	1,015	335	2,642	0.8
24. Loans Unclassified	525	2,132	292	2,301	4,808	5,027	15,085	4.6
SUB-TOTAL	26,192	36,708	37,416	57,623	79,822	92,396	330,157	100.0
Southern Cameroons	1,290	1,079	1,200	1,302	1,403	2,684	8,958	
GRAND TOTAL	27,482	37,787	38,616	58,925	81,225	95,080	339,115	

* Including Department of Marketing and Exports.

Source: Economic Survey of Nigeria, 1959, Appendix XI, Table 11B.

(3) The Scope and Method of Planning, 1962-1970

The National Economic Council decided in 1959 "that a National Development Plan should be prepared for Nigeria with the objective of the achievement and maintenance of the highest possible rate of increase in the standard of living and the creation of the necessary conditions to this end...".[24] The planners gave this directive fairly definite operational content viz:

a) To raise the growth rate of GDP at least to 4 percent (from 3.9 percent estimated for 1950-60) per annum;

b) To achieve a) by investing 15 percent of GDP;

c) To achieve a "take-off" (defined in terms of raising the domestic savings ratio from 9.5 percent in 1960-61 to at least 15 percent by 1975) by about 1980.

Other objectives included the creation and equalization of opportunities which would involve raising agricultural productivity (by introducing farm settlements, cooperative plantations, modern machinery and expanded extension services). There were also fairly specific targets for the Transport sector, e.g., 293 miles of rail, 7 new docks, tarring of another 2,000 miles of road.[25]

Undoubtedly the coverage of this plan was much broader than in the past. The set of goals was also national in the sense of being accepted by all the regions. There was only slight regional variation of the priority attached to Agriculture, Industry and Manpower. Against this must be noted the fact that each region and the federal government had separate programmes. The essential idea was that if the set of public investment projects was supported by an adequate level of private

investment, the given growth rate would be achieved. The aggregate growth rate was further specified with respect to the main categories of national income (see Table 2.3). There were no absolute or specific production targets and no mention of structural relationships, existing or expected. The total size of the plan was broken down according to the planners' expectations regarding the private sector. This is shown in Table 2.4. Private Investment was expected to maintain, at best, its 1961 level, i.e., £ 72 million per annum (version B). Version A implies annual private investment in the plan period less than the actual investment in the year immediately preceeding the plan period. It would seem, therefore, that the emphasis was on the maximum utilization of public investment leaving private investment as a residual to obtain a required minimum total. The proposed allocations of the public investment are indicated in Table 2.5.

The Plan was to be paid for through an expected increase of 46 percent in Government revenue,[26] including the revenues from statutory corporations. It was also assumed that foreign aid would come to just under 50 percent of planned capital expenditure. Even then there was an 'Uncovered Gap' of £ 63.7 million or 9 percent of the capital programme (less underspending); (See Table 2.6.)

In evaluating the 1962-68 Plan, mention should be made of general policy preferences; Monetary stability was to be maintained and foreign trade and exchange control was to be avoided. Import substitution was implied but not stressed as an explicit policy. For the first time the governments were explicitly interested in industrialization. However, there was no national industrialization plan with specific

Table 2.3. Implied or Specified Plan Targets, 1962-68 Plan

	Annual Growth Rate	Approximate Composition of GDP 1961	1968
Private Consumption	3.0	83	78
Public Consumption	11.6	8	12
Gross Investment	4.0	15	15
Exports	5.9	15	18
Imports (including debt, service and profit remittances	5.6	-21	-23
GROSS NATIONAL PRODUCT	4.0	100	100

Source: GATT The First Six-Year Plan of Nigeria, p. 6.

Table 2.4. Planned Composition of Investment, 1962-68

(million £N)

	A	B
1. Budgeted Capital Expenditure - all Governments	504	504
add: local governments investment	29	29
less: investments for defence	-28	-28
add: capital formation from current expenditure	149	132
less: adjustment for underspending	-33	-59
Sub-Total I Government Capital Expenditure	621	578
2. Budgeted Capital Expenditure of Statutory Corporations	173	173
Sub-Total II Public Capital Expenditure	794	751
3. Private Capital Expenditure	389	432
TOTAL: GROSS FIXED INVESTMENT	1,183	1,138

Source: GATT The First Six-Year Plan of Nigeria, p. 6.

Table 2.5. 1962-68 Plan, Sectoral Breakdown

₤ 000's

Sector	Federal	Northern Region	Eastern Region	Western Region	Total	Per cent Distribution
I. Primary Production	20,466	22,494	30,361	18,439	91,760	13.6
II. Trade and Industry	44,030	9,864	12,930	23,445	90,269	13.4
III. Electricity	98,140	1,500	600	1,500	101,740	15.1
IV. Transport System	103,957	24,660	8,850	6,350	143,817	21.3
V. Communications	30,000	—	—	—	30,000	4.4
VI. Water Other than Irrigation	1,863	7,442	5,100	9,853	24,258	3.6
VII. Education	29,154	18,949	8,805	12,855	69,763	10.3
VIII. Health	10,304	3,317	1,819	1,636	17,076	2.5
IX. Town & Country Planning	23,160	6,000	3,306	9,280	41,746	6.2
X. Co-operatives	—	2,439	—	1,500	3,939	0.6
XI. Social Welfare	2,689	—	534	1,510	4,723	0.7
XII. Information	2,351	88	450	773	3,662	0.5
XIII. Judicial	272	—	250	442	964	0.1
XIV. General	43,915	993	2,067	1,114	48,089	7.1
XV. Financial Obligations	2,200	—	120	1,600	3,900	0.6
TOTAL:	412,501	98,803*	76,000	90,287	676,800	100.0

* The Northern Region Components do not necessarily add up to total because of slight differences in sectoral definitions.

Source: First National Development Plan, p. 41.

Table 2.6. Planned Sources of Finance for the Public Investment Programme, 1962-68

(£ million)

	Federal	East	West	North	Total
Recurrent Budget Surpluses	27.0	6.0	11.5	16.1	28.4
Domestic Borrowing and Central Bank	63.7	-	-	12.1	75.7
External Reserves and other Accumulated Funds	30.0	1.7	3.5	-	35.2
Internal Resources of the Statutory Corporations	80.0	-	-	-	80.0
Marketing Boards	-	14.1	10.0	15.0	39.1
Foreign Aid	203.5	33.9	45.2	44.5	327.1
Other	-	-	0.2	4.4	4.6
Uncovered Gap	2.7	12.0	19.9	29.1	63.7
Capital Programme (less underspending)	406.9	67.7	90.3	88.9	653.8

Source: National Development Plan Progress Report, 1964, p. 27.

details about goals and methods. The regions merely listed industries in which they were interested (cf. Table 2.7).

The dominant theme in the formulation of the 1962-68 Plan was the concept of economic profitability. This has been discussed extensively in Stolper's "Planning Without Facts".[27] Essentially the planners established that the government recurrent budget was the crucial variable in resource supply. It was, therefore, necessary to concentrate on sectors which made less demand on the recurrent budget. For this purpose they had three broad categories -- Economic Sector, Social Sector and Administrative Sector. They preferred investment in the Economic Sector.

At the project level, investment was decided on the same criterion. The planners' logic was that this criterion was sufficient to determine the sectoral composition of investment once aggregate investment was determined.[28] The planners intended their concept to be used in a general equilibrium context so various attempts were made to take account of linkages and interdependencies. Unfortunately, the feasibility studies were largely confined to industrial projects and public utilities. Not surprisingly, therefore, the bulk of agricultural investment went into large government-directed projects -- plantations, farm settlements, etc.[29]

The planners did not use capital-output ratios in determining the size of the plan. They tried, however, to use them as ex post checks on their aggregate projections. In terms of the familiar $g = s/v$ formula, the capital-output ratio assumed was 3.7. It is impossible, however, to discern from the plan a relationship between this and

Table 2.7. Industrial Interests of the Regional Governments

Northern Region	Eastern Region	Western Region
Cotton Textiles	Iron and Steel	Cocoa Processing
Tanning	Glass	Palm-kernel Processing
Cement	Roofing Materials	Coconut Processing
Iron and Steel	Cement	Flour Milling
Fibre (sacks)	Textiles	Iron and Steel
Oilseed Crushing	Oil Refinery	Nails, locks, hinges
Starch		Pulp and Paper
Paper		Fertilizers and Chemicals
Abbatoirs		Chipboard and Fibreboard
Oil Refinery		Pharmaceuticals
Miscellaneous		Distillery
		Car Assembly

sectoral ratios. This is especially unfortunate because if agriculture generally has a low capital-output ratio and the plan had supposedly shifted emphasis towards agriculture, a capital-output ratio of 3.7 seems too high. This suggestion is reinforced by the simultaneous shift towards directly productive investment.

It could be argued that considering the historically high proportion of residential construction in gross capital formation[30] and the assignment of a substantial part of the budget to surveys, research, etc.[31] the assumption was not unrealistic. But this argument would not suffice to explain why the growth rate averaged 3.9 percent for 1950-60 with an average annual investment level of 11 percent. This implies a capital-output ratio of 2.9. It would appear as if the planners regarded this past relationship as fortuitous, preferring a deduction from the trend of foreign trade which showed a short post war boom and then a down turn.

Looking again at the project evaluation process, it seems overly simplistic. A sequential project evaluation process cannot determine an optimum allocation of resources. For a general model of allocation, equilibrium prices are required and the planners' use of market prices for skilled labour and capital implies a neglect of all but the most obvious indirect effects. This is aggravated by the fact that the level of indirect effects depends too much on planners' judgement in the partial context. As Clark argued,[32] when a certain proportion of return or cost occurring or expected to occur in one industry has to be attributed to another, the choice will be arbitrary because there is no objective basis for determining the distribution of indirect effects. Furthermore, taking projects one at a time tends to

lead to double counting. A phenomenon occurring in an industry can be very easily attributed to two projects.

An evaluation of the First Plan must consider the planners' view of the whole development process. In particular, it must be borne in mind that to them, planning was concerned essentially with marginal adjustments. They did not see their tasks as being connected with the question of structural change.[33] The Plan was certainly not conceived of as an instrument to attain a different social order.

These considerations were, therefore, involved in the formulation of the Second Plan. The Second Plan had a broader perspective in two senses. First, it explicitly stated the Plan was an instrument to achieve a different social order.[34] Second, it consciously integrated the private sector into the development programme.[35] Planning was directed towards the goals of:

(1) a united, strong and self-reliant nation

(2) a great and dynamic economy;

(3) a just and egalitarian society;

(4) a land of bright and full opportunities for all citizens; and

(5) a free and democratic society.[36]

The attainment of these goals, it was argued, called for comprehensive planning of all sectors but direct control only of some key ones -- the 'commanding heights' of the economy.

Priority status was given to Agriculture, Industry, Transport and Manpower Development. Social Services and Utilities were ranked of

lower priority. The basis for assigning priority was intuitive. The problem of project selection was approached from a social profitability angle. In submitting proposals for public expenditure, the various ministries based their calculations on the "Manual on Project Preparation for the Reconstruction and Development Plan, 1970-74"[37] provided by the Federal planning ministry. The planners chose an average discount rate of 6 percent as "representing the opportunity cost of using public sector investment resources..."[38] Unfortunately, the method of arriving at this number was unexplained. In addition to "taking intuitive account of interdependencies",[39] the planners attempted to allow for scarcity values by using shadow prices for foreign exchange and skilled labour in project evaluation.

As in the First Plan, macroeconomic projections were made. The planners specified an average annual growth rate of 6.6 percent but more important to them was "the extent to which the economy can succeed in removing obstacles to an even higher growth rate from 1974 onwards".[40] To achieve this, it was planned that gross domestic capital formation average 20 percent of GDP over the plan period. If inflation could be contained at no more than 1.5 percent per annum, the Plan envisaged that per capita real income would be growing by at least 3.5 percent by 1974.

The general strategy of the Plan involved efforts at agricultural diversification without reducing export crop production. It was expected that an increase in export earnings, especially because of the petroleum boom, would provide the foreign exchange for the purchase of capital imports necessary to support an import substitution programme that would be directed at intermediate and capital goods production. The

essence of the emphasis on transport was a concern with the early liquidation of intersectoral bottlenecks aggravated by the cival war. The plan's strategy can be usefully summarised in terms of Tinbergen's targets and instruments.[41] The most important target variables were:

(1) The rate of growth of real GDP;

(2) The level of employment;

(3) The distribution of income.

Instrumental variables were of the general type as summarised in Table 2.8 . The greater part of the plan document was devoted to breaking down government expenditure and specifying policies related to particular sectors. A summary of sectoral allocation is presented in Table 2.9 . It can be discerned from these tables that sectoral allocations conformed generally to the stated order of priority.

Since the national accounts were used as the frame of reference for checking the internal consistency of the plan, it is interesting to compare the priority rating to the output projections in the plan. The plan projections were supposed to have taken into account structural considerations, among which were productive capacity, the differential impact of the civil war, and "the nature of policies programmes and projects in the current plan".[42] Implied elasticities of sectoral production with respect to GDP are indicated in Table 2.10 (column 5). They indicate remarkable differences in sectoral contribution to output. Thus while mining (oil) is expected to grow at over ten times the growth rate of output, agriculture is only expected to grow at less than one-third the output growth rate. But agriculture is the priority sector whereas the expected aggregate growth rate is

Table 2.8 Targets and Instruments in the Second Plan

AREA OF POLICY	INSTRUMENTS			
	PRICE VARIABLE		QUANTITY VARIABLE	
	Instrument	Variables Affected	Instrument	Variables Affected
Monetary	-	-	Open Market Operations	(1) Money Supply (2) Prices
Fiscal	Personal Income Tax, Corporate Income Tax	Consumption, Savings, Profits, Investment	Government Expenditure	(1) GDP (2) Price Level
Foreign Investment	Tax on foreign profits	Level of Foreign Investment	Foreign Aid	Investment level, Exchange Supply
Foreign Trade	Exchange Rate Tariffs	(1) Cost of Imports (2) Price of Exports (3) Balance of Payments	Import quotas Exchange control	Level of imports Domestic prices
Labour	Wages	(1) Labour Costs (2) Profits and Investment (3) Income Distribution	Manpower Training	(1) Labour Supply (2) Income Distribution

Table 2.9 (A) Total Public Sector Capital Investment, 1970-74

(₦ million)

Sector	Total	Federal Government	All States	Benue-Plateau	East-Central	Kano	Kwara	Lagos	Mid-Western	North-Central	North-Eastern	North-Western	Rivers	South-Eastern	Western
A. ECONOMIC															
1. Agriculture ..	107.663	30.835	76.828	2.924	10.389	16.739	2.370	3.000	4.100	3.219	4.130	3.982	4.267	7.655	14.053
2. Livestock, Forestry and Fishing ..	25.004	3.188	21.816	0.902	2.250	1.367	0.631	2.755	2.410	0.816	2.353	1.847	2.109	0.807	3.569
3. Mining	2.586	2.586	—	—	—	—	—	—	—	—	—	—	—	—	—
4. Industry ..	86.069	40.817	45.252	1.950	5.650	3.500	2.156	2.460	5.363	2.568	4.031	2.527	4.033	3.009	8.005
5. Commerce and Finance.. ..	18.890	10.970	7.920	0.100	1.600	1.540	1.700	0.200	0.430	0.250	0.100	0.200	0.200	0.100	1.500
6. Fuel and Power ..	45.325	45.325	—	—	—	—	—	—	—	—	—	—	—	—	—
7. Transport ..	242.599	167.133	75.466	7.010	5.001	5.500	3.350	4.000	8.891	6,321	9.970	3.310	7.490	6.210	8.413
8. Communications	42.641	42.641	—	—	—	—	—	—	—	—	—	—	—	—	—
9 Resettlement and Rehabilitation	10.000	10.000	—	—	—	—	—	—	—	—	—	—	—	—	—
10 Sub-Total ..	580.777	353.495	227.282	12.886	24.890	28.646	10.207	12.415	21.194	13.174	20.584	11.866	18.099	17.781	35.540
B. SOCIAL															
11. Education ..	138.893	49.122	89.771	5.245	8.000	8.100	2.608	3.809	6.763	9.142	4.400	7.415	5.575	4.214	24.500
12. Health	53.811	10.130	43.681	0.885	7.000	4.910	3.211	2.500	4.202	3.041	3.133	4.275	3.212	1.700	5.612
13. Information ..	10.931	4.782	6.149	0.400	1.000	0.030	0.100	0.100	0.500	0.180	0.839	0.500	0.500	0.500	1.500
14. Labour and Social Welfare ..	11.974	3.004	8.970	0.225	0.500	1.033	1.332	0.900	0.376	0.964	0.882	0.740	0.418	0.400	1.200
15. Town and Country Planning ..	19.075	5.287	13.788	0.300	1.750	1.600	0.500	0.500	0.688	2.100	0.600	0.200	1.050	2.000	2.500
16. Water and Sewerage ..	51.696	—	51.696	4.323	3.413	4.500	3.038	4.364	3.700	7.533	2.707	2.033	2.500	2.040	11.545
17. Sub-Total ..	286.380	72.325	214.055	11.378	21.663	20.173	10.789	12.173	16.229	22.960	12.561	15.163	13.255	10.854	46.857
C. ADMINISTRATION															
18. General Administration	52.370	23.432	28.938	2.203	4.251	3.246	1.808	2.537	1.070	1.506	2.693	3.086	2.603	0.935	3.000
19. Defence and Security ..	96.360	96.360	—	—	—	—	—	—	—	—	—	—	—	—	—
20. Sub-Total ..	148.730	119.792	28.938	2.203	4.251	3.246	1.808	2.537	1.070	1.506	2.693	3.086	2.603	0.935	3.000
D. FINANCIAL															
21. Financial Obligations ..	9.482	9.482	—	—	—	—	—	—	—	—	—	—	—	—	—
22. Sub-Total ..	9.482	9.482	—	—	—	—	—	—	—	—	—	—	—	—	—
23. Nominal Total ..	1,025.369	555.094	470.275	26.467	50.804	52.065	22.804	27.125	38.493	37.640	35.838	30.115	33.957	29.570	85.397

Source: Second Plan, p. 273.

Table 2.9 (B) Total Public Sector Capital Investment, 1970-74

Percentage Distribution

Sector	Total	Federal Government	All States	Benue-Plateau	East-Central	Kano	Kwara	Lagos	Mid-Western	North-Central	North-Eastern	North-Western	Rivers	South-Eastern	Western
A. ECONOMIC															
1. Agriculture	10.5	5.5	16.3	11.0	20.5	32.1	10.4	11.1	10.6	8.5	11.4	13.2	12.5	25.9	16.5
2. Livestock, Forestry and Fishing ..	2.4	0.6	4.6	3.4	4.4	2.6	2.8	10.2	6.3	2.2	6.6	6.1	6.2	2.7	4.2
3. Mining	0.3	0.5	—	—	—	—	—	—	—	—	—	—	—	—	—
4. Industry	8.4	7.3	9.6	7.4	11.1	6.7	9.4	9.1	13.9	6.8	11.3	8.4	11.9	10.2	9.4
5. Commerce and Finance	1.8	2.0	1.7	0.4	3.2	3.0	7.5	0.7	1.1	0.7	0.3	0.7	0.6	0.3	1.7
6. Fuel and Power ..	4.4	8.2	—	—	—	—	—	—	—	—	—	—	—	—	—
7. Transport	23.7	30.1	16.1	26.5	9.8	10.6	14.7	14.7	23.1	16.8	27.8	11.0	22.1	21.0	9.8
8. Communications ..	4.2	7.7	—	—	—	—	—	—	—	—	—	—	—	—	—
9. Resettlement and Rehabilitation ..	1.0	1.8	—	—	—	—	—	—	—	—	—	—	—	—	—
10. Sub-Total ..	56.7	63.7	48.3	48.7	49.0	55.0	44.8	45.8	55.0	35.0	57.4	39.4	53.3	60.1	41.6
B. SOCIAL															
11. Education	13.5	8.8	19.1	19.8	15.7	15.6	11.4	14.0	17.6	24.3	12.3	24.6	16.4	14.2	28.7
12. Health	5.2	1.8	9.3	3.4	13.8	9.4	14.1	9.2	10.9	8.1	8.7	14.2	9.4	5.7	6.6
13. Information ..	1.1	0.9	1.3	1.5	2.0	0.1	0.5	0.4	1.3	0.5	2.3	1.6	1.5	1.7	1.8
14. Labour and Social Welfare	1.2	0.5	1.9	0.9	1.0	2.0	5.8	3.3	1.0	2.5	2.5	2.4	1.2	1.4	1.4
15. Town and Country Planning ..	1.9	1.0	2.9	1.1	3.4	3.1	2.2	1.9	1.8	5.6	1.7	0.7	3.1	6.8	2.9
16. Water and Sewerage	5.0	—	11.0	16.3	6.7	8.6	13.3	16.1	9.6	20.0	7.5	6.8	7.4	6.9	13.5
17. Sub-Total ..	27.9	13.0	45.5	43.0	42.6	38.8	47.3	44.9	42.2	61.0	35.0	50.3	39.0	36.7	54.9
C. ADMINISTRATION															
18. General Administration	5.1	4.2	6.2	8.3	8.4	6.2	7.9	9.3	2.8	4.0	7.5	10.3	7.7	3.2	3.5
19. Defence and Security	9.4	17.4	—	—	—	—	—	—	—	—	—	—	—	—	—
20. Sub-Total	14.5	21.6	6.2	8.3	8.4	6.2	7.9	9.3	2.8	4.0	7.5	10.3	7.7	3.2	3.5
D. FINANCIAL															
21. Financial Obligations	0.9	1.7	—	—	—	—	—	—	—	—	—	—	—	—	—
22. Sub-Total ..	0.9	1.7	—	—	—	—	—	—	—	—	—	—	—	—	—
23. Nominal Total ..	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Second Plan, p. 274.

Table 2.10

Sector	Share in GDP 1968/69 %	Absolute Growth ₺ m 1968/69-1973/74	Share in total GDP Increase %	Elasticity of GDP
1. Agriculture, Livestock, Forestry and Fishing	54.6	74.8	14.4	0.26
2. Mining	3.8	210.9	40.7	10.79
3. Manufacturing and Crafts	8.6	120.1	23.2	2.71
4. Electricity and Water Supply	0.7	5.3	1.0	1.40
5. Building and Construction	5.0	26.5	5.1	1.025
6. Distribution	12.9	21.9	4.2	0.32
7. Transport	3.4	8.0	1.5	0.44
8. Communication	0.5	4.8	0.9	1.70
9. General Government	3.3	8.9	1.7	0.51
10. Education	3.2	16.0	3.1	0.96
11. Health	0.6	4.6	0.9	1.45
12. Other Services	3.4	15.3	3.0	0.87

Source: Calculated from Second Plan.

due mainly to oil. It is hard to discern the relationship between the pattern of expenditure and the output projections. This difficulty is aggravated when employment elasticities are brought into the picture (cf. Table 2.11). Thus total employment was expected to increase by much less than total output. More significantly, however, the capital intensive nature of the Mining industry shows up very strongly. Recalling that Agriculture employs over two-thirds of the labour force, it is obvious that the sources of growth are not identical with the sources of employment.

One reason for this type of inconsistency lies in the failure to specify the nature of the relationships among the variables. It was stated that policy variables would be used in conjunction with one another, but specification of how this was to be done was left open. It is difficult to incorporate a large number of assumptions and projections explicitly in a simple national accounts framework. In a general planning context, it is necessary to specify priorities and production techniques simultaneously. The main logic of planning is to ensure that the ex post production hyperplane is as close as possible to the ex ante one.

It is also not clear what meaning would be attached to the distribution objective. The general comments about wages and salaries review boards are relevant only to a small fraction of the population in a predominantly rural agricultural economy. It is impossible to deal adequately with this kind of problem in an aggregate framework.

Finally, a comment is in order in relation to the criterion of national value added which was to be applied in dealing with the

Table 2.11

Sector	Projected Increase in Output %	Projected Increase in Employment %	Implied Employment Elasticity
1. Agriculture	9.8	6.5	0.66
2. Mining	289.6	27.3	0.09
3. Manufacturing and Crafts	70.4	54.4	0.77
4. Construction	30.9	25.9	0.84
5. Commerce	12.1	10.1	0.83
6. Building and Construction	20.3	17.3	0.85
7. Services	21.7	20.1	0.93
TOTAL	31.7	11.4	0.36

Source: Calculated from Second Plan.

private sector. Briefly, this criterion emphasized the social preference for enterprises which maximized the use of domestic resources; human, material and natural.[43] It is easy enough to apply this criterion in the comparison of two small projects. But in dealing with two sectors, it is difficult to see how it can be applied.

D. Conclusion

(1) Shifts in Sectoral Emphasis

One of the prime determinants of the nature of a plan is the existing level of development and the accompanying structural relations. Hanson[44] argued that at a very low level of development, planning has to concentrate on the infrastructure and to a lesser extent on social investment. At a higher level, planners become confronted with a bigger choice-set: To what extent should the country commit resources to the intensification of economic activities for which it now possess comparative advantage or pursue the attainment of a different comparative advantage in the future through diversification of its production base? How should the clamant demand for investment in industry be balanced against the equally clamant demand for investment in agriculture or transport? How far can the country pursue a policy of self-sufficiency? How should the growth of output be weighed against the provision of employment? In short, the planning puzzle "is to devise policies which will enable each sector, whatever relative weight it may be given, to make its planned contribution".[45]

The Nigerian experience certainly lends credence to Hanson's thesis. Successive plans have tended to be broader in scope. We have

observed a broadening of planning range from a series of schemes to national comprehensive planning.

Hanson's theory can be extended to take into account the fact that every plan also inherits a set of problems from previous ones. It is fair to assume that the development of Nigerian infrastructure and the respectable output growth rate since 1945 must have been due partly to the efforts of planners. However, the problem of unemployment has become increasingly worse; so has the inflation problem. In addition, serious doubts are emerging now about the ability of the nation to feed itself.[46] Some part of the blame for these problems must also be attributed to the planners. It can, in fact, be argued that it is easier to correlate the "bads" with planning than the "goods" because of certain fundamental biases inherent in the plans, especially the later ones.

(2) Some Biases of Planning in Nigeria

Myint recently suggested that dualism can be interpreted as "a species of distortion in the allocation of resources arising out of the unequal terms on which economic resources are made available to the two (traditional and modern) sectors".[47] In Nigeria as elsewhere there is a historical tendency for policy to be discriminatory against the traditional sector. Agriculture has borne the burden of taxation but has benefitted less from public expenditure; adverse intersectoral terms of trade have resulted in massive rural-urban migration and the creation of a large pool of urban unemployeds. In addition, subsidized interest rates and artificially high wage rates have cumulatively encouraged capital intensive, import substitution industrialization. The traditional sector has no easy access to the organized capital market and cannot, therefore, compete effectively.

This point is illustrated in Table 2.12 which gives a breakdown of planned public expenditure in the Second Plan. It is seen that the

Table 2.12. Urban/Rural Investment in Selected Sectors: 1970-74 Development Plan (All Governments)

Item	Total Planned Capital Investment ₦ million	Urban-Based Investment ₦ m	%	Rural-Based Investment ₦ m	%
1. Industry	86.1	77.7	91.2	8.4	9.8
2. Electricity	45.3	40.3	89.0	5.0	11.0
3. Water & Sewerage	51.7	42.2	71.6	9.5	18.4
4. Town & Country Planning	19.1	18.0	94.3	1.1	5.7
5. Education	138.9	98.4	70.9	40.5	29.1
6. Health	53.8	45.2	84.0	8.6	16.0
7. Social Welfare	12.0	11.0	91.7	1.0	8.3
8. Others (including agriculture)	373.1	307.7	82.5	65.4	17.5
TOTAL	780.0	640.5	82.1	139.5	17.9

Source: Aluko, S.A. "Industry in the Rural Setting" in Rural Development in Nigeria: Ibadan: Nigerian Economic Society, 1973, p. 217.

share of total investment allocated to the urban sector is 82.1 percent. The urban-rural imbalance is most striking in the allocations in industry and electricity which are 9.8 percent and 11 percent respectively for the rural sector.

The urban bias in planning has been manifest in the emphasis on agricultural investible surplus. Paul Streeten is right in regarding this as an euphemism for the squeezing of savings out of agriculture to provide investment for industry.[48] Since planning policy was to choose a desired output growth rate, it is to be expected that the projects selected would be those which would maximize the rate of growth.

According to the main architect of the First Plan, "the whole purpose of the planning exercise (is) to aid Nigeria in mobilising as many resources as possible and allocating them for growth".[49] Believing, in addition, that "as much as possible of the decisions ought to be of a semi-automatic or automatic nature...",[50] he was particularly emphatic about the investment-output relationship. He believed that the most important indicator of development was the growth rate of per capita income. It was essential, therefore, that emphasis be put on projects which "will have a pay-off equal to or greater than the expected rate of growth"[51] because projects with smaller pay-offs will slow down the average.

This approach led the planners into making rather sophisticated pay-off calculations because "a maximum of resources must be shifted into directly growth-inducing sectors (and this shift) must also get priority in timing".[52] In the process of rationalizing this philosophy, the

planners tried to use equilibrium prices, i.e., prices that would have obtained in the Nigerian economy if there were no fragmentation of markets, quantitative restrictions, etc. Unfortunately, because of insufficient data, they had to rely to a great extent on personal and professional judgement. Moreover, on two important occasions they decided to use market prices: they chose to use the interest rate which the government would have to pay on funds in the market and to take wages at actual cost. They were undoubtedly aware that the interest rate they chose (6 percent) was too low and that the market wage rate "undervalued highly skilled and overvalued unskilled labour given the supply and demand of each".[53]

At this stage the planners became quite convinced of the need for an interactive macro-framework. It was mentioned earlier that the planners' concept of economic profitability was meant to be used in a general equilibrium framework. It can be inferred that the planners would really have preferred to use a formal model of resource allocation that focussed on sectors as competitors for limited resources. An input-output table is the simplest basis for this kind of model and if this is combined with the objective of maximizing the growth rate and other constraints regarding say, foreign exchange, quasi-equilibrium[54] prices can be derived from the dual solution of a linear programming model.

In response to these perceived needs, the planners suggested that Carter prepare an input-output table of the Nigerian economy.[55] It will be argued subsequently that some of the shortcomings of Carter's table derive essentially from the orientation of the architects of the 1962-68 Plan.

It would also seem as if the Second Plan could not in practice divorce itself from the philosphy and orientation of its immediate predecessor. Despite the introductory pontification in the Second Plan on the need for a broader planning horizon, it reflected essentially the same biases as the First Plan.

There is only so much that can be done within a simple national accounting framework. It is not surprising that one of the main consequences of the Second Plan was the establishment of an Office of National Accounts to produce a new set of social accounts complete with input-output tables, flow-of-funds accounts and national balance sheets. In the process of formulating the plan the architects of the Second Plan came to the same conclusion reached by their immediate predecessors, namely, that a broader macro-framework was indispensable.

Some contradictions resulting from the absence of this framework have already been mentioned in connection with the relationship between sectoral priorities and expected growth of sectors. A further illustration is in order to show the urban bias in the Second Plan. For the plan period, an average increase of 1.5 percent per annum in the price level had been assumed. However, actual rises turned out to be several times higher -- the price level rose by 6 percent in the first year of the plan and by a further 9.5 percent in the second.[56] This distortion is due, at least partly, to the fact that not enough account was taken of the pressures generated by the imbalance between the traditional and modern sectors. The impact of a rise in money incomes generated by planned investment falls heavily on wage goods (mainly foodstuffs, in Nigeria) because of a high income elasticity of demand.[57] However, if

planned agricultural production does not keep pace, food prices rise (the middleman being the main beneficiary). The rise in food prices tends to be cumulative and soon spreads to the industrial sector as pressures mount to raise wages. It is significant in this regard to note that a Wages and Salaries Review Commission was set up at the beginning of the plan period to review remuneration in the Public Service, the Statutory Corporations and state-owned companies. The Commission's awards imposed an additional wage-bill of £39 million per annum on the economy.[58] In response to continued inflation, the government initiated control of prices, wages and housing rents in the main urban areas and established yet another price and wage commission. Meanwhile, it had been estimated in the plan that the number of urban dwellers was less than 20 percent of total population and that wage employment was only 5 percent of the labour force. The plan's surprising deduction from this, that "it is on this segment of the labour market that the direct effects of public policy and development planning impinges"[59], seems to have provided the raison d'être for the government's policies dealing with inflation. But the policies clearly reflect a confusion between the symptoms and the disease.

The conception of planning dimensions in terms of a public versus a private sector and the conception of the resource problem in general terms which leads to conclusions such as "the most serious bottleneck during the Plan period is identified as the scarcity of foreign exchange"[60] disguise the real issues involved in creating a self-sustaining and dynamic productive system. What is needed is a concept of development nodes based on the facts that (1) the majority of

Nigerians live in rural areas; (2) natural and human resources are particular and (3) the inherited structure has been feeding on and reinforcing a distorted pattern of resource allocation. It is not sufficient that planners recognize the need for, and adopt, a macro-framework; the kind of framework is a crucial factor.

(3) The Required Type of Framework

In the process of shifting towards comprehensive planning, planners have become aware of the large number of variables with which they need to deal simultaneously. Unfortunately, the unidimensional emphasis on certain generalized entities has cumulatively created more problems than it has solved.

The prerequisite for development in Nigeria is still internal economic integration. This means that the development process must permeate the whole system. There is no point in emphasising common prices when the economy is known to be dominated by fragmented markets for labour and capital and a fragmented information system. At the same time, development planners have to come to terms with the limits to transformation within an international capitalist order. Perhaps the most pessimistic argument in this regard is that presented by Immanuel Wallerstein. He says:

> "To be very concrete, it is not possible theoretically for all countries to develop simultaneously. The so-called "widening gap" is not an anomaly but a continuing mechanism of the world economy. Of course, some countries can "develop". But the some that rise are at the expense of others that decline... It would seem to be more fruitful to look at the possible alternative strategies in the light of the fact that only a minority can "make it" within the framework of the world system as it is than to search for the universal recipe". 61

Wallerstein's thesis is in the spirit of the recent approach to development theory which seeks to introduce a historical perspective into the study of the development process.[62]

In a paper recently read before the Nigerian Economic Society, Aboyade[63] summarized what he regarded as broadly valid conclusions from cross-sectoral and international comparison studies of development. Among other things, he mentioned that the development process involves a decline in the relative contribution of primary production. This decline "is accompanied by increased urbanization and the growth of large scale production organizations, calling for a new kind of specialized managerial skills".[64] As a logical consequence of this, income distribution becomes increasingly skewed against agriculture at the early stages of development because

> agricultural (and, therefore, rural) families have relatively low productivity levels compared with industrial (and, therefore, urban) families who, although constituting a smaller proportion of total population, are beneficiaries of the application of more effficient technology and management organization.

This is the kind of thinking that underlay the Second Plan and led to the emphasis on the competitive aspect of the relationship between rural and urban sectors, between agriculture and manufacturing, and between the private and the public sector. But it derives essentially from the simplistic juxtaposition of two ideal types in the Weberian sense. 'Developed' and 'underdeveloped' ideals are each characterized by a set of indices. The difference between the two is the development programme. This straightforward application of comparative statics

leads to an emphasis on industrialization and a choice of planning tools which bears little relevance to the objective circumstances of the developing country.[65]

The need for an improved analytical framework is inescapable but it calls for much more than a social accounting matrix along the lines suggested in the United Nations' System of National Accounts. The required framework must be one that would force planners to make all their assumptions and projections explicit. It should allow for the rational integration of a large number of variables. The structure of production and trade, the government budget and the credit and financial systems all have to be incorporated into a single macro framework. This framework would ease the problem of accounting for interdependencies and indirect effects. Insisting on a sequential micro project evaluation approach to planning leads to neglect of the basic fact that the object and subject of planning is the pattern of production relations and not the size of the government budget. The structure of production as it really is and as it is expected (or desired) to be must be constantly in front of planners.

The search by Nigerian planners for a macro-framework has led them to an input-output method. However, the input-output method is not system neutral in the sense of having a life of its own divorced from the material environment. True, the concepts of input-output tables and input-output analysis are system neutral. What is not system neutral is the design of an input-output table or the use of an input-output model. The design of an input-output table must reflect the type of economy and the type of problem for which it is proposed.

The comprehensive planning that has taken place in Nigeria has not addressed itself to the essence of the problem.[66] It is very easy for an input-output table to be a simple methodological extension of the biases inherent in the plans. It will become apparent in subsequent chapters, that this has tended to be the case with Carter's input-output table. It is not simply a matter of data being scanty. More fundamentally, it must be recognized that much of planning in Nigeria has to be directed at destroying some cells, changing the shape of some, multiplying others, and creating entirely new ones in the socio-economic matrix.

Because of the need for structural transformation, an input-output framework for planning in Nigeria involves a drastic modification of the conventional blueprint. The first problem to be solved may be loosely described as "ideological". It is necessary to establish a broad system of values and articulate how individuals and institutions are to be related. Thus, the concern in the Second Plan with income distribution requires a framework that would allow planners to think in terms of target groups. In an input-output model, this would be manifest in the weights attached to different commodities in the desired final demand vector and in the breakdown of the value-added section. Furthermore, planned convergence raises certain questions about changing the coefficients of the production structure and increasing the number of industries. It is very important, therefore, to evaluate how much can be done with an input-output model in planning in an LDC. This problem is addressed in the next chapter.

Footnotes to Chapter II

[1](Sessional Paper No. 24 of 1945) Lagos, Government Printer, 1946.

[2]Hansard, May 21, 1940, Col. 45. Quoted in Barbu Niculescu Colonial Planning, London, George Allen and Unwin Ltd. 1958, p. 61.

[3]Ibid.

[4]Implementation of the 1940 Act was delayed because of the Second World War.

[5](Sessional Paper No. 6 of 1951) Lagos, Government Printer, 1946.

[6]International Bank for Reconstruction and Development, The Economic Development of Nigeria, The Johns Hopkins Press, 1955, Preface.

[7]After the establishment of a federation, the regions acquired the right to implement aspects of the Revised Plan falling within their constitutional jurisdiction.

[8]For a fuller discussion of fiscal federation and planning in Nigeria, see A. Adedeji, "Federalism and Development Planning in Nigeria", Ch. 3, in Ayida, A.A. and H.M.A. Onitiri (editors), Reconstruction and Development in Nigeria, published for the Nigerian Institute of Social and Economic Research by Oxford University Press, Ibadan, 1971.

[9]See Aboyade, O., Foundations of an African Economy, New York: Praeger, 1966, Chapter 5.

[10]See, for instance, Professor Aluko's contribution to the discussion of A. Ayida's 'Development Objectives', Chapter 1 in Ayida and Onitiri, op. cit.

[11]Niculescu, Barbu, op. cit., Chapter 3.

[12]Aboyade, O., op. cit., p. 151.

[13]Lagos: National Economic Council, 1959.

[14]Ashby, Sir Eric, et. al., Investment in Education: The Report of the Commission on Post-School Certificate and Higher Education in Nigeria, Lagos: Federal Ministry of Education, 1960.

[15]Robinson, H., S. Smith, and Kenneth Clare, The Economic Coordination of Transport Development in Nigeria, Stanford Research Institute Project No. 1-3280, Lagos: Federal Ministry of Economic Development, 1961.

[16]Hansen, L.M., "Comprehensive Economic Planning in Nigeria", Chapter 10 in Eicher, Carl K. and Liedholm, C. (editors) Growth and Development of the Nigerian Economy, Michigan State University Press, 1970.

[17]Second National Development Plan, 1970-1974, Lagos: Federal Ministry of Information, 1970.

[18]The Central Planning Office is an expansion of the Economic Planning Unit through the appointment of professional planners outside the main pool of administrators.

[19]Preliminary Statement on Development Planning in Nigeria, Sessional Paper No. 6 of 1945, Lagos: Government Printer, 1945, p. 4. Quoted in Helleiner, Gerald, K., Peasant Agriculture, Government and Economic Growth in Nigeria, Homewood, Illinois: Richard D. Irwin, Inc., 1966, pp. 332-333.

[20]Quoted in Balewa, Sir Abubakar, Nigeria Speaks, London: Longmans, Green and Co., Ltd. 1964, p. 138.

[21]See Schatz, Sayre, P., "The Influence of Planning on Development, the Nigerian Experience", Social Research, Vol. 27, No. 4, Winter, 1960, pp. 452-468.

[22]Cf. Schatz, op. cit., p. 460.

[23]Schatz, op. cit., p. 463.

[24]Second National Development Plan, 1970-1974, op. cit., p. 10.

[25]See Chapter 4, National Development Plan, 1962-68, Lagos: Federal Ministry of Economic Development, 1963.

[26]This must be viewed in the light of the overwhelming share of total revenue contributed by the foreign sector, cf. Helleiner, op. cit., Chapter 8.

[27]Stolper, W.F., Planning Without Facts, Cambridge: Harvard University Press, 1966, Chapter 5.

[28]"The basic aims that have to be constantly kept in mind are the achievement of a certain growth rate (or more) and the rapid enlargement of the choices available to the economy ... In order to achieve a certain growth rate (or more) in a particular period, as many resources as feasible must be pushed into uses in which they will yield growth. From this point of view it is irrelevant what sector the employment is in and what kind of commodity or service is produced... If this point is granted, it becomes redundant to look for sectoral investment criteria. The proper sectoral balance is derived from the summation of the individual project". Stolper, ibid., p. 145.

[29]See Wells, J.C., "Issues in Agricultural Policy During the 1962-68 Nigerian Development Plan". Chapter 13, in Eicher and Liedholm, op. cit.

[30]For an excellent discussion of which, see Aboyade, op. cit.

[31]which, more accurately, should be regarded as recurrent expenditure.

[32]Clark, p. 13, Planning Import Substitution, Amsterdam: North-Holland Publishing Co., 1970, Chapter 8.

[33]Cf. Stolper, W.F., "The Main Features of the 1962-68 National Plan", Nigerian Journal of Economic and Social Studies, Vol. 4, No. 2, July, 1962, p. 86.

[34]Second National Development Plan, 1970-74, op. cit., p. 37.

[35]How well this was done is a question of a different order. In the preceding plan the role of the private sector was only vaguely indicated and never articulated. Here the need for a combination of direct and indirect action on private activities was emphasized.

[36]Second National Development Plan, 1970-74, op. cit., p. 32.

[37]Federal Ministry of Economic Development and Reconstruction, Lagos, 1970.

[38]Second National Development Plan, 1970-74, op. cit., p. 40.

[39]Ibid.

[40]Second National Development Plan, op. cit., p. 34.

[41]Tinbergen, Jan., On the Theory of Economic Policy, Amsterdam: North-Holland Publishing Co., 1963.

[42]Second National Development Plan, op. cit., p. 44.

[43]Bhambri has criticized the way planners have used this criterion, briefly, he argued that value-added and the maximization of linkages are incompatible. The reason being that a firm which increases the ratio of value-added to gross output would be reducing demand from other firms. However, this argument is unfair because the operative phrase was national value-added, not value-added. The choice of terminology may be criticized but the planners expected their concept to be seen in terms of domestic as opposed to foreign resources. Cf. Bhambri, R.S., "Second National Development Plan: A Selective Appraisal", Nigerian Journal of Economic and Social Science, Vol. 12, No. 2, July, 1970, pp. 179-193.

[44]Hanson, A.H., The Process of Planning, London: Oxford University Press, 1966.

[45]Ibid., p. 15.

[46]See, for instance, Guidelines for the Third National Development Plan, 1975-1980. Lagos: Federal Ministry of Economic Development and Reconstruction, 1974, p. 10.

[47]Myint, H., "Dualism and Internal Integration of the Underdeveloped Economies", Banca Nazionale del Lavoro Quarterly Review, No. 93, June 1970, pp. 128-156.

[48]See his 'Comment' on Aboyade's paper in Ayida and Onitiri, (eds.), op. cit., p. 81.

[49]Stolper, W.F., "The Main Features of 1962-1968 National Plan", Nigerian Journal of Economic and Social Sciences, Vol. 4, No. 2, July, 1962, p. 85.

[50]Ibid., p. 86.

[51]Ibid.

[52]Ibid., p. 88. It also goes without saying that since pay-off calculations could be made almost only for projects within the modern sector, an anti-traditional sector bias was built into even the project evaluation technique.

[53]Hansen, L.M., "Methods of Economic Programming and Analysis in the Plan", Nigerian Journal of Economic Social Science, Vol. 4, No. 2, July, 1962, p. 104.

[54]'Quasi' because a linear programming algorithm only generates an internally consistent set of relative prices which reflects the resource constraints specified in the model. Too many taxes and subsidies are implicit in the system for the shadow prices to correspond to real equilibrium prices. In this connection, see Taylor, Lance, Multi-sectoral Models in Development Planning, A Survey; Economic Development Report No. 230. Centre for International Affairs, Harvard University, Cambridge, Massachusetts; March 1973.

[55]This is discussed further in Chapters III and IV. See Carter, Nicholas, G., An Input-Output Analysis of the Nigerian Economy, 1959-1960. Working Paper No. 29-63, M.I.T. School of Industrial Management, Cambridge, Massachusetts; 1963. Chapter I.

[56]Cf. Second National Development Plan, 1970-1974, Second Progress Report, Lagos: Federal Ministry of Economic Development and Reconstruction, May 1974, p. 21.

[57]Even if the elasticity of food with respect to income is low in general, it would still be very high at or below a certain level of income. Cf. Mellor, J., The Economics of Agricultural Development, Ithaca: Cornell University Press, 1966. Ch. 4, pp. 57-80.

[58]Cf. Adedeji, A., Foundation for Sound Development, Lagos: Federal Ministry of Information, 1972.

[59]Second National Development Plan, op. cit., p. 327.

[60]Second National Development Plan, op. cit., p. 65.

[61]Wallerstein, I., "Dependence in an Interdependent World: The Limited Possibilities of Transformation within the Capitalist World Economy", African Studies Review, Vol. 17, No. 1, April, 1974, pp. 1-26.

[62]See, for instance, Andre Gunder Frank, "Sociology of Development and Underdevelopment of Sociology" in Cockroft, J.D., A.G. Frank and D.L. Johnson, Dependence and Development, New York: Doubleday & Company Inc., 1972. Also, see Papandreou, A.G., Economic Development - Rhetoric and Reality, E.S. Woodward Lectures in Economics, University of British Columbia, Department of Economics 1973.

[63]Aboyade, O., Incomes Structure and Economic Power, Ibadan: Presidential Address, Conference of the Nigerian Economic Society, April, 1974. Professor Aboyade was head of the Central Planning Office which designed the Second Plan. After the plan was launched, he became head of the Office of National Accounts.

[64]Aboyade, O., Incomes Structure and Economic Power, p. 5.

[65]For a fuller discussion of this point, see Papandreou, A.G., Economic Development - Rhetoric and Reality, op. cit.

[66]This has nothing to do with the failure or success of planning in terms of comparing implementation with stated objectives. Rather, it is a matter of not being convinced that the particular brand of planning used in Nigeria is adequate for the purpose of structural transformation.

CHAPTER III

INPUT-OUTPUT ANALYSIS AND PLANNING IN DEVELOPING COUNTRIES

> Now there are two different attitudes towards learning from others. One is the dogmatic attitude of transplanting everything, whether or not it is suited to our conditions. ... The other attitude is to use our heads and learn those things which suit our conditions, that is, to absorb whatever experience is useful to us.
>
> Mao Tse Tung

A. Introduction

As the art of planning becomes more sophisticated, multi-sector planning models attain a pre-eminent position. It is now generally recognized that planning involves venturing from the purely economic workshop into socio-political corridors attempting, as we go along, to attach measurable indices to concepts that are often both vague and elusive.[1] It is known with greater confidence, however, that whatever other variables are affected, planning invariably involves non-random changes in the structural relationships of production within the economy. In multi-sector models sectoral differences in structural relationships are emphasized. It is important to keep in mind that in their practical application to planning problems these models, like the computers through which they are usually programmed, cannot do more than they are instructed to do given certain information. In less developed countries instructions can very easily be based on incomplete, irrelevant and (sometimes) incorrect information because of the sheer intractibility of certain features of production relations.

Multisector models are particularly useful in planning because they impose logical consistency on the process. For instance aggregate demand may be equal to aggregate supply only because non-substitutable excesses in sectoral supply and demand cancel out. The identification of these sectoral imbalances is a main advantage of multi-sector models. Of this class of models, this study concentrates on the open static input-output model. The reason is simple: this model is usually an important subset in the more sophisticated (dynamic input-output and mathematical programming) models. If the simple model is inadequate because of the design of the table on which it is based, the modifications and extensions of the more complex models may be inadequate.[2] As a particular example, the framework of the Nigerian Input-Output table for 1959-60[3] is described in this chapter with a view to analysing the characteristics of the model derivable from it. An almost natural order of analysis is thus suggested: to place input-output analysis in its historical context; to present the essentials of an input-output table and its descriptive properties, to examine the main features of the Nigerian table and its limitations as a description; to specify the input-output model and explore its significance by relating it to the Walrasian model, to analyse the output and price determination and other applications of the model and to investigate whether and how the model derived from the Nigerian table fits the abstract mould; to specify the premises of the input-output argument; and finally to evaluate the model especially from the standpoint of (1) the theory of production in a developing country, and (2) the requirements of input-output model building with respect to (a) the choice of endogenous variables and (b) the choice of a period during which the relationship among variables is expected to hold.

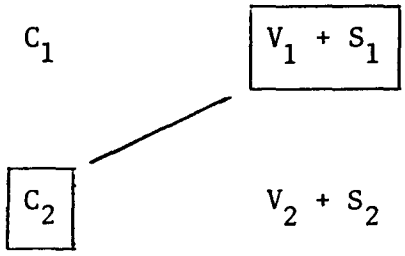
B. The Development of Input-Output Analysis

"The conception of the general interdependence of all sectors and all elements of the economic process"[4] was first presented by Quesnay in his famous Tableau Economique (1758). The tableau was a diagram showing the circulation of goods and services among economic classes (three in his formulation) and the relationship of the income of each class to the interdependent activities of all classes with respect to production and consumption. The first full development of the idea of general equilibrium was given by Leon Walras in his 'Element's d'economie politique pure' (1874). In volume II of Marx's 'Das Kapital' (1885), the idea of input-output relations between various branches of an economy also received a systematic treatment in the schemes for reproduction of capital.

In the Marxian scheme, total national product is broken down into three components -- C, the constant capital used in production; V, the variable capital (or wages); and S, the surplus generated (i.e. profits)[5]. The economy is then divided into two departments -- a producer good (1) and a consumer good (2) department. Writing total output of producer goods = $C_1 + V_1 + S_1$ and total output of consumer goods = $C_2 + V_2 + S_2$, the total national product is $C + V + S \equiv (C_1 + C_2) + (V_1 + V_2) + (S_1 + S_2)$. An input-output relation is very easily derived from the three equations. In the stationary state the total demand for means of production is $C_1 + C_2$, which is equated to the output of producer goods, i.e.,

$$C_1 + C_2 = C_1 + V_1 + S_1 \Rightarrow C_2 = V_1 + S_1 \qquad (3.1)$$

The input-output relation can be indicated in a simple table:



$V_1 + S_1$ is transmitted to department 2 in exchange for consumer goods and value of output equal to C_2 in department 2 is exchanged for producer goods. Stationary equilibrium requires balanced exchange between the two departments which condition is given by equation (3.1). The same condition can be obtained by equating the demand for and supply of output in department 2; i.e.

$$V_1 + S_1 + V_2 + S_2 = C_2 + V_2 + S_2 .$$

Now if we denote C_1 and C_2 by χ_{11} and χ_{21} respectively and $(V_1 + S_1)$ and $(V_2 + S_2)$ by χ_{12} and $_{22}$ respectively we obtain the table

$$\left.\begin{matrix} \chi_{11} & \chi_{12} \\ \chi_{21} & \chi_{22} \end{matrix}\right\} \quad . \ . \ . \ . \qquad (3.2)$$

The column sums are equal to the row sums in (3.2). This equality plays an important role in the input-output sytem. It should be noted that in this scheme we have a closed[6] model.

Walras specified factors of production physically and temporally and called them productive services. Define a coefficient of production as the quantity of a productive service entering the production of one unit of a product. Let there be m productive services and n products and

assume: (1) the productive services are used only to produce the n goods, and (2) only the m productive services are used in production. In short the economy is closed. The problem is to determine equilibrium prices and quantities. Now let y_i (i = 1, ..., m) be the quantities of productive services: x_i (i = 1, ..., n) the quantities of products; and λ_i (i = 1, ..., m) and p_i (i = 1, ..., n) the prices of productive services and commodities respectively. Also let a_{ij} denote each of the (mn) coefficients of production. Walras' stationary equilibrium is given by the two sets of equations

$$\sum_{j=1}^{n} a_{ij}x_j = y_i \quad ; \quad i = 1, \ldots m.$$

and

$$\sum_{i=1}^{m} a_{ij}\lambda_i = p_j \quad ; \quad j = 1, \ldots n.$$

which are respectively summarized in matrix notation as

$$AX = Y \tag{3.3}$$

$$A'\Lambda = P \tag{3.4}$$

where A is the matrix of coefficients and X, Y, Λ and P are the vectors of x_i, y_i, λ_i, and p_i respectively. The first equation expresses the equality of demand for productive services and available supply whilst the second describes the equality of average cost and product prices.[7] The input-output approach is an attempt to relate this analytical scheme of a closed economy in long run equilibrium to an actual system.

C. The Input-Output Table

The logical status of the table in the language of input-output analysis is definite - descriptive in the sense that "the input-output table of A" (where A is a specified region) would be a record of specific information about specified aspects of A. It falls naturally therefore into Morgenstern's class of 'scientific information'.[8] Let there be the following three sets: G is a set of gathered sets of data, the elements of which will include national accounts tables, censuses of production and external trade reports. H is a set of other data which may be data on historical events or non-measurable expectations based on experience. E is a set of certain aspects of economic theory. For input-output analysis this would include general equilibrium theory and the theory of production. It may also include the theories of consumption, investment, planning and public policy. Now scientific information is provided by the union of $G \cap E$ and $H \cap E$ i.e. $G \cap E \cup H \cap E$. The intersection $G \cap H \cap E$, if it exists, is of course also scientific information. It follows therefore that since this information is the result of a contrived process its quality depends on the quality of this process. It is necessary to examine the construction of the input-output table, since it is fundamental to the quality of the result.

The input-output table is a rectangular array of sales and purchases among different production and non-production sectors of an economy. Assume that there are n production sectors (industries) in a hypothetical economy. Represent the value of product flows among them by row entries in a matrix of order n x n. Now let this matrix be augmented by a row and a column vector to represent transactions

between the production and non-production sectors and between the non-production sectors. The result is a partitioned matrix of the form:

$$\left[\begin{array}{cccc|c} \chi_{11} & \chi_{12} & \cdots & \chi_{1n} & f_1 \\ \chi_{21} & \chi_{22} & \cdots & \chi_{2n} & f_2 \\ \vdots & \vdots & & \vdots & \\ \chi_{n1} & \chi_{n2} & \cdots & \chi_{nn} & f_n \\ \hline w_1 & w_2 & \cdots & w_n & s \end{array}\right] \qquad (3.5)$$

In what follows the notation hereunder is used frequently for simplicity

$\{\chi_j\}$ = a column vector of χ

$\langle\chi_i\rangle$ = a row vector of χ

$\|a_{ij}\|$ = a square matrix of coefficients a

$\lceil a_{ij} \rfloor$ = a diagonal matrix of a.

In (5) χ_{ij} denotes inter-industry deliveries; $\{ f_j \}$ represents output delivered for final domestic and foreign use; $\langle w_j \rangle$ shows all inputs into the production system that are not produced within it. The bottom right-hand partition represents transactions between the non-production sectors. If the gross output[9] of any industry i is χ_i, then

$$\chi_i \equiv \sum_{j=1}^{n} \chi_{ij} + f_i , \quad i = 1, \ldots, n \qquad (3.6)$$

The subscripts i and j respectively denote the row and column position of any element. Equation (3.6) states that the total demand for any product is given by the sum of deliveries for intermediate use and deliveries to final users. In addition the total output of any industry j is denoted by

$$\chi_j \equiv \sum_{i=1}^{n} \chi_{ij} + w_j \quad ; j = 1, \ldots, n \tag{3.7}$$

i.e. the sum of produced inputs and primary inputs.[10]

The descriptive feature of the table lies in its statistical depiction of the diversity and complexity (or the lack thereof) of the economy. It shows direct interdependence. For each industry forward linkages are derived from the size and number of entries in the corresponding rows. Similarly, backward linkages are derived from the size and number of entries down the relevant columns. Forward linkages reflect the number of different commodities an industry helps in producing while backward linkages reflect the variety of commodities necessary to produce any commodity. The greater the extent of specialization in the economy, the less will be the number of zero entries.

One can detect from the preceding discussion at least three possible sources of error in the table. First, errors may arise if the coverage of the economy to which it refers is not total or/and the data are not accurate. Second, errors may arise because the data has to be adapted to certain theoretical concepts, for instance the concepts industry and product have to be approximated. In addition, for the table to be manipulable a degree of aggregation is usually necessary. Finally

there may simply be gaps in the data which would have to be filled and this introduces errors of interpolation, extrapolation, etc. An examination of the Nigerian input-output table will clarify these points.

D. Main Features of the Nigerian Table

The table refers to the fiscal year (April 1) 1959 - (March 31) 1960. The essential strategy in its construction was the simultaneous balancing of inputs and outputs on the basis of the two control totals that were generally available. i.e. gross output (sometimes only exports) and value added. These figures were then combined with other information of varied reliability to determine the rest of the matrix.

The table shows twenty production sectors, three categories of final users -- 'Investment', 'Exports' and 'Consumption' --, and two non-produced input sectors -- 'Imports' and 'Value Added'. The Investment sector should be more accurately referred to as a pseudo sector in the sense that whenever a production sector, h, sells output, g, to any other sector, k, as a capital good it is recorded as a sale by sector h to the Investment sector which has no selling activity. The twenty production sectors are shown in Table III-1 which gives the sectoral percentages of total gross output.

For any developing country, especially one as large as Nigeria, the coverage of any nation-wide data will always be less than corresponding data for a developed country because of the intractability of certain features of the developing country: Certain villages for instance are simply inaccessible to data gatherers and in many of the accessible ones there is an acute distrust of 'strangers', especially those of official

Table III-1: Relative Importance of Sectors

SECTOR	Sectoral Contribution to Consumption as Percentage of Gross Output of All Sectors	Sectoral Gross Output as Percentage of Total Gross Output
1 Agriculture	33.08	39.32
2 Livestock Forestry & Fishing	6.73	8.52
3 Agricultural Processing	1.02	6.24
4 Textiles	0.00	0.56
5 Clothing	2.85	2.87
6 Drink and Tobacco	1.15	1.16
7 Food	1.90	1.91
8 Metal Mining	0.00	0.52
9 Non-Metal Mining	*	0.83
10 Chemicals	0.20	0.29
11 Transport	5.79	8.99
12 Utilities	0.02	0.46
13 Trade	4.74	6.37
14 Construction	0.25	7.76
15 Service	8.21	10.48
16 Transport Equipment	0.06	0.74
17 Non-metallic Mineral Products	*	0.12
18 Metal Manufacturing	0.49	0.85
19 Wood, Leather, Plastic, Rubber, Paper	1.33	1.73
20 Miscellaneous Manufacturing	0.07	0.19
TOTAL SUM OF 1-20.....	68.23	99.91 ...

*equals almost zero. Source: Calculated from Table II, Carter, N.G., An Input-Output Analysis of the Nigerian Economy.

status who could very easily be tax agents. This should be recognized. It will be impractical therefore for the planner in Nigeria to expect total coverage in the data at his disposal. The more important thing is the accuracy of the figures he has and this brings up the question of the quality of the data used in the input-output table.

One of the real foundations of Carter's input-output table for Nigeria was the "Nigerian National Accounts 1950-57" by P.N.C. Okigbo.[11] Carter states that "without this (Okigbo's) report, it is doubtful that the present (input-output) study could have been undertaken ... Okigbo was used extensively to obtain agricultural figures".[12]

How did Okigbo obtain his agricultural figures? The phenomenon usually vaguely referred to as "Dualism" is probably most manifest in agriculture. Subsistence production and production for exchange, internal and external, occur concurrently. This of course raises two problems. Where should the line be drawn between production and non-production activity? How does one value activities that have by definition no money prices? Agricultural subsistence activity can be classified into three general types.

(1) Primary production in the rural household for auto-consumption and for investment;

(2) (a) Processing, storage, transportation and distribution of own primary production;

(b) processing of purchased goods for own consumption;

(3) Household services of a general nature.

The conceptual distinction between production and non-production activity is most serious in (3) and any decision must of necessity be arbitrary.

If subsistence output is entered in an input-output matrix there would certainly be a final demand component and probably one intermediate use component (χ_{ij}, i=j). Category 2(b) may also mean a few column entries but by definition the row and column will be mainly blank. However the process of filling these blanks as a result of increased monetization is of real interest to the planner. Quite apart from the conceptual problem, however, is the fact that it may be impossible in practice to isolate the pure subsistence activity of the rural household. The most frequently observed case of farming in Nigeria is that of subsistence and commercial activities occurring in the same time-space dimension.[13] But input-output analysis is a study in structural analysis and must therefore consider the constantly changing ratio of traded to untraded output. Developed countries can neglect subsistence activity because it constitutes a very small fraction of total activity; a less developed country would be ignoring a very large part of its activity if it neglected subsistence.

Okigbo's approach was to attempt to define total product without isolating subsistence output. He distinguished between marketed, marketable and non-marketable output.[14] His definition of product excluded non-marketable output especially household services of a general nature. While sales figures were generally available from the marketing boards for export crops, he had to base the output of food crops on acreage and yield figures from a rather poor sample survey. "The trouble (was) that no area of the country was covered more than once and in no single year (was) the whole country covered".[15] The acreage and yield estimates in the

sample were based on the subjective estimates of the agricultural officers. In the end Okigbo had to rely on a purely arbitrary set of quantification rules: "an unqualified increase or decrease in either yield or acreage reported for a particular province was put at 5 per cent on the previous year, a 'considerable' change was put at 10 per cent, "no change" meant zero ...".[16] This seems to have been the best he could do in the circumstances. Using these figures in an input-output table has certain implications which will be discussed presently.

Having obtained output figures, Okigbo had to solve the valuation problem. This problem was posed very succintly by Prest: "should the maize eaten by a peasant farmer be evaluated at the highest price at which he could have sold it or at the lowest price which he would have had to pay for it if he had not produced it himself?".[17] Okigbo chose to use a single producer (ex-farm) price for all of each crop in each region of the country.[18] Since there were no true producer prices, "the decision adopted ... was to take for each crop for each year a simple average of the unweighted average of prices ruling over the year in representative markets in the main producing areas of each Region".[19] It was recognized that production and sales in food deficit areas reflected only the conditions in the surplus areas, but no adjustment was made for this.

Dualism is used in another sense. The simultaneous use of traditional and modern methods in the production of a commodity is often referred to as technological dualism. Technological dualism is reflected in the Nigerian national accounts table by the subclassification of 'manufacturing' into 'Crafts' and 'Other'. How did Carter deal with this phenomenon? Small-scale industrial activity was 60 per cent of industrial output in Okigbo's estimates. Carter's estimates were based mainly on an AID study in one region for 1961. The survey covered

thirty-five industries in fourteen towns in the Eastern Region. For the input-output study the assumption was made that industrial activity occurred only in the urban areas. The AID study figures were then extended through multiplication by the ratio of urban population to total population and adjusted by estimated productivity figures in each region. The important point is that the calculation of figures for crafts and small industry was less accurate than that for the large manufacturing enterprises which were covered by an annual industrial survey. In addition the output of the cottage industries is inextricably linked with transport and distribution and again some of it is non-marketed.

In Carter's industrial classification the outputs of small-scale industrial activity are assigned to the same industry as the output of modern enterprises producing similar commodities. For instance, 'Domestic Weaving' where the only input entry was from 'Agriculture', was lumped with the output of the textile mills which bought inputs from eleven other sectors, none of which came directly from agriculture, and 'Weaving and Dyeing', the main input of which was imports.[20] Also, formal transportation like railways and aircraft was assigned to the 'Transport' sector along with small river canoe services, although it was obvious that neither their input structures nor the nature of demand for them was similar. Judging from the fact that 'Manufacturing and Crafts' and 'Transport' accounted for less than ten per cent of gross domestic product in his reference year, it seems reasonable to infer that Carter was striving to avoid creating too many sectors with too few entries. It is not clear, however, how 'inputs' and 'outputs' should be interpreted in these industries.

In the light of the foregoing, how good a description of the relevant[21] features of the Nigerian economy does Carter's table offer? Carter was interested in showing the degree of industrialization in Nigeria.[22] As a result he produced a table that is strikingly similar to the input-output tables of developed industrialized countries. Only 49 percent of his cells were empty which compares favourably with the percentage of empty cells in the tables for other more advanced countries -- U.S.A. 30 percent (1947), Italy 36 percent (1954), Yugoslavia 35 percent (1955), Norway 50 percent (1950).[23] In the process he assigned two sectors to primary production, 'Agriculture' and 'Livestock, Forestry and Fishing' even though this accounted for roughly 65 percent of gross domestic product in 1959-60. Add to this the fact that three of his other sectors -- 'Construction', 'Transport' and Services -- accounted for another 20 percent of G.D.P. and a very important question arises. Why was 75 percent of the input-output table devoted to describing only 15 percent of the national product?

The answer seems to lie in a form of value rigidity, i.e., an inability to revalue what one sees because of a commitment to previous values. Because he was aware of what an input-output table "should" look like, Carter probably failed to recognize the possible need to adapt the table to the peculiarities of the Nigerian economy. For instance, one of the well-known assumptions of the conventional model is the assumption that the number of products in the economy equals the number of produced inputs. But in an economy like Nigeria, where the momentum is provided by a few leading sectors (Arthur Lewis' "prime movers"[24]), and only a few basic domestic inputs are significant, this assumption is really unnecessary.[25] Since most material inputs are imported, it seems more important to distinguish the industrial origin of imports. A knowledge of the composition of

intermediate imports facilitates the analysis of import substitution prospects. In this instance, Carter's choice was not restricted by a lack of data because import statistics are among the most reliable data available.

Furthermore, because Carter undertook to construct the table at the suggestion of the members of the EPU, he was probably influenced by their cognition of the planning problem and corresponding emphasis on the fastest growing sectors as the best approach (Cf. Chapter II, D). This would account for his attempt to show as much detail as possible in the manufacturing sector. Since this sector is the main user of scarce capital and foreign exchange, its detailed description would facilitate the analysis of the allocation of these scarce resources among the various activities in this sector. But pushing the fastest growing activities is unlikely to result in structural transformation. The weak links between the modern and traditional sectors denies the majority access to a share of the benefits arising from the fast growing activities.

A certain degree of subjectivity is unavoidable in industrial classification for any model. However, an input-output table must at least provide the basis for rationally relating government policy to people. The pressing problems have to do with raising productivity in agriculture and traditional manufacturing; finding employment for the urban unemployeds; and determining the relative roles of export promotion and import substitution in the transformation process. Solving these problems requires from an input-output table, a description of the economy that reflects factors constraining structural transformation. A certain classification system may be meaningful in some countries but not in others. For instance, it may be reasonable to assign one row to Agriculture, Forestry and Fishing

in an input-output table for Canada, where this sector is not a primary employer and it produced only 3.8 percent of G.D.P. in 1972.[26]

Since he was thinking in terms of planning, Carter may have asked the wrong questions in terms of structural transformation. One of the main tasks of planning is to ensure the feasibility and consistency of various simultaneous projects and input-output table is singularly suitable for isolating bottlenecks. For instance, coal and petroleum production are both in Carter's 'Non-metal Mining' sector. Coal production in Nigeria is falling and petroleum production is rising. The construction of an Iron and Steel Industry would require an increased production of coal which might be very difficult; but this would not be revealed in the table. Simply by changing the size and composition of the aggregates in the table, different answers can be obtained from any input-output table, as Leontief himself recognized.[27] Since any input-output table must of necessity be somewhat aggregated, it seems reasonable to insist on the description of the most significant relationships.

As a last example, it may be noted that the implications of Myint's argument (see page 44 above) for the performance of the economy will be obscured in Carter's table. Two industries may be producing the same or similar commodities and yet show markedly different factor proportions and growth rates because public policy is discriminatory against one. A model based on a table that does not distinguish between the two industries would give misleading results.[28]

E. The Nature and Significance of the Input-Output Model

The mathematics of the input-output model is very simple. The n production sectors of the system (3.5) above provided a set of n equations as in (3.6). Input coefficients are obtained from the division of every element in $\|\chi_{ij}\|$ by the column sum x_j ; i.e. $a_{ij} = \chi_{ij}/x_j$; $i, j = 1, \ldots, n$; where the a_{ij}'s are input coefficients. This is substituted into Equation (3.4) to yield:

$$X_i = \sum_{j=1}^{n} a_{ij}x_j + f_i \; ; \; i = 1, \ldots, n. \tag{3.8}$$

The equations for the n industries can be summarized in vector-matrix notation as

$$X = AX + F \tag{3.9}$$

where X is a vector of gross outputs, $A = \|a_{ij}\|$ and F is the final demand vector. Equation (9) has a general solution of the form

$$X = [I - A]^{-1} F \tag{3.10}$$

where I is an n x n identity matrix.[29] Gross output levels are uniquely determined once the final bill of goods (F) is given and A has been estimated from the transactions table.

Price determination is also very similar to the process in the Walrasian model. Suppose that $\|a_{ij}\|$ was given in natural units. Then the per unit cost of material inputs in industry j would be $\sum_{i=1}^{n} a_{ij}P_i$, where P_i is the unit price for the product of industry i. In industry j therefore, the value added per unit of output (V_j) would be

$$V_j = P_j - \sum_{i=1}^{n} a_{ij}P_i \quad ; \quad j=1, \ldots, n.$$

from which $V = [I - A']\ P$ where $V = \{V_j\}$,

and $P = \{P_i\}$ are vectors of values added and prices respectively. Assume now that (1) the elements $w_1, \ldots, w_n$ were the physical units of one (homogeneous) primary factor so that $w_j/x_j = a_{oj}$ is the fixed proportion in which labour is required; and (2) that the wage rate is π. Then $V_j = a_{oj}\pi$ and $V = \pi a_o'$ where $a_o = < a_{oj} >$. Substituting for V we have

$$\begin{aligned} \pi\, a_o' &= [I - A']P \\ \text{and} \quad P &= [I - A']^{-1}\, \pi\, a_o' \\ &= ([I - A]^{-1})'\, \pi\, a_o' \\ &= (\pi\, a_o[I - A]^{-1})' \\ \therefore\ P' &= [(\pi\, a_o[I - A]^{-1})']' \\ \therefore\ P' &= \pi\, a_o[I - A]^{-1} \end{aligned} \tag{3.11}$$

Prices like output are technologically determined. As in the Walrasian system they may be interpreted as long run perfect competition prices. It should be noted however, that while the Walrasian model was a closed system in long-run equilibrium, the input-output model is of an actual production system and is open in the sense that part of output is delivered outside, and some inputs are delivered from outside the production system.

The scope of this model is limited to the examination of the effects on the endogenous variables (prices and outputs) of changes in the exogenous variables, and on the effects of endogenous variables on one another. Before considering these points, some extensions of the simple model should be examined.

The model can be extended to make consumption endogenous. Here labour is assumed to be produced within the system with household consumption as the inputs. The assumption that labour is the only primary factor is retained. The consumption component of final demand can be isolated by subtracting other uses, i.e. $C = F - F_o$, and $S_c = S - S_o$, (1) where C is the vector of consumption, F_o is a vector of other final uses, (2) S_c is direct consumption of labour by households and S_o is other direct consumption of labour. The submatrix $\|\chi_{ij}\|$ in (5) is then augmented into

$$\begin{bmatrix} \chi_{11}, \ldots, \chi_{1n} & C_1 \\ \chi_{n1}, \ldots, \chi_{nn}, & C_n \\ w_1, \ldots, w_n, & S_c \end{bmatrix}$$

Total demand for labour is then given by

$X_o = \sum_{j=1}^{n} a_{oj} X_j + S_c + S_o$. If it is also assumed that consumer purchases are directly proportional to total labour supply then $C_i = a_{io} X_o$. Gross output including "production" of labour can then be determined. If $a_o = [a_{o1}, \ldots a_{on}]$ and $C = [a_{10}, \ldots, a_{1n}]$, then the general solution will be

$$\begin{bmatrix} X \\ --- \\ X_o \end{bmatrix} = \left[\begin{array}{c|c} I - A & -C \\ \hline -a_o & 1-S_c \end{array}\right]^{-1} \begin{bmatrix} F_o \\ --- \\ S_o \end{bmatrix} \quad \ldots \qquad (3.12)$$

Another simple extension is the endogenization of the Investment component of final demand. The model becomes dynamic bearing a logical resemblance to the Harrod-Domar growth model.[30] The main variation on the static theme is the addition of capital inputs to the production functions. For every time period (t) each industry j now has also a stock of capital bearing a proportional relationship to X_j, i.e.

$$S_{ij}(t) = b_{ij}X_j(t) \qquad \text{for all } i, j, t. \tag{3.13}$$

where the b_{ij}'s are constant.

S_{ij} is the amount of the output of i held by j as capital stock. The total stock of i held for production is therefore

$$S_i(t) = \sum_{i=1}^{n} S_{ij}(t) = \sum_{i=1}^{n} b_{ij}X_j(t) \qquad i = 1, \ldots, n \tag{3.14}$$

It is sometimes assumed that these stocks never depreciate so that it is always true that

$$\Delta S_i(t) = S_i(t+1) - S_i(t), \geq 0 \text{ ; for all } i, t \text{ and}$$

$S_i(t)$ never decreases. Excess capacity is ruled out so that gross output in each industry exactly equals demand; i.e. for every t

$$X_i = \sum_{i=1}^{n} a_{ij}X_j + \Delta S_i + f_i \quad ; i = 1, \ldots, n \ldots \tag{3.15}$$

Now, writing $B = \left\| b_{ij} \right\|$ and $X_t = [X_1(t), \ldots, X_n(t)]$, the Leontief dynamic system can be obtained.[31]

$$X_t = AX_t + B[X_{t+1} - X_t] + F_t \ \ldots \tag{3.16}$$

which gives

$$[I - A + B]\, X_t - BX_{t+1} = F_t \ \ldots \tag{3.17}$$

Given F_t for all time and initial values for the vectors X_o and $S_o = BX_o$, it is easy to compute gross output level for all future time. This is because 3.17 can be solved for X_{t+1} as $X_{t+1} = B^{-1}[I - A + B]X_t - B^{-1}F_t$ This of course depends on the existence of the inverse of B.

F. Uses of Input-Output Analysis

It is now time to examine some of the analytical uses of the open static model. From the general solution (10) more meaningful measures of interdependence can be derived. These measures take into account the indirect effects of changes in the exogenous variables, i.e., the interaction among the endogenous variables in adjusting to changes in the exogenous variables. The matrix $[I - A]^{-1}$ can be given a simple economic interpretation. If $[I - A]^{-1}$ exists, it may be approximated as

$$[I - A]^{-1} = I + IA + IA^2 + IA^3 \ldots$$

This expression explains the composition of $[I - A]^{-1}$. I accounts for one unit to be delivered to final demand; A is the direct input required for the production of the one unit of final demand; A^2 shows the direct inputs needed to produce A required to produce I; A^3 shows the inputs needed to produce the A^2 needed to produce the A needed to produce I . . . . The inverse matrix $[I - A]^{-1}$ is therefore simply a matrix of production multipliers. Its typical element C_{ij}, represents the increase in the output of industry i per unit increase in final demand for the product of industry j. The column summation $C.j = \sum_{i=1}^{n} C_{ij}$, all j therefore indicates the total increase in production from the whole system needed to cope with a unit increase in the final demand for the product of the j^{th} industry total input requirements. Similarly, the row sums ($C_i.$; all i)

represents the increase in the output of industry i required for a unit increase in the final demand for every industry. In other words if we replace $\|C_{ij}\|$ by another matrix the elements of which are all zero except in the i^{th} row where the C_{ij} are retained, then

$$\begin{bmatrix} X_1 \\ . \\ . \\ . \\ X_n \end{bmatrix} = \begin{bmatrix} 0 & . & . & . & 0 \\ . & & & & . \\ C_{i1} & . & . & . & C_{in} \\ . & & & & . \\ 0 & & & & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ . \\ . \\ . \\ 1 \end{bmatrix} = \begin{bmatrix} \\ \sum_j C_{ij} \\ \\ \end{bmatrix}$$

From this analysis Rasmussen[32] suggested interpretations for the averages $\frac{1}{n}$ C.j and $\frac{1}{n}$ Ci. If the final demand for the product of industry j(j = 1, . . . , n) increased by one unit, an industry chosen at random would increase its direct and indirect supply by $\frac{1}{n}$ C.j Similarly $\frac{1}{n}$ Ci. could be interpreted as an estimate of the demand by a randomly chosen industry for the product of industry i to sustain a unit increase in the final demand for all products.

In presenting his notions of backward and forward linkages, Hirschman[33] referred to the quantification of the degree of interdependence given by Chenery and Watanabe.[34] Chenery and Watanabe had measured interdependence through direct purchases from other sectors and interdependence through direct sales to other sectors. These two measures were taken by Hirschman as backward and forward linkages respectively. Rasmussen's analysis is more complete because it also took indirect effects into account. Normalizing the averages $\frac{1}{n}$ C.j and $\frac{1}{n}$ Ci. by the overall average he produced the two indices:

$$U_j = \frac{1}{n} C.j \;/\; \frac{1}{n^2} \Sigma_j C.j$$

and

$$U_i = \frac{1}{n} Ci. \;/\; \frac{1}{n^2} \Sigma_i Ci.$$

U_j, which he called the 'Index of Power of Dispersion', measures "the relative extent to which an increase in final demand for industry j is dispersed throughout the system of industries";[35] i.e. the general expansion effect of an expansion in industry j. U_i, which is the 'Index of Sensitivity of Dispersion', measures the extent to which industry i is affected by an expansion in all industries. Hazari regarded U_j and U_i as more accurate indices of linkages.[36] Since $\Sigma_j U_{j/n} = \Sigma_i U_{i/n} = 1$, $U_i > 1$ implies that the increase in industry i in response to a unit increase in all final demand will be greater than average. Also $U_j > 1$ means that the j^{th} industry absorbs more output from the system than average.

Since averages are sensitive to extreme values, Hazari combined these indices with measures of dispersion to define key sectors. He proposed the coefficient of variation indices for C.j and C_i. respectively as:

$$V_j = \left[\left(\frac{1}{n-1} \right) \left[\sum_{i=1}^{n} \left(C_{ij} - \frac{1}{n} C.j \right)^2 \right] \right]^{\frac{1}{2}} \Big/ \frac{1}{n} C.j$$

and

$$V_i = \left[\left(\frac{1}{n-1} \right) \left[\sum_{j=1}^{n} \left(C_{ij} - \frac{1}{n} Ci. \right)^2 \right] \right]^{\frac{1}{2}} \Big/ \frac{1}{n} Ci.$$

A V_j low relative to the average, would imply that industry j draws evenly from other sectors. Similarly a V_i low relative to the average,

implies that other sectors are evenly dependent on industry i.

Key sectors are then identified as those which have U_i and U_j > 1 and V_i and V_j low relative to their averages.[37]

The input-output model can also be used for factor requirements analysis. Suppose the direct requirements for imports and labour in the production system are given as m_j and a_{oj} respectively for all j. Import requirements are given by the vector $m = < m_j >$. For any final demand vector direct import requirements are given by

$M = m[I - A]^{-1} F$. Comparing M with export possibilities and potential capital inflow would determine the foreign exchange gap. If there is an interest in the sectoral distribution of M, m is simply replaced with $\hat{m} = [m_j]$.

The labour requirements of the final bill of goods is also given as $L = a_o[I - A]^{-1} F$ where $a_o = < a_{oj} >$. Here also the indirect needs for labour are taken into account.

If sectoral capital-output ratios are given by k_j for every j then the model can also be used to allocate investment; i.e.

$K = \hat{k}[I - A]^{-1} [F' - F]$ where K is a vector of required investment, and $\hat{k} = [k_j]$, F' is the planned and F the actual final demand vector.

If the coefficients in 3.10 are regarded as best statistical estimates of the future, the general solution can be used to provide answers to questions like: what will producers do in response to changes in demand? First the structure of demand is forecast and producers response is predicted as

$$X_{t+z} = [I - A]^{-1} F_{t+z}; \; z > 0.$$

This perhaps brings out most clearly the fact that production is demand determined in the input-output model.

When applied in a planning context, the problem is similar, though not identical, to the prediction problem. Here the simplest way to pose the problem is: what must producers do to achieve a given vector of final demand at some future date? The difference lies in the fact that here the vector is plan determined. It is not endogenous in the market process in the sense of being calculated from income elasticities, for instance. The more recent applications of input-output models have tended to explicitly introduce optimization and this has generally involved its combination with mathematical programming.

Very often these models are used for more explicit analysis of the allocation of particularly scarce resources. Thus a linear programming input-output combination has been used to estimate the cost of protection in terms of domestic resources used to save or earn a dollar of foreign exchange. Once this has been done, it is easier to redesign a set of policies to minimize the cost of import substitution and accommodate export promotion. Bruno[38] has used this approach for Israel. Clark recently designed a model of optimal import substitution for Nigeria.[39] This model, derived from Carter's table, has never been put to the test through use in actual planning exercises, mainly because planners have little faith in his actual numbers.

Another direction in which the above method has been used is in educational planning. Attempts have been made to incorporate skilled labour into the input structure. Future needs for education are then derived from an overall projection.[40]

More general models have been designed which determine an optimal allocation of resources for the whole economy under certain specified

limitations. In principle, more than one objective of the economy can be handled by such a model. For instance, it may be desired to maximize consumption subject to production constraints (derived from the input-output table) savings and foreign exchange constraints, etc. A selective summary of some of these models is given in Manne.[41]

The advantage of these models is that they enhance rational decision-making by planners. They can also simulate socratic dialogues between technocrats and policy makers in deriving planning targets. Most of these models have tended to be growth rather than development oriented, and as such have tended to ignore the very important distributional questions. Manne[42] has recently suggested the incorporation of equity considerations into these models by introducing interpersonal utility comparisons.

The main problem in numerical optimization is that the results obviously depend on the numbers used. Before applying them to LDC's one has to ensure that the statistics used in them are accurate enough to produce useful predictions.

Given the transactions table for Nigeria, the following balance equations hold.

$$X_i = \sum_{j=1}^{20} X_{ij} + I_i + E_i + C_i \quad ; \quad i = 1, \ldots, 20 \ldots \qquad (3.18)$$

total domestic supply equals total demand

$$X_j = \sum_{i=1}^{20} X_{ij} + M_j + V_j \quad ; \quad j = 1, \ldots, 20 \ldots \qquad (3.19)$$

total production equals the value of inputs. Also for every $i = j$, $X_i = X_j$. The summation of the first balance equation over the twenty rows and the second over the twenty columns would yield.

$$\sum_{i=1}^{20} X_i = \sum_{i=1}^{20} \sum_{j=1}^{20} X_{ij} + \sum_{i=1}^{20} I_i + \sum_{i=1}^{20} E_i + \sum_{i=1}^{20} C_i \quad . \; . \; . \tag{3.20}$$

and

$$\sum_{j=1}^{20} X_j = \sum_{i=1}^{20} \sum_{j=1}^{20} X_{ij} + \sum_{j=1}^{20} M_j + \sum_{j=1}^{20} V_j \quad . \; . \; . \tag{3.21}$$

where I_i = investment of product of industry i.

E_i = exports of product of industry i.

C_i = consumption of product of industry i.

M_j = imports to industry j.

V_j = value added in industry j.

and X_j, X_i, X_{ij} are as before.

(3.18) can be re-expressed as

$$X_i = \sum_{j=1}^{20} a_{ij} X_j + I_i + E_i + C_i \quad ; \quad i = 1, \; . \; . \; . \; , 20.$$

It is apparent that the formal structure of this model is very similar to that of the open static model already discussed. The adaptation of this model in attempts to solve planning problems is considered below and in the next chapter.

G. Assumptions of the Input-Output Model

The assumptions underlying the input-output model have been discussed widely in the past in relation to both theoretical and empirical analysis.[43] We shall therefore concentrate on the relation of the assumptions to the economic features of developing countries, particularly Nigeria.

The characteristic assumption is that of constant input coefficients, i.e., the a_{ij}'s are fixed with respect to both scale and time. Several conditions are necessary if this assumption is to hold. First, fixed coefficients imply both constant returns to scale and the non-substitutability of inputs. Non-substitution implies the uniqueness of the production process in every industry, and this means that all inputs are perfectly complementary, with the marginal product of every input zero except when used in the given combination with others. This is, incidentally, sufficient to preclude maximizing behaviour on the part of suppliers. For non-substitution to hold, it must be true either that technology allows no substitution of inputs when relative prices change (which Eckaus[44] argued is indeed the case in manufacturing in developing countries); or that relative prices cannot in fact change (as Samuelson[45] has shown to be the case if there is only one primary factor, labour in the theorem). Since Nigeria's technology in modern manufacturing is invariably imported, imports create fixed input ratios, ipso facto. But this technology exists side by side with traditional methods of production. Petroleum is the only exception as there are no traditional oil producers. This violates the single process assumption and since traditional production methods are often quite efficient, it cannot be assumed that they will disappear as the economy advances. In the context of Samuelson's non-substitution theorem, there are at least two primary inputs in Nigeria, foreign exchange and labour.

In addition, within the class of skilled labour allowance has to be made for the fact that there are non-competing groups with shortages and surpluses existing side by side as a result of the educational structure --

> though lawyers abound, there are a few people with enough qualifications and experience to run a competent business ... of technicians -- engineers, agronomists, scientists of all kinds -- there is an appalling dearth". 46

Therefore, the assumption of one homogeneous primary factor is particularly suspect for an economy like Nigeria's.

The assumption of constant returns to scale in input-output analysis is usually contested on the grounds that the implied production functions lack descriptive realism especially in view of the fact that it is sometimes necessary to incur a once-for-all expense to support output increases over a range.[47] Friedman argues, however, that the crucial question is whether an input-output model yields good predictions despite a disregard of actual production functions.[48] But one of the long run goals of the planning process is to get a better picture of the structure of the economy. Short run predictive ability should not be sought at the expense of getting a realistic picture of the economy. Thus it is important to know if constant returns to scale actually hold. For a developing country then, the assumption is a more serious one.

As a kind of reverse of the non-substitution assumption, it is also required that there be only one product per process; i.e. by-products and joint producers are ruled out. This is not a serious problem when considering secondary products. The usual practice is to define an industry with respect to its characteristic product. Then secondary products can simply be treated as negative inputs. When two products bear a constant or near constant relationship to each other, beef and hides, for instance, the problem is not severe. However, in agriculture, the problem can be quite troublesome because the proportions of beans and yams on the same plot of land may change drastically in response to market conditions. At the same time, it would be hard to put beans and yams in

different industries. How would the relative input proportions be determined? This is probably why Malinvaud doubts the validity of breaking agriculture down. He states that "the basic hypotheses would be so badly fulfilled that any conclusion depending on this decomposition would have little practical value".[49] However the agricultural sector must somehow be disaggregated because of its great importance in the national product and because it is a major foreign exchange earner. Admittedly, it would be a particularly difficult job but not an impossible one. This problem is taken up again in Chapter VI.

To make things even simpler, externalities are also ruled out in input-output analysis. However if one agrees with Scitovsky[50] that purely technological external economies are rare (although diseconomies may not be so rare) and notes that pecuniary externalities can in principle be incorporated, although this would take us outside the realm of the simple static model,[51] this problem is not too serious.

Finally, it has to be assumed that we are in long-run (competitive) equilibrium since it is necessary to rule technical change out in order that the input coefficients be constant over time. This is a particularly serious assumption to make for a developing country in which the problem is to make a "structural break" with past technology. If the model of an economy consists of the following set of functional relationships

$$Y_g\ (y,\ z;\ \alpha_g) = 0; \quad g = 1, 2 \ldots \quad G$$

(where y and z are the endogenous and exogenous variables respectively and α is the coefficient of the funtional relationship), "a structure is ... defined as the set of functional relationships together with the given

values of the coefficients occuring in them".[52] In symbols $S = (\overline{\Psi}, \alpha)$, where Ψ and α are structural equations and structural parameters respectively, a change in either of which would lead to a change in the structure of the economy. The n equations and n^2 input coefficients of our simple input-output model $X = AX + F$, could be said to describe a given structural situation. According to Chakravarty, if the number of structural relations change, say as a result of an industrialization programme, then a "structural break" has occured, "even though the coefficients have remained the same".[53] It would seem only logical to consider also as a structural break a change in the value of some of the coefficients even if the number of relationships has not changed. This may come about from the substitution of one process for another, and is almost implied by the term 'development'.

Chakravarty introduced the problem of a structural break because dynamic growth models, depending as they do on the set of initial conditions, cannot handle the problem of a changing structure.[54] Obviously the static input-output model cannot handle the problem either. It can reasonably be used as a predictive device over a short period in the developed countries: the tendency towards homogeneity of techniques in the short-run because of industrial competition in developed countries and the fact that technical change is usually internally generated in these countries, makes it realistic to ignore radical change in production coefficients in the short run. In the developing countries a major investment by the government, for instance a hydroelectric system, or an iron and steel complex, could mean change in the economic structure literally overnight.

Carter seems to have succeeded in producing an input-output table for Nigeria which could easily be the basis for a growth model. Such a model would show a time path of movement of the endogenous variables (gross output) on the assumption that the structure of production remains unchanged. By preferring to show the extent of industrialization[55] in the Nigerian economy, he was concentrating on sectors that were growing. But these are not necessarily the same sectors that will grow or sectors that we wish to see grow. For development, the structure must be allowed to change because it may not be desired. The growth/development distinction is important. Although both concepts involve the increase of per capita income, development means more than growth. This distinction is clarified in Chapter V, where Carter's system is compared with a system that was built in the context of a development plan. It is now necessary to show the relationship of Carter's table to the planning process in Nigeria.

H. Adapting Carter's Model

The formal structure of Carter's table can be represented as

$$X = AX + F \tag{3.21}$$

where X is a column vector of the value of output of each of n industries.

A is an nxn matrix of input coefficients.

F is a column vector (or order n) of final demand by source.

In a recent application to Ontario, Kubursi[56] shows how the economic impact of government expenditure by department can be assessed within the input-output framework. His model was designed to trace the effect of departmental variation in government expenditure to change in industrial purchases of primary factors. It was necessary, therefore, to reclassify

the final demand component of the provincial government by departments. A balance equation of the following form was designated:

$$X + M = AX + Ff + Gg \tag{3.22}$$

where X and A are as in equation (3.22).

M is an nxl vector of imports for each industry.

F is an nxs matrix of coefficients of other final demand, i.e., the (h,i)th element is the value of purchase from industry h per dollar spent on final demand of type i.

f is an sxl vector of the value of other final demand by source

G is an nxp matrix of government expenditure coefficient, i.e., the (j,k)th element is the value of purchase from industry j per dollar spent by department k.

g is a pxl vector representing values of government expenditure by department.

From (3.22), the usual functional relationship between output and final demand is derived. Assume that

$M = \hat{m}x$; where $\hat{m}$ is a diagonal matrix of import coefficients, i.e., $m_{ii} = M_i/X_i$. Equation (3.23) is now derived.

$$X = (I + \hat{m} - A)^{-1} (Gg + Ff) \tag{3.23}$$

where I is an nxn identity matrix.

The relationship between a change in the composition of government programme and primary inputs is derived as follows. First, the demand for primary inputs is defined by

$$y = Bx + Hg + Ef \tag{3.24}$$

where

y is a vxl vector of total values of primary inputs.

B is a vxn matrix of primary input coefficients.

H is a vxp matrix of primary input coefficients associated with government expenditure.

E is a vxs matrix of primary input coefficients associated with other final demand.

By substituting equation (3.24) into (3.23) the relationship between primary factors and final demand is obtained, i.e.,

$$y = B(I + \hat{m} - A)^{-1} (Gg + Ff) + Hg + Ff \qquad (3.25)$$

If one assumes now that a change occurs only in the composition of government expenditure, the effect on primary inputs can be depicted as

$$\Delta y = B(I + \hat{m} - A)^{-1} G\Delta g + H\Delta g \qquad (3.26)$$

This framework is easily extended to evaluate the effects of government expenditure on the trade balance and can be refined somewhat by treating the household sector as a production sector. (See section E, above).

Carter's table could be used along the lines suggested by Kubursi It should be noted that Carter's table does not distinguish between private and public expenditures in the final demand sub-matrix. In principle, however, no complication arises in its use for evaluating government expenditure. Moreover, this type of evaluation is precisely what planners have been doing implicitly all along. Allocation of funds under the plan have invariably been according to government ministries. Thus, Carter's format can be adapted to provide an excellent basis for the explication of current practice.

Kubursi's evaluation scheme can be a useful one for development planning if it can be assumed that the existing structure of the economy is

the same as the desired one. It will be argued in Chapter IV that in an underdeveloped country it is nothing of the sort; fundamental changes are necessary in the inherited cell structure. Until these occur his scheme does not become applicable.

One can easily extend the analysis to take account of the planning constraints as Nigerian planners seem to have perceived it. Recall, for instance, the indication of foreign exchange as the most important bottleneck (Chapter II). For the purpose of this extension, the characterisation of the Nigerian economy as land surplus can be considered valid. In addition, the country is known to possess a large pool of unemployed and underemployed labour. Therefore, it can also be considered valid that neither land nor unskilled labour constrains production. Instead, planners suggest that the real constraints are: (a) foreign exchange; (b) skilled labour, including managerial capacity; and (c) investment funds. The process of identifying which of these constraints will be binding over a plan period is straightforward in principle. First, the use of these factors in every sector identified in the input-output table is estimated, i.e., the value-added matrix is broken down so that it contains a 3xn submatrix of coefficients, S_{kj}, of factor k (where k is one of the three constraints mentioned above) required to obtain one unit of sector j output. Then sectoral requirements of these "scarce" factors are identified as in (3.25) and (3.26). To determine the binding factors, a vector of expected availabilities is described for comparison with the factor requirements vector. If all elements of the latter are less than corresponding elements in the former, increases can be made in the government budget. The first element in the factor

requirements vector to equal its counterpart in the availabilities vector is the bottleneck.[57]

It is clear that the foregoing is only a simplified use of the linear programming method. Carter's table has actually been used as a basis for a more sophisticated linear programming model of the Nigerian economy. This model, by Peter Clark,[58] has two very interesting properties; it was designed to examine the implications of an optimal import-substitution strategy. More importantly, although a secondary aim to Clark, it showed how to assess the viability of a single project within an interactive framework.

Clark's static linear programming problem was to allocate the scarce factors of domestic savings and foreign exchange among sectors in an optimal way. His model consisted of a set of balance constraints, represented by a disaggregated version of Carter's input-output table; a consumption function, based on constant expenditure elasticities; capacity constraints, based on a constant capital-output ratio, a set of investment accounting relationships, utilizing a 'stock-flow conversion factor';[59] a balance of payment constraint, included by imposing an upper bound on foreign capital inflow; and a savings constraint introduced by the placement of an upper bound on the marginal savings rate.

Clark was concerned with choosing an optimal set of import-substituting industries. He, therefore, adopted the method of specifying a matrix of potential technology. This matrix was appended to the existing structure as given by Carter's table and the optimising exercise undertaken as if the new industries were already in operation. The production functions for his potential industries "were estimated from

feasibility studies reflecting Nigerian costs and in those cases where the adaptation of an industry has not been previously considered and there existed no feasibility study, with data taken from other LDC's".[60]

The shortcomings of Clark's model are in the main shortcomings of the linear programming model.[61] However, in two respects it is an inadequate basis for planning the Nigerian economy. Before discussing these, it must be mentioned that his model was conceived within the actual institutional framework of plan formation in Nigeria with which he was familiar.[62] It was, therefore, devised essentially as a systematic way of approaching the problems of choice as the architects (at least of the first plan) saw it.

Clark's specification of potential technology offers an interesting method of project evaluation within a macroeconomic framework. It demonstrates the possibility of analytical continuity between micro-evaluation of projects and consistency at a macro-level. By appending desired projects to the existing structure, the viability of any project becomes a function not only of the structure of direct and indirect costs, but also the macroeconomic constraints, domestic savings, foreign exchange, and skilled labour. The implementation of any project within this framework can be viewed in terms of the growth of some, and the contraction of other industries; direct and indirect contributions to employment, which are so difficult to quantify in micro project evaluation; and savings and foreign exchange gaps.[63]

The obvious question is how these potential industries were chosen. On the assumptions (1) that it is impossible to conduct feasibility studies for <u>every</u> industry known and (2) that it is impractical

to include all possible industries in an operational model, the criteria for the selection of projects for comparison is very important. Presumably because he was interested primarily in import substitution, Clark compiled his list from foreign trade statistics. It would seem as if he was using Hirshman's concept of a threshold, at least implicitly. This concept is discussed in the next chapter. What this means, however, is that his potential industries also reflect demand as revealed by the current preferences of those people in whose consumption bundle imports occupy a significant place. But the relation of the existing import structure to popular needs is weak. Clark's model is, in general, an extension of the orientation of planning in Nigeria. To that extent it merely implies a more systematic pursuit of the same policies which have tended to utilize abundant resources less intensively than scarce resources.

The second element of great relevance in Clark's model is his choice of an objective function. He chose consumption as his maximand because he regarded this "as the best approximation of a social welfare function".[64] The usual rationale for the use of consumption as maximand are the assumptions that it is the ultimate objective of any plan and the real basis of all economic activity.[65] In addition, Clark tried out seven other objective functions. Among these were maximizing gross domestic product and maximizing investment. It is interesting to note that the set of activities which allocates the constrained primary resources (domestic savings and foreign capital) optimally is the same whether the maximand is gross domestic product, investment or consumption. This is a result of Clark's specification of the model. Consumption is a function of itself due to his use of expenditure elasticities, exports are fixed exogenously and the national income is an identity. Therefore, investment is the only endogenous

demand variable and is a function of the primary resource constraints. The (investment) need to create new capacity implies a demand-led growth process. But supply, as specified in the commodity distribution equation, must always be at least equal to demand in every sector. Therefore, import or domestic production activities must always be chosen so as to allocate the primary resource constraints optimally.

Of more concern in this context is Clark's failure to include income distribution or employment objectives in his model. This could be a result of the fact that a meaningful disaggregation of income recipients was not available; the input-output table which served as a basis for Clark's study made no attempt to disaggregate value-added or to distinguish consumption according to income groups. The lack of appropriate statistics also constrained Clark to crude estimates of expenditure elasticities which were not broken down according to income groups. Again, however, Clark is in line with planners in Nigeria. We have already seen their biases and the consequent retrogression of agriculture, the growth of unemployment and continued income inequality.[66]

It may be argued that any number of goals can be included in the generalised input-output type model either by using a complex system of weights to include them in the objective function or by selecting a specific one and including the others in the set of constraints.[67] Nevertheless, for the specification of the set of constraints we need parameters. These parameters cannot be derived from the existing structure because the input-output coefficients may not correctly reflect technical production coefficients; for instance, if there is excess capacity in some sectors. Moreover, the existing pattern may simply be unacceptable to

planners especially if they reject its market solution; i.e., the vector of final demand depends on the ideological stance of the planners. Furthermore, it is known that the modern sector has little linkage with the traditional sector because of the techniques used in the former. In short, some parameters must be allowed to change.

In reality, the way we allow parameters to change is to look back or around; back at the historical experience of developed countries, around at the present structure of both developed and underdeveloped countries. There is no objective way of knowing what to look for, i.e., the industries one looks back or around at depend on what one has and where one wants to go. Therefore, the dimensions of structural transformation become paramount. Here, the key issues relate to such questions as: what should be the composition of demand? What is the desired structure of production? What techniques are required and what changes do they imply in the pattern of investment.

I. Conclusion

It was asserted above that it is really not necessary for the number of outputs to be equal to the number of inputs in a developing country. The reason is that 'Manufacturing' in Nigeria still consists essentially of the processing (more accurately, semi-processing) of agricultural raw materials for export and, less often, for domestic consumption (final) and the final processing or assembly of imports. It follows that in the context of an input-output table for a developing country, the basic domestic inputs (apart from labour) will most likely be 'Distribution', 'Transport', 'Water' and 'Power'. This is also a logical deduction from the O.E.C.D. 'Industrial Profiles'[68] for goods most frequently considered

for production in the developing countries. It is, therefore, more essential to consider these basic inputs together with imports and labour in greater detail than to present a general picture of 'interdependence' that obscures them.

The great importance of labour and imports to the whole production system in Nigeria also sheds light on a fundamental limitation of Carter-type input-output models in developing countries. The real impetus to development must come from solving the problems of foreign exchange, skilled labour, investment resources and agricultural productivity simultaneously with the problem of changing the pattern of demand to fit a planning norm. Take a predominantly agricultural economy with a relatively low level of technology and technical education and a relatively small number of employees (as contrasted to the self-employed); add the direct interventionist principle implied in development planning; the result is a production system wherein inter-industrial deliveries will be determined (since constrained) by supply factors. The construction of an input-output matrix must focus on these problems since these are the questions planners are trying to solve in Nigeria.

The most important objectives of the 'Second National Development Plan'[69] for Nigeria were; raising the level of employment; attaining a more equitable distribution of income; obtaining a higher growth rate and achieving economic independence, by which was meant not autarky but equal partnership in trade. In the recently issued "Guidelines for the Third National Development 1975-1980" some of the problems of implementing these objectives were articulated. For instance "executive capacity continues to be a binding constraint on the growth of the economy".[70] It was however interesting to note that "as far as the next Development Plan is concerned

foreign exchange is unlikely to feature as a major problem"[71] but "at the present rate of supplies, Nigeria will not be able to feed its people unless there is a radical departure from existing attitude to and investment in agriculture".[72] In the area of "Import Substitution Industrialization" the problems have persisted because "most intermediate goods, capital equipment and some materials are [still] imported. The consequence of this is that the net impact of the manufacturing sector on GDP is low".[73] The 'Guidelines' also criticized the Second Plan because the "employment implications of individual projects were not identified"[74] which was tantamount to the employment question being assumed away, in the sense that it was taken for granted that employment will increase sufficiently in response to a general income expansion! To assess accurately the implications of such pronouncements there is hardly any alternative to using an input-output matrix so as to ensure consistency between capacity-expansion programs in various sectors. According to Seers: "There is really no other way of assessing whether any industrial or agricultural policy is likely to be supported by sufficient increases in domestic demand, allowing for government objectives in other fields and likely trends in exogenous variables".[75]

The consumption vector should be broken down into private and public consumption. Figures for government consumption are very good and it is important for the distribution question that we know who consumes what. The private consumption vector should be disaggregated by income groups or at least between urban and rural households.

The value added vector should also be disaggregated. We would wish to know what payments are made to which category of labour; how much

is paid to foreigners in profits and interest and (especially) how much to the government in what forms of taxes.

Foreign trade statistics have traditionally had the greatest accuracy in Nigeria. It is a little surprising that this was not reflected in Carter's table. It would certainly be very instructive to record exports by destination and imports both by origin and according to whether they are competitive or complementary. This would be one of the easier things to do and it would help the policy objective of pursuing independence.

More important, perhaps, than the foregoing, agriculture must be given special consideration. Even though agriculture figures prominently in policy discussions, not much is known about it except that it is stagnant. A most detailed study of subsistence and rural activity is mandatory. Admittedly the problems are numerous but input-output analysis in a predominantly agricultural economy is futile if agriculture is not incorporated. The input-output table should allow the incorporation of information on changes in the product mix, changes in the disposition of output and changes in input use in agriculture. This means that both the agricultural sector proper and agro-allied industries must be treated in a fairly disaggregated manner. No method will ever be wholly satisfactory because single-cropping is the exception rather than the rule in Nigerian agriculture and rather different input combinations are required for the production of beans and cassava.

It was also suggested above that the assumption of fixed coefficients is unacceptable for agriculture. If an input-output table is to be used for planning it must allow for variations in input coefficients. One aim of planning in Nigeria is to raise productivity per man hour and/or per man acre which implies drastic changes of input coefficients. These

coefficients cannot come from aggregate accounts but from farm management studies and an intensive survey of peasant farming. It might also turn out to be necessary to derive the coefficients for the manufacturing sector from engineering studies at home, or in countries emerging under similar conditions.

One more comment is particularly pertinent to agriculture. Exogenous influences on agricultural output must be minimized in the input-output table. Since agriculture is highly subject to pestilence and the vagaries of the weather, the entries in a transactions matrix must represent a "normal" year as much as possible, perhaps an average of output for a few previous years.

The cost of constructing input-output accounts in Nigeria will be great but they can certainly be less than the benefits. Once the initial effort has been made to reach the rural sector, the problems of filling in the gaps in the data are minimized. Judging by the number of university graduates underemployed in the various civil services it is not beyond the administrative capacity of the country today. The result would be that policy statements could be based on more accurate information and the planning bureau would need to rely less on "guesstimates".

FOOTNOTES TO CHAPTER III

[1]See, for instance, the interesting and provocative study by Irma Adelman and Cynthia Morris, Society, Politics and Economic Development, Baltimore: Johns Hopkins Press, 1967.

[2]By adequacy we are here implying a criterion not of precedence but of the logical relation to a (planning) problem; i.e. the adequacy of a relationship, R, is defined by the extent to which it is consistent with a given problem.

[3]Carter, Nicholas, G., An Input-Output Analysis of the Nigerian Economy 1959-60, M.I.T. Working Paper No. 29-63, School of Industrial Management, 1963.

[4]Schumpeter, J.A., History of Economic Analysis, New York: Oxford University Press, 1954.

[5]For a more detailed discussion, see Lange, O., Essays on Economic Planning, Calcutta: Asia Publishing House, 1960. See also, Samuelson, P.A., "Understanding the Marxian Notion of Exploitation: A Summary of the So-Called Transformation Between Marxian Values and Competitive Prices", Journal of Economic Literature, Vol. IX, No. 2, 1971.

[6]In the closed input-output system all final demand and all primary factors are treated as unknowns, the equilibrium values of which are solved for simultaneously with the production variables.

[7]It needs hardly to be mentioned that this is only a part of the full Walrasian system.

[8]Morgenstern, O., On the Accuracy of Economic Observations, Princeton: Princeton University Press, 1963.

[9]The use of gross output here must be distinguished from its use in national income accounting. Intermediate transactions are not included in the national income accounts.

[10]The summation over X_{ij}'s in (7) can only be made in value terms because the inputs into an industry do not have a common quantity dimension.

[11]Okigbo, P.N.C., Nigerian National Accounts, Enugu: Federal Ministry of Economic Development, 1962.

[12]Carter, op.cit., p. 16.

[13]In the language of Set Theory, given two sets S and C which contain the number of subsistence farmers and the number of commercial farmers respectively, most Nigerian farmers live in the intersection $S \cap C$.

[14]Okigbo, P.N.C., "Nigerian National Accounts, 1950-7" in L.H. Samuels ed., African Studies in Income and Wealth, London: Bowes and Bowes, 1963, p. 296.

[15]Okigbo, op.cit., p. 63.

[16]Ibid.

[17]Prest, A.R., The Investigation of National Income in British Tropical Dependencies", London: University of London, 1957.

[18]The country was made up of 4 administrative regions and a federal capital territory.

[19]Okigbo, op.cit., p. 66. Emphasis italicized in original.

[20]See Carter, op.cit., pp. 76-77.

[21]Again, relevance is defined by the planning problem.

[22]See his introduction to the Appendix in Stolper, op.cit..

[23]Source: Lucács, O. (ed.), Input-Output Tables, Budapest: Akademiac Kiado, 1962, p. 51. The similarity between the Nigerian table and those for the developed countries is mainly visual. A more appropriate method of comparison could be based on the magnitude of the non-zero entries.

[24]Lewis, Sir Arthur, Reflections on Nigeria's Economic Growth, Paris: O.E.C.D., 1967.

[25]If one wishes to keep the number of rows equal to the number of columns for purposes of calculating the Leontief universe, there is no reason why a set of dummy industries with zero inputs and outputs cannot be created.

[26]See Sawyer, John A., Macroeconomics - Theory and Policy in the Canadian Economy, Toronto: University of Toronto, 1974.

[27]See Leontief, W., "Recent Developments in the Study of Inter-Industrial Relationships", A.E.A. Papers and Proceedings, May 1949, pp. 215-218.

[28]Myint, H., "Dualism and the Internal Integration of the Under-developed Economies", June 1970; see also Chapter II above.

[28]Using the average of the coefficients for modern and traditional technology for planning implies that we wish to keep the technological composition constant. Since this is not the case, it is necessary to present the information on modern and traditional manufacturing activity separately.

[29] Necessary and sufficient conditions for the non-singularity of (I - A) are (1) $0 \leq a_{ij} < 1$, for all i, j; (2) $\sum_{i=1}^{n} a_{ij} < 1$, for all j.

See Hawkins, D., and H.A. Simon, "Some Conditions for Macro-Economic Equilibrium", Econometrica, Vol. 17, pp. 245-248.

[30] For a comparison, see Chakravarty, S., The Logic of Investment Planning, Amsterdam: North Holland Publishing Co., 1959.

[31] This is not a strictly accurate representation of Leontief's original model (in Leontief, W., et.al., Studies in the Structure of the American Economy, New York: Oxford University Press, 1953, Ch.). He used continuous time.

[32] Rasmussen, P. Norregaard, Studies in Inter-Sectoral Relations, Amsterdam: North-Holland Publishing Co., 1956, esp. pp. 133-135.

[33] Hirschman, A. O., The Strategy of Economic Development, New Haven: Yale University Press, 1958, pp. 98-119.

[34] Chenery, Hollis, and T. Watanabe, "International Comparison of the Structure of Production", Econometrica, October, 1958, pp. 487-521.

[35] Rasmussen, op.cit., p. 135.

[36] Hazari, B.R., "Empirical Identification of Key Sectors", Review of Economics and Statistics, May, 1970, pp. 301-305.

[37] Hazari, ibid., See also, Kubursi, A.A. and R. H. Frank, Sectoral Performance Indices of the Ontario Structure of Production, Working Paper 73-09, Department of Economics, McMaster University, June 1973.

[38] Bruno, M., "A Programming Model For Israel", in Adelman, Irma and Erik Thorbecke, eds., The Theory and Design of Economic Development, Baltimore: The Johns Hopkins Press, Paperbacks Edition, 1969.

[39] Clark, Peter B., Planning Import Substitution, Amsterdam: North Holland Publishing Co., 1970.

[40] See, for instance, Adelman, I., "A Linear Programming Model of Educational Planning: A Case Study of Argentina", Chapter 14 in Adelman and Thorbecke, op.cit..

[41] Manne, A.S., Multi-Sector Models for Development Planning, A Survey: Technical Report No. 91, Institute for Mathematical Studies in the Social Sciences, Stanford University, 1973.

[42] Manne, ibid..

[43] See for instance, Morgenstern, O. (ed.), Economic Activity Analysis, New York: Wiley, 1954, and National Bureau of Economic Research, Input-Output Analysis: An Appraisal, Studies in Income and Wealth, Vol. 18, Princeton: Princeton University Press, 1955.

[44] Eckaus, R. S., "The Factor Proportions Problem in Underdeveloped Areas", American Economic Review, September 1955.

[45] Samuelson, P.A., "Abstract of a Theory Concerning Substitutability in Open Leontief Models" in Koopmans, T.C., (ed.), Activity Analysis of Production and Allocation, New York: Wiley, 1951.

[46] "Shaping Up", Supplement on Nigeria, The Economist, October 24, 1970.

[47] See Christ, C., "A Review of Input-Output Analysis" in NBER, Input Output Analysis: An Appraisal (Studies in Income and Wealth,Vol.18),op.cit..

[48] See his "Comment" on Christ's paper, Ibid.

[49] Malinvaud, E., "Aggregation Problems in Input-Output Models", Ch. 8 in Barna, T., (ed.), The Structural Interdependence of the Economy, New York, Wiley, 1954.

[50] Scitovsky, T., "Two Concepts of External Economics", Journal of Political Economy, April, 1954.

[51] But, see Chenery, Hollis B., "Interdependence of Investment Decisions, in Abramovitz, A., et. al., Allocation of Economic Resources, Stanford University Press, California 1959.

[52] Chakravarty, S., op.cit., p. 27.

[53] Ibid.

[54] Even Chakravarty's model is a gross over-simplification in as much as he tends to assume a once-for-all structural break so that he can directly compare three phases of economic change - before the structural break, the break, and after the break. The process in developing countries is such that a series of "structural breaks" is continuously occurring and the transition cannot be characterized as a once-over affair.

[55] Cf. Carter's introduction to the Appendix in Stolper's Planning Without Facts; Cambridge: Harvard University Press, 1966.

[56] Kubursi, A.A., Evaluating the Economic Impact of Government Expenditure by Department, An Application of Input-Output Analysis. Socio-Economic Planning Sciences, Vol. 8, pp. 101-108, 1974.

[57] See Pearson, Scot, Petroleum and the Nigerian Economy, Stanford, 1970, for the use of factor requirements analysis in the context of the impact of the petroleum industry on the Nigerian economy.

[58]Clark, P.B., Planning Import Substitution. Amsterdam; North-Holland Publishing Co., 1970.

[59]The 'stock-flow conversion factor' is a device for converting the change in capital stock during the plan period in a static linear programming model to a flow of capital goods in the final year of the plan. For a derivation, see Clark, op.cit., Appendix 4-A-2.

[60]Clark, P.B., op.cit., p. 72.

[61]For a discussion of which, see Taylor, Lance, Multi-Sectoral Models in Development Planning: A Survey, Economic Development Report, No. 230, Centre for International Affairs, Harvard University, Cambridge, Massachusetts; March 1973.

[62]Clark was described (in E.E. Hagen (ed.) Planning Economic Development, Richard D. Irwin, Inc. Homewood Illinois 1963, P X) as "member of the three man advisory team involved with preparation of Nigeria's First National Development Plan". It seems, however, that there were only two people, Stolper and Hansen, in the official advisory team. (See O. Aboyade, Foundations of an African Economy, New York: Frederick A. Praeger, Publishers, 1966). Nonetheless there seems little doubt that Clark was actually around the planning circle when the first plan was being formulated.

[63]Skilled labour was not actually imposed as a constraint in Clark's system because "neither the appropriate statistics nor the additional computational capacity exists in the present model to make such an adjustment feasible", Clark, op.cit., p. 94.

[64]Clark, op.cit., Page 96.

[65]It should be mentioned that consumption is the maximand most commonly used in applied linear programming models. "It is the most easily interpretable in terms of varying consumption weights to trace out the transformation function", page 96, Taylor, L., Multisectoral Models In Development Planning: A Survey, Economic Development Report No. 230, March 1973, Center for International Affairs, Harvard University.

[66]For an analysis of income and wealth based on a sample survey see O. Aboyade, Incomes Profile, University of Ibadan Inaugural Lectures, 1972/73, July 1973.

[67]Cf. P.B. Clark, Alejandro Foxley R., Target Shooting With A Multisectoral Model, in R.S. Eckaus and P.N. Rosenstein-Rodan (editors), Analysis of Development Problems, Amsterdam; North-Holland Publishing Co., 1973.

[68]Annex to Volume 1 of Little, I.M.D., and J. Mirrlees, Manual of Industrial Project Analysis (2 volumes), Paris: O.E.C.D., 1968.

[69]Second National Development Plan, 1970-74, Lagos: Federal Ministry of Information, 1970.

[70]Guidelines for the Third National Plan, 1975-1980, Lagos: Federal Ministry of Economic Development and Reconstruction, 1973, p. 8.

[71]Ibid., p. 10.

[72]Ibid.

[73]Ibid., p. 18.

[74]Ibid., p. 49.

[75]Seers, Dudley, "The Use of a Modified Input-Output System for an Economic Programme in Zambia", Chapter 8 in Adelman and Thorbecke, op.cit., p. 218.

CHAPTER IV

THE STRUCTURE OF PRODUCTION IN NIGERIA AS PORTRAYED BY CARTER'S INPUT-OUTPUT TABLE

A. INTRODUCTION

It could be inferred from the preceding chapter that the planning application of the conventional input-output table is based on the inversion of the coefficients matrix to determine the sectoral output requirements and corresponding factor requirements of a change in any of the components of final demand. In addition, this table facilitates the analysis of certain technical and economic implications of intersectoral relationships. This calls for the systematic manipulation of the transactions matrix and other tables derived from it.

With a systematic analysis of the pattern of sectoral interdependence, the planner can discover the extent to which certain industries are vital to capacity expansion in other industries. Having assessed this, the planner can take the necessary steps to forestall the development of capacity bottlenecks.

This chapter, therefore, is an attempt to use Carter's input-output table as a basis for analysing the structure of production in Nigeria. The general plan is to examine certain indices reflecting the following:

(1) the extent of direct, indirect, and induced links among sectors;

(2) the simple and induced income multipliers of the various sectors;

(3) the different types of productive sectors according to input use and output distribution;

(4) the extent of backward and forward linkages;

(5) the identification of certain sectors as "key" sectors;

(6) the dependence of various sectors on the different types of final demand.

In addition, Carter's table will be examined in its triangulated form; and the interaction of the Nigerian economy with the rest of the world will be looked at through direct and indirect import requirements.

In general, the analysis should show that the input-output table can be used to derive a good static picture of production interrelatedness. In addition, it should aid the study of the relationship between the input-output table as a formal description for understanding the system and its use as the basis of a model to change the system. We shall dwell more on this aspect in the concluding section.

B. INDICES RELATING TO THE NIGERIAN STRUCTURE OF PRODUCTION

1. Direct, Indirect and Induced Output Effects

The gross output level required to sustain a given vector of final demand is determined by the following system:[1]

$$X = (I - A)^{-1} F \qquad (4.1)$$

For notational simplicity the elements of $(I - A)^{-1}$ will be denoted by C_{ij}. Every C_{ij} indicates the amount of output of industry i that must be produced to sustain a unit of final demand for the output of sector j. It follows then that the sum of the column elements

$$\sum_{i-1}^{n} C_{ij} = C.j \qquad (j = 1, \ldots, n) \qquad (4.2)$$

represents the outputs required from the whole system to sustain a unit of final demand for output of industry j. To clarify this, replace the

vector F in (4.1) by a standard basis vector $\{e_j\}$ with zeros everywhere except in the j^{th} position where we have 1. The result is

$$\begin{bmatrix} X_1 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ X_n \end{bmatrix} = \begin{bmatrix} C_{11} & \cdots & C_{1n} \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \cdot & & \cdot \\ C_{n1} & \cdots & C_{nn} \end{bmatrix} \begin{bmatrix} 0 \\ \cdot \\ \cdot \\ 1 \\ \cdot \\ \cdot \\ 0 \end{bmatrix} = \begin{bmatrix} C_{ij} \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ C_{nj} \end{bmatrix} \tag{4.3}$$

(4.2) is the summation of the vector on the extreme right hand side of (4.3).

Calculation of C.j's takes the requirements indirectly needed by production sectors to produce a unit of final demand into account but it neglects the fact that final demand changes generate repercussions on the components of final demand themselves. As is well known, changes in final demand result in income changes which in turn induce changes in at least the consumption component of final demand. To account for these induced output effects it is necessary to construct a partially closed table. This partial closure involves the assumption that consumption is an "input" in the production of income. Mathematically, the input coefficients matrix is augmented by a column vector representing marginal or average propensities to consume by sector, and a row vector of value added per unit of output in each sector. The result will be the following system of simultaneous equations

$$\left.\begin{aligned} X &= AX + \frac{C}{\eta} X + J + E \\ \eta &= vX \end{aligned}\right\} \tag{4.4}$$

where $\frac{C}{\eta} X$ is a column vector of gross output by sector weighted by the average propensity to consume, i.e., the typical element is $\frac{C_i}{\eta} X_i$; where C_i is consumption of industry i's output and η is total income. V is a row of value added per unit of output in each sector. The system (5.4) reduces to[2]

$$\begin{bmatrix} I - A & \frac{C}{\eta} \\ -v & 1 \end{bmatrix} \begin{bmatrix} X \\ \eta \end{bmatrix} = \begin{bmatrix} J + E \\ 0 \end{bmatrix}$$

Therefore

$$\begin{bmatrix} X \\ \eta \end{bmatrix} = B^* \begin{bmatrix} J + E \\ 0 \end{bmatrix} \qquad (4.5)$$

where

$$B^* = \begin{bmatrix} I - A & \frac{C}{\eta} \\ -v & 1 \end{bmatrix}^{-1}$$

Now define a new matrix B which represents a partition of B* by deleting the last row and last column. Denoting the elements of B by b_{ij}'s, the sum of the column elements

$$\sum_{i=1}^{n} b_{ij} = b.j \qquad (j = 1, \ldots, n) \qquad (4.6)$$

represents the direct, indirect, and induced effect per unit change in the adjusted final demand.

To summarize, the induced, indirect, and output effects can be isolated respectively as:

$$\text{induced effect } \gamma_j = b.j - c.j$$
$$\text{indirect effect } \theta_j = c.j - a.j \qquad (j = 1, \ldots, n) \qquad (4.7)$$
$$\text{direct effect } \varepsilon_j = a.j$$

a.j represents the summation of the input coefficients matrix over columns.

The indices in (4.7) are calculated from Carter's table and reported in Table IV.1. Thus a dollar increase in sector (4), (Textiles) gives the largest total effect. Next in magnitude is sector (13), (Trade) followed very closely by sector (1), Agriculture and sector (2) (Livestock Forestry and Fishing). It is not surprising that Agriculture and Livestock, Forestry and Fishing rank high even though their direct output effects are small. The bulk of their delivery is to the consumption sector. When direct and indirect effects together are considered apart from induced effects, we find that the lowest indices are those for Agriculture and Livestock, Forestry and Fishing. In this case the largest effects are generated by increases in the final demand for Agricultural Processing followed by Food, Wood, Leather etc., and Chemicals.

2. Simple and Induced Income Multipliers

A matter of obvious interest related to the output effects of a unit change in the final demand of a given sector is the income effect of that change. The question of what industries will produce the extra income when final demand increases can easily be answered in the input-output context. The mapping of output into income is effected simply as

$$\eta = v(I - A)^{-1} F \qquad (4.8)$$

where v is a vector of value added per unit of gross output.

TABLE IV.1 DIRECT, INDIRECT AND INDUCED OUTPUT EFFECTS *

		DIRECT EFFECTS	INDIRECT EFFECTS	INDUCED EFFECTS
1.	Agriculture	.0022	1.0003	2.9794
2.	Livestock, Fish & Forestry	.0126	1.0046	2.8407
3.	Agricultural Processing	.5837	1.0208	1.2638
4.	Textiles	.4220	1.0439	2.6306
5.	Clothing	.3277	1.1100	2.3327
6.	Drink & Tobacco	.0819	1.0110	2.1085
7.	Food	.5401	1.0276	2.3319
8.	Metal Mining	.1024	1.0219	2.6945
9.	Non-Metal Mining	.0787	1.0162	1.9610
10.	Chemicals	.3733	1.1414	1.9529
11.	Transport	.1196	1.0188	2.0040
12.	Utilities	.2806	1.0568	2.1736
13.	Trade	.0686	1.0120	2.9033
14.	Construction	.3500	1.0896	2.0188
15.	Service	.0746	1.0193	2.8349
16.	Transport Equipment	.1382	1.0302	2.0388
17.	Non-Metallic Mineral	.3446	1.0582	2.2282
18.	Metal Manufacturing	.1768	1.0204	1.5539
19.	Wood, Leather, etc.	.3670	1.1681	1.3171
20.	Miscellaneous Manufacturing	.1731	1.0185	1.9090

* All tables in this chapter except Table IV.3 are calculated by the author, from Carter's input-output data.

This relationship can be allocated to industries by replace F with our standard basis vector e_j. Thus

$$y_j = v(I - A)^{-1} e_j \tag{4.9}$$

This is the direct plus indirect effect on income of a unit change in the final demand for industry j. The vector of incomes generated by directly and indirectly by a dollar increase in every final demand is then

$$y = v(I - A)^{-1} \tag{4.10}$$

where y_j is the jth component of the vector y. Moore's "simple" income multipliers can then be calculated as the ratio of the direct plus indirect effects to the direct alone;[3] i.e.

$$m^y = v(I - A)^{-1} [v]^{-1} \tag{4.11}$$

The larger a multiplier, the greater will be the relative impact of that industry on the economy: since $y_j = \sum_{i=1}^{n} v_i C_{ij}$ is the direct plus indirect effect on income of a unit change in the jth final demand, the multipliers for every industry is given by

$$m_j^y = y_j/v_j = \frac{1}{v_j} \sum_{i=1}^{n} v_i C_{ij} \qquad (j = 1, \ldots, n) \tag{4.12}$$

Again, the multipliers in (4.12) do not take into account, induced effects. To account for the induced effects, it is necessary to calculate another set of multipliers. Following our earlier practice, these can be represented as

$$\vec{m}^y = v(B)[v]^{-1} \tag{4.13}$$

The vector $\vec{m}^y$ will be called a vector of induced multipliers.

The two sets of multipliers are shown in Table IV.2. The results of this table indicate that Food, Agricultural Processing, Textiles, Chemicals and Wood, Leather, etc. respectively generate the largest simple

TABLE IV.2 SIMPLE AND INDUCED INCOME MULTIPLIERS

		VALUE ADDED PER UNIT OF OUTPUT	INCOME MULTIPLIER - NO INDUCED EFFECTS	INCOME MULTIPLIER WITH INDUCED EFFECTS
1.	Agriculture	.9933	1.0021	3.6058
2.	Livestock, Fish & Forestry	.9387	1.0122	3.6390
3.	Agriculturing Processing	.3870	2.4515	8.6521
4.	Textiles	.4837	1.8466	6.5754
5.	Clothing	.5363	1.5394	5.3411
6.	Drink & Tobacco	.6400	1.1150	3.9790
7.	Food	.3042	2.6789	9.3408
8.	Metal Mining	.8320	1.1034	3.9210
9.	Non-Metal Mining	.6010	1.1117	3.9497
10.	Chemicals	.3844	1.8392	6.3009
11.	Transport	.7673	1.1244	3.9671
12.	Utilities	.5846	1.3617	4.6318
13.	Trade	.9203	1.0648	3.8060
14.	Construction	.4216	1.7223	5.9090
15.	Service	.8992	1.0690	3.8112
16.	Transport Equipment	.5674	1.2238	4.3476
17.	Non-Metallic Mineral	.5704	1.4588	4.8921
18.	Metal Manufacturing	.3716	1.4397	5.0770
19.	Wood, Leather, etc.	.4607	1.7448	6.1249
20.	Miscellaneous Manufacturing	.4974	1.3176	4.6546

simple and induced income multipliers. This means that if the output of the sector "Food" drops such that direct income payments decline by $1 million, the cut in total output would result in a total decline in incomes of $2.7 million. A further decline of $6.7 million will be generated by the consumption-income relationship.

It has already been mentioned that tables previously derived from the transactions matrix can be used to classify and identify patterns of sectoral interdependence. This is illustrated in the following four sections.

3. Types of Productive Sectors

The simplest way to classify the sectors of an economy is of course to summarize the transactions matrix. Let the ratio of total intermediate sales of industry i to its total sales be represented by ϕ_i. Similarly, let λ_j be the ratios of the sum of intermediate inputs purchased by industry j to the total output of the same industry. These two indices reflect the extent to which production in the economy involves produced commodities rather than primary factors; i.e.

$$\left.\begin{aligned} \phi_i &= \sum_{j=1}^{n} X_{ij}/X_i \qquad (i = 1, \ldots, n) \\ \lambda_j &= \sum_{i=1}^{n} X_{ij}/X_j \qquad (j = 1, \ldots, n) \end{aligned}\right\} \tag{4.14}^4$$

For the economy as a whole, the ratio of indirect factor use to total output is the same as the ratio of indirect demand to total demand, i.e.,

$$\phi = \sum_{i=1}^{n}\sum_{j=1}^{n} X_{ij} \Big/ \sum_{i=1}^{n} X_i = \sum_{j=1}^{n}\sum_{i=1}^{n} X_{ij} \Big/ \sum_{j=1}^{n} X_j = \lambda \tag{4.15}^5$$

Following Chenery and Watanabe,[6] sectors can be classified according to whether λ_j and ϕ_i are above or below their averages. Since a high value of ϕ_i means that industry i is more a supplier of industrial material rather than of finished goods and a high λ_j implies that industry j depends on intermediate inputs more than primary inputs, the following four classes are distinguished:

I	Intermediate Primary Production	- High ϕ, Low λ
II	Intermediate Manufacturing	- High ϕ, High λ
III	Final Manufacturing	- Low ϕ, High λ
IV	Final Primary Production	- Low ϕ, Low λ

At this point a few caveats are in order: these indices are very sensitive to the degree of aggregation as illustrated in Table IV.3.[7] Because of averaging, it is not possible to tell whether a sector has a single dominant supplier (buyer) or many small ones.

The two-way classification based on these indices offers a first description of the structural characteristics of the economy by highlighting the different roles played by the various sectors in the total production process. These are shown in Table IV.4. Making due allowance for the blurring due to aggregation, there is still sufficient distinction between the sectors. Those sectors that fall under Class IV are relatively independent of other producers and provide a direct link between final users and the owners of primary factors. Those in category II are at the other extreme.

TABLE IV.3 EFFECTS OF AGGREGATION ON λ_j AND ϕ_j

3.A

Producing Sector \ Purchasing Sector	1	2	3	4	Intermediate Demand W_i	Final Demand F_i	Total Demand X_i	ϕ_i
1	15	20	0	10	45	80	125	.36
2	10	25	15	5	55	45	100	.55
3	5	15	0	15	35	25	60	.58
4	5	15	0	5	25	15	40	.63
Total Purchases U_j	35	75	15	35	160			
Value Added v_j	90	25	45	5				
Total Output X_j	125	100	60	40				
λ_j	.28	.75	.25	.88				

3.B

Producing Sector \ Purchasing Sector	1+2	3+4	W_i	F_i	X_i	ϕ_i
1+2	70	30	100	125	225	.44
3+4	40	20	60	40	100	.60
U_j	110	50	160			
v_j	115	50				
X_j	225	100				
λ_j	.49	.50				

TABLE IV.4 TYPES OF PRODUCTIVE SECTORS

OUTPUT	FINAL (LOW ϕ)	INTERMEDIATE (HIGH ϕ)
Manufacturing (High λ)	III Final Manufacture	II Intermediate Manufacture
	Sector λ_j ϕ_i	Sector λ_i ϕ_i
	4 Textiles .4220 .1997	3 Agricultural Processing .5837 .6404
	5 Clothing .3277 .0022	
	7 Food .5401 .0000	
	10 Chemicals .3733 .0125	
	12 Utilities .2896 .2161	
	14 Construction .3500 .0510	
	17 Non-Metallic Mineral .3446 .0203	
	19 Wood, Leather & Paper .3670 .0813	
Primary Production (Low λ)	IV Final Primary Production	I Intermediate Primary Production
	Sector λ_j ϕ_j	Sector λ_i ϕ_j
	6 Drink & Tobacco .0819 .0000	1 Agriculture .0022 .8200
	8 Metal Mining .1024 .0012	2 Livestock, Fishing & Forestry .0126 .4856
	16 Transport Equipment .1382 .0766	9 Non-Metal Mining .0787 .3078
	18 Metal Manufacturing .1768 .1890	11 Transport .1196 .6021
	20 Misc. Manufacturing .1731 .0292	13 Trade .0686 .3652
		15 Service .0746 .5175

The cost of their use of primary factors is less than the cost of their purchased inputs and their delivery to final demand is less than half of the total demand for their products. It is interesting to note that the only industry in this category (Agricultural Processing) also ranked very highly with respect to the income multipliers.

Chenery and Watanabe[8] suggested that Categories I, II and III may be thought of as successive stages of production. Judging from Table IV.4 it is hard to discern the possibility of such a pattern in the Nigerian production system.

Using the input coefficients matrix for measuring interdependence results in an incomplete picture. An industry may significantly influence (or be influenced by) others through the indirect effects. To take account of these, it is necessary to use the matrix multiplier in measuring interdependence.

4. Forward and Backward Linkages

$$\left.\begin{aligned} \text{Let } \alpha_j &= c.j \qquad (j = 1, \ldots, n) \\ \beta_i &= ci. \qquad (i = 1, \ldots, n) \end{aligned}\right\} \tag{4.15}$$

α_j has been interpreted already. β_i represents the increase in the output of industry i required to sustain a unit increase in the final demand for the output of all sectors.[9] α_j and β_i provide a basis for a technological identification of key sectors. Before Hirschman's introduction of the concepts of backward and forward linkages, Rasmussen had suggested an interpretation for the averages $\alpha_{j/n}$ and $\beta_{i/n}$.[10] If the final demand for the product of industry j increases by one unit, the direct and indirect

increase in the output to be supplied by an industry chosen at random is given by $\alpha_{j/n}$. Similarly $\beta_{i/n}$ would be an estimate of the demand by a randomly chosen industry for the product of industry i to sustain a unit increase in the final demand for all products. To derive the economic significance of these indices and facilitate inter-industry comparisons, Rasmussen normalized them by the overall average to produce

$$\left.\begin{aligned} U_j &= \frac{1}{n} C.j \Big/ \frac{1}{n^2} \sum_{j=1}^{n} C.j \qquad (j = 1, \ldots, n) \\ U_i &= \frac{1}{n} Ci. \Big/ \frac{1}{n^2} \sum_{i=1}^{n} Ci. \qquad (i = 1, \ldots, n) \end{aligned}\right\} \tag{4.16}$$

which he respectively called the "Index of Power of Dispersion" and the "Index of Sensitivity of Dispersion". U_j measures the general expansion effect of an expansion in industry j and U_i indicates the extent to which industry i is affected by an expansion in all industries.

Since $\sum_j U_{j/n} = \sum_i U_{i/n} = 1$, $U_i > 1$ implies that the dependence of the system on industry i is greater than average - the increase in industry i in response to a unit increase in all final demand is greater than average. Similary $U_j > 1$ suggests that the j^{th} industry absorbs more output from other sectors than the average industry.

Later, Hazari identified these measures with Hirschman's backward and forward linkages.[11] Rasmussen realized that since these indices are also based on the averaging method, they are both sensitive to extreme values. He, therefore, suggested that they be supplemented by the coefficients of their variation. These are

$$\left.\begin{aligned} V_j &= \left[\left(\frac{1}{n-1}\right)\left[\sum_{i=1}^{n}\left(Cij - \frac{1}{n}C.j\right)^2\right]\right]^{\frac{1}{2}} \Big/ \frac{1}{n}C.j \\ V_i &= \left[\left(\frac{1}{n-1}\right)\left[\sum_{j=1}^{n}\left(Cij - \frac{1}{n}Ci.\right)^2\right]\right]^{\frac{1}{2}} \Big/ \frac{1}{n}Ci. \end{aligned}\right\} \qquad (4.17)$$

$$(i,j = 1, \ldots, 20)$$

V_j and V_i are respectively equivalent to standard deviations of ΣCij and ΣCij divided by the corresponding average. If V_j is low relative to the average, it implies that sector j draws output evenly from other sectors. Similarly a low V_i implies the consistent dependence of other sectors on sector i. These indices are reported in Tables IV.5 and IV.6.

To facilitate comparison, especially because developing countries have to stress the actual direct relationship between sectors, similar indices were calculated from the input coefficients matrix, i.e.,

$$\left.\begin{aligned} W_i &= \frac{1}{n}ai. \Big/ \frac{1}{n}2\sum_{i=1}^{n}ai. \\ W_j &= \frac{1}{n}a.j \Big/ \frac{1}{n}2\sum_{j=1}^{n}a.j \end{aligned}\right\} \qquad (i,j = 1, \ldots,n) \qquad (4.18)$$

and

$$\left.\begin{aligned} Z_i &= \left[\left(\frac{1}{n-1}\right)\left[\Sigma\left(aij - \frac{1}{n}ai.\right)^2\right]\right]^{\frac{1}{2}} \Big/ \frac{1}{n}ai. \\ Z_j &= \left[\left(\frac{1}{n-1}\right)\left[\Sigma\left(aij - \frac{1}{n}a.j\right)^2\right]\right]^{\frac{1}{2}} \Big/ \frac{1}{n}a.j \end{aligned}\right\} \qquad (4.19)$$

These are reported in Tables IV.7 and IV.8.

TABLE IV.5 FORWARD LINKAGES AND COEFFICIENTS OF VARIATION BASED ON THE INVERSE MATRIX

V_i \ U_i	Low U_i	High U_i
Low V_i	III Sectors With Low Forward Linkages and Low Coefficients of Variation Sectors: 12 Utilities (V_i 3.594, U_i .970); 18 Metal Manufacturing (3.663, .951)	II Sectors With High Forward Linkages and Low Coefficients of Variation Sectors: 1 Agriculture (2.196, 1.685); 2 Livestock, Fish & Forestry (2.936, 1.215); 3 Agricultural Processing (2.660, 1.215); 9 Non-Metal Mining (3.337, 1.057); 11 Transport (2.517, 1.354); 13 Trade (3.082, 1.118); 15 Service (2.721, 1.255)
High V_i	IV Sectors with Low Forward Linkages and High Coefficients of Variation Sectors: 4 Textiles (3.755, .941); 5 Clothing (4.457, .787); 6 Drink & Tobacco (4.472, .784); 7 Food (4.472, .784); 8 Metal Mining (4.465, .785); 10 Chemicals (4.410, .795); 14 Construction (4.178, .838); 16 Transport Equipment (3.977, .879); 17 Non-Metallic Minerals (4.371, .802); 19 Wood, Leather & Paper (4.058, .861); 20 Misc. Manufacturing (4.306, .813)	I Sectors With High Forward Linkages and High Coefficient of Variation

TABLE IV.6 BACKWARD LINKAGES AND COEFFICIENTS OF VARIATION BASED ON THE INVERSE MATRIX

<table>
<tr><th>V_j \ U_j</th><th>Low U_j</th><th>High U_j</th></tr>
<tr><td>Low V_j</td><td>III Sectors With Low Backward Linkages and Low Coefficients of Variation</td><td>II Sectors With High Backward Linkages and Low Coefficients of Variation
<table>
<tr><th></th><th>Sectors</th><th>V_j</th><th>U_j</th></tr>
<tr><td>3</td><td>Agricultural Processing</td><td>2.909</td><td>1.258</td></tr>
<tr><td>4</td><td>Textile</td><td>3.144</td><td>1.149</td></tr>
<tr><td>5</td><td>Clothing</td><td>3.102</td><td>1.127</td></tr>
<tr><td>7</td><td>Food</td><td>2.904</td><td>1.229</td></tr>
<tr><td>10</td><td>Chemicals</td><td>2.929</td><td>1.188</td></tr>
<tr><td>12</td><td>Utilities</td><td>3.312</td><td>1.049</td></tr>
<tr><td>14</td><td>Construction</td><td>3.065</td><td>1.129</td></tr>
<tr><td>17</td><td>Non-Metallic Minerals</td><td>3.172</td><td>1.101</td></tr>
<tr><td>19</td><td>Wood, Leather, Paper</td><td>2.940</td><td>1.204</td></tr>
</table></td></tr>
<tr><td>High V_j</td><td>IV Sectors With Low Backward Linkages and High Coefficient of Variation
<table>
<tr><th></th><th>Sector</th><th>V_j</th><th>U_j</th></tr>
<tr><td>1</td><td>Agriculture</td><td>4.461</td><td>.785</td></tr>
<tr><td>2</td><td>Livestock, Fish, & Forestry</td><td>4.395</td><td>.798</td></tr>
<tr><td>6</td><td>Drink & Tobacco</td><td>4.074</td><td>.857</td></tr>
<tr><td>8</td><td>Metal Mining</td><td>3.955</td><td>.882</td></tr>
<tr><td>9</td><td>Non-Metal Mining</td><td>4.075</td><td>.858</td></tr>
<tr><td>11</td><td>Transport</td><td>3.922</td><td>.893</td></tr>
<tr><td>13</td><td>Trade</td><td>4.132</td><td>.847</td></tr>
<tr><td>15</td><td>Service</td><td>4.080</td><td>.858</td></tr>
<tr><td>16</td><td>Transport Equipment</td><td>3.808</td><td>.915</td></tr>
<tr><td>18</td><td>Metal Manufacturing</td><td>3.713</td><td>.939</td></tr>
<tr><td>20</td><td>Misc. Manufacturing</td><td>3.727</td><td>.934</td></tr>
</table></td><td>I Sectors With High Backward Linkages and High Coefficient of Variation</td></tr>
</table>

TABLE IV.7 FORWARD LINKAGES AND COEFFICIENTS OF VARIATION BASED ON THE INPUTS COEFFICIENTS MATRIX

Z_i \ W_i	Low W_i	High W_i
Low Z_i	III Sectors With Low Forward Linkages and Low Coefficients of Variation Sectors / W_i / Z_i 12 Utilities .93601650 1.95434085 14 Construction .22103224 1.53964294 18 Metal Manufacturing .81845184 1.90199103 19 Wood, Leather, Paper .35206757 1.29569089 20 Misc. Manufacturing .12647046 1.22704591	II Sectors With High Forward Linkages and Low Coefficients of Variation Sectors / W_i / Z_i 3 Agricultural Processing 2.77359242 2.11299536 11 Transport 2.60798930 0.80200344 13 Trade 1.58200632 0.94244876 15 Service 2.24120903 0.71100429
High Z_i	IV Sectors With Low Forward Linkages and High Coefficients of Variation Sectors / W_i / Z_i 4 Textiles .86493639 4.32379113 5 Clothing .00936631 3.17757086 8 Metal Mining .00520703 4.47213595 10 Chemicals .05408348 3.006179297 16 Transport Equipment .33178801 3.38309429 17 Non-Metallic Mineral .087975443 3.46977999	I Sectors With High Forward Linkages and High Coefficients of Variation Sectors / W_i / Z_i 1 Agriculture 3.55142137 2.62226170 2 Livestock, Fishing & Forestry 2.10319405 2.80103459 9 Non-Metal Mining 1.33319230 2.50035884

TABLE IV.8 BACKWARD LINKAGES AND THE COEFFICIENTS OF VARIATION BASED ON THE INPUT COEFFICIENTS MATRIX

Z_j \ W_j	Low W_j	High W_j
Low Z_j	III Sectors With Low Backward Linkages and Low Coefficients of Variation	II Sectors With High Backward Linkages and Low Coefficients of Variation
	Sectors W_j Z_j	Sectors W_j Z_j
	6 Drink & Tobacco .35490283 1.76485087	10 Chemicals 1.61688699 2.19671977
	8 Metal Mining .44344936 1.84785959	12 Utilities 1.21519562 1.76578143
	9 Non-Metal Mining .34083459 1.52962397	14 Construction 1.57581201 1.53658959
	15 Service .32297681 1.75512372	
	16 Transport Equipment .59837283 1.87846139	
	18 Metal Manufacturing .76591086 1.97155898	
	20 Misc. Manufacturing .74977738 1.84138904	
High Z_j	IV Sectors With Low Backward Linkages and High Coefficients of Variation	I Sectors With High Backward Linkages and High Coefficients of Variation
	Sectors W_j Z_j	Sectors W_j Z_j
	1 Agriculture .00944789 2.30568022	3 Agric. Processing 2.52808300 2.96210732
	2 Livestock, Fish, & Forestry .05467348 2.72757857	4 Textiles 1.82777481 3.31667039
	11 Transport .57807502 2.39099306	5 Clothing 1.41942804 2.67050952
	13 Trade .29731382 2.33547408	7 Food 2.33924136 2.55677989
		17 Non-Metallic Mineral 1.49251009 2.28716500
		19 Wood, Leather, Paper 1.58933324 3.11533181

Tables IV.5 - IV.8 represent two-way classifications of the sectors with respect to the U's and V's and the W's and Z's. Sectors that fall under high U_j and low V_j such as Agricultural Processing, Textiles and Clothing are those with a high absorption rate from other sectors. Likewise, sectors in the high U_i and low V_i should be those with above average supply of direct and indirect output to a large number of sectors. Transport, Trade and Service obviously belong to this category. Agriculture and Livestock, Forestry and Fishing probably qualify through the role of the Agricultural Processing Industry.

This impression is reinforced by looking at Tables IV.7 and IV.8. Agricultural Processing, Trade, Service and Transport all have high W_i's and low Z_i's. However none of them also has a high W_j and a low Z_j. Not surprisingly, Agriculture and Livestock, Forestry and Fishing both belong in the category with low W_j and high Z_j and the category with high W_i and low Z_i.

5. "Key" Sectors of the Nigerian Economy

Since Hirschman, the identification of key sectors has been related to the concepts of forward and backward linkages. Adopting Hazari's criteria, for instance, a key sector would be one with

(a) both U_i and U_j greater than 1

and (b) both V_i and V_j greater than 1

It has been argued, most recently by Kubursi and Frank,[12] that Hirschman did not impose any restrictions on variability in his definition of key sectors. It must however be noted that Hirschman was not interested in a purely technological definition of key sectors as such. He was

interested in linkage effects rather than linkages. In Hirschman's system the linkage effect of a newly established industry is the sum of outputs of all industries that may be established as a result, weighted by the possibility that they will emerge; i.e. the total linkage effect of establishing an industry s, $L_s = \sum_{i=1}^{n} x_i p_i$; where p_i is the probability of of industry i emerging and x_i is its output at minimum economic size.[13] It is then obvious why greater emphasis was put on backward linkage than on forward linkage.[14] The establishment of an industry is more dependent on the demand for its output than on its demand for the output of others. In the Hirschman system, the market mechanism is very significant and establishing one huge industry may be as important as, or more important than establishing several small ones (in terms of additional investible resources created) since the greater the number of sectors backward-linked to s the greater, ceteris paribus, the probability that at least one will actually emerge. Expected dispersal of input sources have been implicitly taken into account in Hirschman's market inducement mechanism.

The only sector that qualifies as a key sector in Nigeria, based on the U's and V's is the Agricultural Processing industry. If key sectors are however to be defined in relation to the W's and Z's, no sector qualifies.

Before leaving the subject of "key" sectors, it is instructive to compare the roles played by the different types of final demand. For this purpose, we assume a static final demand pattern. A static pattern of consumption is implied if each sector's contribution to consumption as a

proportion of total consumption, is specified to remain at the existing level. We can derive a vector of indices;

$$\Omega_c = (I - A)^{-1} C^*$$

where C^* is a vector with elements $C_i / \Sigma_i C_i$; C_i is the contribution of sector i to consumption. If the same assumption is made with respect to investment and exports similar indices can be derived.

Thus we see in Table IV.9 that the gross output requirements by a unit change in consumption, investment and exports are 1.1, 1.4 and 1.3 respectively. If a unit of domestic usage (consumption and investment) is substituted for exports, given a static production and demand pattern, total output is likely to increase slightly. It must be recalled, however, that the static pattern implies that for each sector the goods produced for each type of final demand are identical. Since this is not quite accurate, in agriculture for instance, a policy of convergence implies the simultaneous change of the production and demand patterns. In this case, the determination of key sectors would depend on the planners assessment of production changes necessary to meet the required demand pattern; for instance, the setting up of storage and processing facilities for the internal distribution of the required agricultural products.

6. Sectoral Market Dependencies

For completeness in the analysis of structural and linkage weaknesses in the economy, it is important to analyse the contribution of the different categories of final demand to the generation of demand for each sector's output. This can be done by constructing a final demand

TABLE IV.9 GROSS OUTPUT REQUIREMENTS PER UNIT OF OF CONSUMPTION, INVESTMENT AND EXPORTS

Sector \ Output Requirements		Consumption	Investment	Export
1	Agriculture	.4996	.0264	.4690
2	Livestock, Fish & Forestry	.1097	.0222	.0798
3	Agricultural Processing	.0238	.0691	.3767
4	Textiles	.0082	.0000	.0005
5	Clothing	.0422	.0002	.0001
6	Drink & Tobacco	.0170	.0000	.0007
7	Food	.0279	.0000	.0011
8	Metal Mining	.0000	.0000	.0486
9	Non-Metal Mining	.0016	.0464	.0302
10	Chemicals	.0032	.0070	.0013
11	Transport	.0965	.1231	.1265
12	Utilities	.0054	.0044	.0059
13	Trade	.0790	.0939	.0170
14	Construction	.0063	.8495	.0023
15	Service	.1315	.0704	.0847
16	Transport Equipment	.0068	.0224	.0083
17	Non-Metallic Mineral	.0001	.0131	.0003
18	Metal Manufacturing	.0096	.0211	.0019
19	Wood, Leather, Etc.	.0224	.0207	.0023
20	Misc. Manufacturing	.0025	.0012	.0011
	TOTAL	1.0933	1.3914	1.2583

matrix F* whose typical element f_{ij} shows output of sector i to final demand category j. Total demand stimulated by the different kinds of final demand, expressed as a ratio of gross output, can then be derived as

$$D = [X]^{-1}(I - A)^{-1} F^* \qquad (4.21)$$

The results of this computation are shown in Table IV.10.

It is seen from this table that over 80 percent of the output of ten sectors is generated by consumption. For four sectors, Textiles, Clothing, Drink and Tobacco, and Food, the proportion is about 99 percent. It is very significant that 64 percent of Agricultural processing is for export. This, perhaps more than any other index explains the nature of this industry - it is mainly concerned with semi-processing of agricultural raw materials for exports; it includes such activities as wood-sawing, and leather-tanning. This also shows why only 13 percent of agricultural output is generated by exports. Metal mining produces almost exclusively for export although the total of this production is small. Petroleum, which now dominates Nigeria's exports, was not very important in 1959/60. However, it should be pointed out that the 39 percent of demand for the output of Non-metal Mining generated by export is due mainly to export of crude petroleum.

7. The Triangulated Matrix

An overview of the pattern of interdependence can be obtained by triangulating the input-output matrix. The triangulation of the matrix

TABLE IV.10 PERCENTAGE DEPENDENCE OF SECTORAL OUTPUT ON VARIOUS CATEGORIES OF FINAL DEMAND

Sector \ Final Demand Category	Investment	Exports	Consumption
1 Agriculture	.00576805	.12732395	.86690801
2 Livestock, Fishing & Forestry	.02243943	.09993218	.87762839
3 Agricultural Processing	.09524097	.64429061	.26046843
4 Textiles	.00065575	.00995089	.98939337
5 Clothing	.00054917	.00034151	.99910933
6 Drink & Tobacco	.00000000	.00658151	.99341849
7 Food	.00000000	.00625529	.99374471
8 Metal Mining	.00041897	.99806788	.00151315
9 Non-Metal Mining	.48755780	.38659278	.13484943
10 Chemicals	.20575822	.04648901	.74775278
11 Transport	.11773101	.15005808	.73221097
12 Utilities	.07964618	.13430777	.78604607
13 Trade	.12668787	.02842245	.84489372
14 Construction	.94165405	.00313861	.05520735
15 Service	.05773823	.08626607	.85599577
16 Transport Equipment	.25872578	.11901435	.62225993
17 Non-Metallic Mineral	.90440603	.02818781	.06740617
18 Metal Manufacturing	.21176342	.02342608	.76481057
19 Wood, Leather & Paper	.10275497	.01433514	.88290996
20 Misc. Manufacturing	.05189750	.05905026	.88905283

serves to demonstrate the recurssivity of the structure of production. A perfectly triangular matrix (one in which all elements above the main diagonal are zero) implies that the sectors above the row for a particular sector i, bear a relationship to it quite different from sectors below the row for sector i. Those above are the customers and those below are the suppliers. A change in final demand for the output of sector i will therefore have repercussions only on the sectors below it in the hierarchy. Thus policies for the generation of maximum indirect demand should be easily discernible.

The main purpose of triangulation, and the factor of greatest relevance to planning, is the laying bare of the structure of production for comparison with the structure in developed countries. According to Leontief:

> "The process of development consists essentially in the installation and building of an approximation of the system embodied in the advanced economies of the U.S. and western Europe and, more recently, of the U.S.S.R. - with due allowance for the limitations imposed by the local mix of resources and the availability of technology to exploit them." 15

In a comparative study of some industrialized countries,[16] Simpson and Tsukui discovered a fundamental similarity in their respective production structures. They found that the input coefficient matrices decomposed into a bloc-triangular (and very nearly triangular) form, with the blocs composed of industries with easily recognizable technical properties. The most obvious implication of this for a developing country is that it becomes possible to think in terms of development by blocks of industries rather than by key sectors, however defined. The Simpson and Tsukui result is very interesting because the bloc-triangular characteristic

TABLE IV.11

Clothing	1.000																			
Textiles	-.193	1.000																		
Chemicals			1.000																	
Non-Metallic Mineral				1.000																
Metal Mining					1.000															
Utilities				-.092	-.039	1.000														
Construction							1.000													
Wood,Leather,Paper etc								1.000												
Agricultural Proc.		-.055	-.176			-.037	-.073	-.257	1.000											
Food										1.000										
Agriculture		-.314							-.381	-.096	1.000									
Misc. Manufacturing												1.000								
Livest.,Fish, Frstry.									-.077	-.301		-.045	1.000							
Drink & Tobacco														1.000						
Non-Metal Mining				-.155		-.078	-.050								1.000					
Metal Manufacturing			-.053			-.066										1.000				
Transport	-.038			-.041		-.054	-.079	-.032	-.085	-.045		-.048				-.036	1.000	-.028		
Transport Equipment																	-.059	1.000		
Trade	-.043						-.067			-.028						-.044		-.027	1.000	
Service			-.063	-.033				-.034		-.047		-.040		-.025		-.061	-.028	-.041	-.030	1.000

emerged from an a priori rearrangement of sectors rather than a mechanical manipulation of the tables. To show the general nature of interdependence, the input coefficient matrix of the Nigerian table has been triangulated.[17] The result is shown as Table IV.11.

Industries that cater mainly to final demand are at the top. These are Clothing, Textiles, and Chemicals. Mining and quarrying activities are next in line. Not surprisingly, Trade and Service are at the bottom. Most sectors have trade and service needs. It should be noted that Agricultural Processing is very close to the middle which is where a "key" sector should be because of its high backward and forward linkages. It hardly needs to be re-emphasized that the pattern of recurssivity obtained from the historical table of a (non-industrialized) undeveloped country is an uncertain basis for determining key sectors because of the need to change the whole system of production.

8. Direct and Indirect Import Requirements

The structural analysis of an economy is not complete without an evaluation of its interaction with the rest of the world. For developing countries it is especially necessary because of the dependence of domestic output on the international trade cycle. To this end we shall also analyse the direct and indirect import requirements of one unit of final demand. Since total (direct and indirect) output effects are given by $(I - A)^{-1}$, it is easy to compute the import requirements of a change in final demand. Defining $m = < m_j >$ for the vector of import coefficients m_j/x_j, the direct and indirect import requirements per unit of final demand for the output of each sector is given by

$$M = m(I - A)^{-1} \qquad (4.22)$$

Thus it is immediately possible to assess the total import implications of expanding the existing pattern of domestic production. Unfortunately, the classification of imports by purchasers in Carter's table conceals some very pertinent information. An import may be a substitute for a domestically produced good which means that increased domestic production may lower import requirements, thus causing a change in the domestic import coefficients. Import requirements are shown in Table IV.12.

The following industries have the highest total import requirements; Metal Manufacturing, .46; Non-Metal Mining, .33; Transport Equipment, .31; Chemicals, .29; and Construction, .27. The magnitude of these indices seems to be mainly the result of a high direct import content. At the other end are Agriculture, .004; Trade, .02; Service, .04; and Livestock, Forestry and Fishing, .05. It is obvious that much of Nigeria's industry is directly dependent on imports - with equally obvious implications for the balance of payments. On the other hand sectors with low import coefficients can be expanded with less pressure on the balance of payments. However, it must be borne in mind that the expansion of any sector in planned transformation may involve an input combination different from the one in the input-output table. The low import content is therefore neither necessary nor sufficient argument for the expansion of a sector.

Planners may be interested in discovering how a particular vector of final demand affects imports. For instance, they may consider weighting a sector by its contribution to final demand. In this case we

TABLE IV.12 DIRECT, INDIRECT AND TOTAL IMPORT REQUIREMENTS

SECTOR	Direct Requirements	Indirect Requirements	Total Requirements
1 Agriculture	.0045	.0002	.0047
2 Livestock, Fish & Forestry	.0487	.0012	.0499
3 Agricultural Processing	.0293	.0021	.0514
4 Textiles	.0943	.0126	.1069
5 Clothing	.1360	.0385	.1745
6 Drink & Tobacco	.2780	.0084	.2864
7 Food	.1557	.0294	.1851
8 Metal Mining	.0656	.0163	.0819
9 Non-Metal Mining	.3203	.0115	.3318
10 Chemicals	.2423	.0508	.2931
11 Transport	.1131	.0242	.1373
12 Utilities	.1349	.0691	.2040
13 Trade	.0110	.0090	.0200
14 Construction	.2284	.0455	.2739
15 Service	.0263	.0125	.0388
16 Transport Equipment	.2946	.0110	.3056
17 Non-Metallic Minerals	.0850	.0828	.1678
18 Metal Manufacturing	.4515	.0135	.4650
19 Wood, Leather, Etc.	.1723	.0238	.1961
20 Misc. Manufacturing	.3295	.0151	.3446
TOTAL	3.2213	0.4975	3.7188

can calculate the import requirements of a unit change in consumption, say, assuming that this change is distributed over sectors such that each of them maintains the existing proportion of total consumption. The same can be done for Investment and Exports. These indices will be shown respectively as

$$M_C = [m]\ (I - A)^{-1}\ C^*$$

$$M_J = [m]\ (I - A)^{-1}\ J \qquad (4.23)$$

and

$$M_E = [m]\ (I - A)^{-1}\ E$$

where

$$C^* = \{\frac{Ci}{\sum_i C_i}\}\ ;\ J = \{\frac{Ji}{\sum_i J_i}\}\ \text{ and } E = \{\frac{Ei}{\sum_i E_i}\}$$

The results obtained from the set of equations (4.23) are shown in Table IV.13. The main implication of this table is that the import requirements of Investment are about four times as large as for consumption and exports. Sectoral differences in the patterns of consumption and exports are rather obvious even though their total requirements are very nearly the same.

C. EVALUATION OF RESULTS AND CONCLUSION

The structural analysis in the preceding section reveals certain interesting characteristics of the Nigerian economy. Most of these have been touched upon in the appropriate section. However, it would be useful to consolidate some of the results. Table IV.14 is presented for this purpose. In relation to the indices shown, each sector has been assigned a plus or a minus sign. If a sector's score is equal to, or above the

TABLE IV.13 TOTAL IMPORTS PER UNIT OF CONSUMPTION, INVESTMENT AND EXPORTS

	SECTOR	Consumption	Investment	Export
1	Agriculture	.0023	.0001	.0021
2	Livestock, Fish & Forestry	.0054	.0011	.0039
3	Agricultural Processing	.0007	.0020	.0111
4	Textiles	.0008	.0000	.0000
5	Clothing	.0057	.0000	.0000
6	Drink & Tobacco	.0047	.0000	.0002
7	Food	.0043	.0000	.0002
8	Metal Mining	.0000	.0000	.0032
9	Non-Metal Mining	.0005	.0149	.0097
10	Chemicals	.0008	.0017	.0003
11	Transport	.0109	.0139	.0143
12	Utilities	.0007	.0006	.0008
13	Trade	.0009	.0010	.0002
14	Construction	.0014	.1941	.0005
15	Service	.0035	.0018	.0022
16	Transport Equipment	.0020	.0066	.0024
17	Non-Metallic Mineral	.0000	.0011	.0000
18	Metal Manufacturing	.0043	.0095	.0008
19	Wood, Leather, Etc.	.0039	.0036	.0004
20	Miscellaneous Manufacturing	.0008	.0004	.0003
	TOTAL	.0536	.2524	.0526

average, it is assigned a positive sign. Otherwise, it gets a negative sign. In the case of the coefficients of variation, a low score relative to the average is assigned a positive sign.

The most striking feature in Table IV.14 is the absence of consistent sectoral ratings. None of the sectors has an entirely positive or negative set of scores. In general, however, it can be deduced that sectors with a low count of positive scores are essentially "Final Primary" producers. They are relatively independent of other producers and provide a direct link between final users and the owners of primary production. Technically, therefore, a failure to expand in other sectors should not affect these industries. Similarly these industries can expand or contract without repercussions in other sectors. Conversely those sectors with a high number of positive scores are those which depend relatively heavily on other sectors for raw materials but produce mainly for final demand. Therefore, barring excess capacity, failure to expand in other sectors is likely to hinder the expansion of these sectors.

Agricultural Processing, which has the highest number of positive scores, falls under the category "Intermediate Manufacturing". It has the strongest links with other sectors both in terms of input use and output distribution. It would seem as if the production capacity of this sector has far-reaching implications for expansion in other sectors. However, before this information can be translated into plan targets, it must be supplemented by a microsectoral assessment. Agricultural processing is merely a link between agricultural production and industrial production. Nothing specific can be said unless the various crops processed are identified and related to the conditions governing their

TABLE IV.14

SUMMARY OF RESULTS

		DIRECT OUTPUT EFFECT	INDIRECT OUTPUT EFFECT	INDUCED OUTPUT EFFECT	SIMPLE INCOME MULTIPLIER	INDUCED INCOME MULTIPLIER	FORWARD LINKAGE, u_i	FORWARD LINKAGE, v_i	BACKWARD LINKAGE, u_j	BACKWARD LINKAGE, v_j	FORWARD LINKAGE, w_i	FORWARD LINKAGE, z_i	BACKWARD LINKAGE, w_j	BACKWARD LINKAGE, z_j	PRODUCTION TYPE
1.	Agriculture	-	-	+	-	-	+	+	-	-	+	-	-	-	IP
2.	Livestock, Fish & Forestry	-	-	+	-	-	+	+	-	-	+	-	-	-	IP
3.	Agricultural Processing	+	-	-	+	+	+	+	+	+	+	+	+	-	IM
4.	Textiles	+	+	+	+	+	-	-	+	+	-	-	+	-	FM
5.	Clothing	+	+	+	+	+	-	-	+	+	-	-	+	-	FM
6.	Drink & Tobacco	-	-	-	-	-	-	-	-	-	-	-	-	+	FP
7.	Food	+	-	+	+	+	-	-	+	+	-	-	+	-	FM
8.	Metal Mining	-	-	+	-	-	-	-	-	-	-	-	-	+	FP
9.	Non-Metal Mining	-	-	-	-	-	+	+	-	-	+	-	-	+	IP
10.	Chemicals	+	+	-	+	+	-	-	+	+	-	-	+	+	FM
11.	Transport	-	-	-	-	-	+	+	-	-	+	+	-	-	IP
12.	Utilities	+	+	-	-	-	-	+	+	+	-	+	+	+	FM
13.	Trade	-	-	+	-	-	+	+	-	-	+	+	-	-	IP
14.	Construction	+	+	-	+	+	-	-	+	+	-	+	+	+	FM
15.	Service	-	-	+	-	-	+	+	-	-	+	+	-	+	IP
16.	Transport Equipment	-	-	-	-	-	-	-	-	-	-	-	-	+	FP
17.	Non-Metallic Mineral	+	+	+	+	-	-	-	+	+	-	-	+	-	FM
18.	Metal Manufacturing	-	-	-	-	-	-	+	-	-	-	+	-	+	FP
19.	Wood, Leather, Etc.	+	+	-	+	+	-	-	+	+	-	+	+	-	FM
20.	Miscellaneous Manufacturing	-	-	-	-	-	-	-	-	-	-	+	-	+	FP

production. It is quite likely that each crop will be connected to only one industrial activity. In this case the "fundamental" nature of agricultural processing comes under a different light.

It should also be recalled that 64 percent of the gross output of agricultural processing is generated by exports. Thus, the progress of this sector, and, hence, of agricultural production, is not entirely under the control of planners. If greater control of agriculture is desired, production will have to be oriented more towards final demand that can be controlled by policy.

Perhaps the only general policy conclusion that can be made from these indices is that the relative importance of any sector cannot be assessed fully without consideration of specific restrictions imposed by the nature of the problem and the objectives of planners. For instance, in contemplating the allocation of funds to sectors with high income and output effects, serious consideration has to be given to employment effects. However, once the problem and plan objectives are clearly defined, these indices should prove useful in making plan calculations.

The descriptive properties of the table have already been discussed in the last chapter. It will only be mentioned here that Carter's decision to classify imports by intermediate purchases alone creates certain difficulties. It means that the nature of imports and the export-import structure could not be subjected to a complete analysis. The curious aspect is that Nigerian statistics generally record imports by commodity rather than by sectoral purchases. If he could allocate this among industries, it is surprising that he did not attempt to construct an import coefficients matrix. This would be more useful than his row of imports.

At the very least, he could have shown competitive and non-competitive imports separately. This distinction is very important even for the kind of model discussed earlier in this chapter. If this distinction is not made, analysis would suggest that any commodity could be obtained in given proportions from domestic production and imports; e.g., the agricultural sector would be deemed to meet at least part of the demand for all agricultural products even when some of these products are not in fact produced domestically.

Turning now to analytical properties, how can these indices be related to the question of structural transformation? The limitations on structural transformation can be represented very simply as in the following chart. From the analysis of structural transformation in Chapter 1, it can be deduced that an input-output table designed as a planning tool must be able to reflect the extent to which these limitations can be removed. It must, therefore, be flexible enough to accommodate expected changes in the technological and organisational structure and expected changes in the relation of agriculture to industry. For instance, the establishment of agriculture-based industries should provide incentives for increasing farm production and facilitate rural infrastructural development. The dependence of industry on agriculture for raw materials emerges from the structural analysis. However, agriculture does not seem to depend on industry for production requisites. Yet it cannot be over-emphasized that industries producing agricultural inputs need to be developed in the search for economic integration.

Concise tables of expected interdependence worked out in terms of major crops and community groups will be invaluable to the planner.

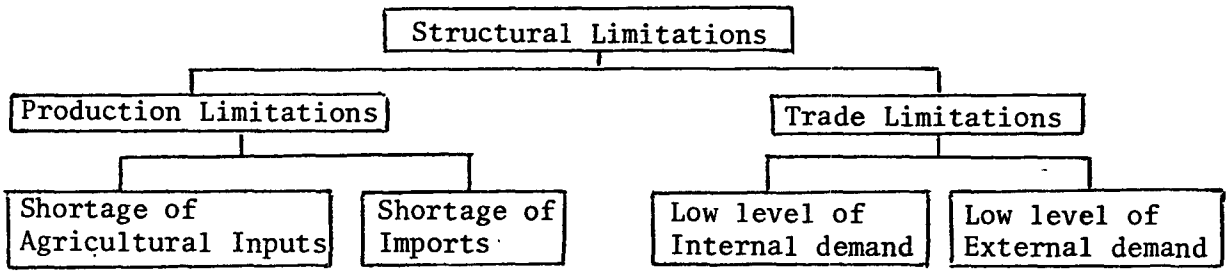


Chart IV.1 Pattern of Structural Limitations

These tables can obviously not be deduced from a historical input-output table largely showing the coefficients that are to be changed.

In planning structural transformation, current requirements have to change. For instance, the final demand vector should be solved for within the objectives of the planners rather than through the market. This conclusion emerges from the fact that increases in output come disproportionately from the relatively small modern sector and the benefits (in terms of income increases) tend to be concentrated in a few hands.[18] If the planned F demand vector is solved for through the market, it will tend to perpetuate the rigidities that planning is supposed to overcome. This means that the existing level and pattern of demand in the economy cannot be the real basis of planning. The mere projection of existing markets into the future does not constitute planning for convergence. This can be illustrated briefly with the aid of Hirshman's model of development based on the backward linkage effect of imports.[19]

Hirshman's system contains n activities, the output of the first k of which must be imported at the beginning of the development process. He further assumes that there are no competitive imports. His system can be represented by the following.

		Receiving Industries									Final	Total
		1	2	. . . .	k	k+1	. .	. . .	n		Demand	Demand
	1	0	0	. . . .	0	$M_{1,k+1}$		. . .	M_{1n}		M_{1F}	M_1
	2	0	0	. . . .	0	$M_{2,k+1}$		. . .	M_{2n}		M_{2F}	M_2
	.	.			.	.			.		.	.
Delivering	.	.			.	.			.		.	.
Industries	.	.			.	.			.		.	.
	k	0	0	. . . .	0	$M_{k,k+1}$		. . .	M_{kn}		M_{kF}	M_k
	k+1	0	0	. . . .	0	$X_{k+1,k+1}$		. . .	$X_{k+1,n}$		$X_{k+1,F}$	X_{k+1}
	.	.			.	.			.		.	.
	.	.			.	.			.		.	.
	.	.			.	.			.		.	.
	n	0	0	. . . .	0	$X_{n,k+1}$		. . .	X_{nn}		X_{nF}	X_n
Value Added		0	0	. . . .	0	$X_{v,k+1}$		. . .	X_{vn}		-	-
Total Inputs		0	0	. . . .	0	X_{k+1}		. . .	X_n		-	X+M

Fig.IV-1 Illustrative Table for Hirschman's Model

Assuming fixed coefficients, $M_1, \ldots, M_k$ and $X_{k+1}, \ldots, X_n$ are determined once the final demand vector is defined: i.e.

$$\begin{bmatrix} M \\ --- \\ X \end{bmatrix} = \begin{bmatrix} \\ I - A_h \\ \\ \end{bmatrix}^{-1} \begin{bmatrix} M_f \\ ---- \\ X_f \end{bmatrix}$$

where the coefficients of A_h are M_{ij}/X_j for the first k sectors and X_{ij}/X_j for the remaining n-k.

Now Hirschman defined a domestic production threshold which is the minimum size at which domestic production of an import becomes profitable. The output of activity i, (i=1,...,k), at this threshold is given by T_i. In the beginning $M_i < T_i$ but M_i grows over time. Domestic production of i will start when $M_i \geq T_i$. Once established the new industry will exert the pressure of excess demand on the domestic industries which supply its inputs.

It is obvious that Hirshman's model is heavily dependent on demand linkages. The total volume of imports is treated as an exogenous variable which is the prime mover in an industrialisation process that necessarily leads to general development. But the existing pattern of imports reflects the consumption preferences of a small segment of the population, usually the relatively more educated urban elite. Yet until recent times, the (autonomous) growth of imports in Nigeria has been paid for by the rural peasantry. It has not led, however, to an agricultural or rural transformation. In 1963, about 40 percent of farmers in Northern Nigeria and 60 percent in Southern Nigeria still worked on farms less than 2.5 acres. And according to a World Bank report, the minimum wage for urban workers ranges between 1.5 and 2.5 times average farmer income.[20]

Furthermore, Hirshman's model neglects the backwash effects of his import substitution strategy. By assuming there are no competitive imports, he ignored the effects of modern manufacturing on those cottage and small-scale industries, the output of which competes with imports. Consequently, to the extent that some of these labour-intensive actitivies are out-competed by the new capital-intensive import-substituting activities,

total employment will fall. Also, those traditional activities in which rationalisation is attempted would tend to become more capital-intensive.

Instead of basing the F vector on those commodities, imports of which are increasing rapidly or domestic production of which is expanding fastest, the question should be what sectors should and can be developed. It has already been stressed that planners should look at needs rather than demand, in choosing the desired state. In addition, the planners must examine the production structure to see the possibilities for transformation. Supply and demand have to be planned simultaneously, for the structure of production and consumption that emerge from the planning process to converge.

In concrete terms the relationship of the indices to the problem of structural transformation is the following: the indices summarize the existing pattern of interdependence among sectors; the volume of exchange is low mainly because the level of specialisation is low; a low degree of interdependence implies a low degree of specialisation! The problem is to increase the degree of specialisation, i.e., introduce positive entries into cells that are now empty. Secondly, the absolute number of industries must be raised, i.e. establish industries that are not now present in any form in the economy. Thirdly, some firms in an industry now operating will contract while others expand because the industry is an agglomeration of old and new lines of production. A picture will be useful at this stage.

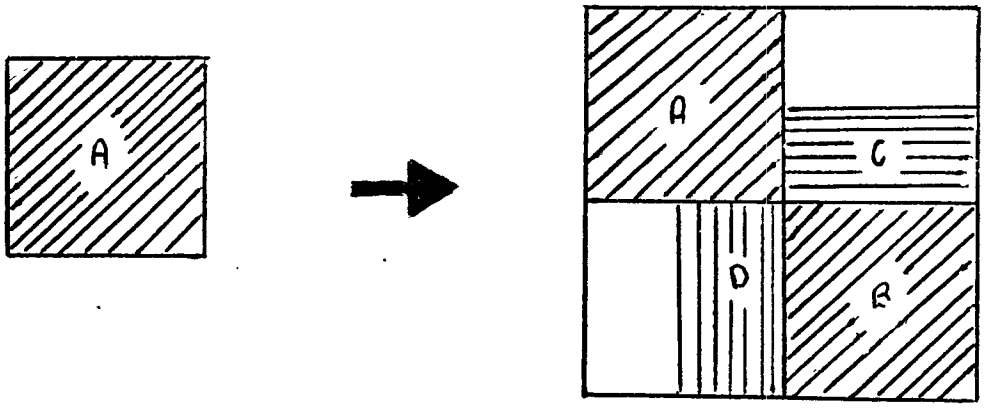


Figure IV.2 Schematic Diagram of the Transformation Process

Box I represents the economy as it is described in the established input-output table. Box II represents the planners vision of what the economy should be like at the end of a perspective plan. A in Box II is the same as in Box I. B represents a bloc of completely new industries to be established. The corridor C represents expected deliveries of (some of) the existing industries to the planned industries. Similarly the corridor D shows expected purchases of (some of) the existing industries from the planned ones. Obviously a sensible way of filling compartment B ex ante would be to refer to the production structures of other countries. In particular it is known with some confidence that in many manufacturing industries a given unit of ouput at a given capacity does require given amounts of certain inputs.[21] If the planner is interested in such an industry he can obviously get better information from an actual industrial profile than from historical input-output data. It is true that in agriculture the influence of climatic factors on agricultural production suggest temporal and spatial non-proportionality. According to Gale Johnson: "given approximately the same quantity of inputs, the output of

a given major farm crop may vary from one year to another by as much as 30 to 50 per cent".[22] Even here a comparison of existing input-output proportions with the proportions in other countries would provide indication as to possible lines of transformation. Aggregating all of agriculture may have the virtue of the statistical law of large numbers but the constancy of its coefficient is of no particular relevance to someone interested in how the input combination in the production of a particular crop can be changed.

In conclusion, the indices derived from Carter's table merely tell us formally that Nigeria is an underdeveloped country. For planning a developing country, it will be necessary to modify both the descriptive and analytical properties of Carter-type tables. One can then evaluate projects that are to be undertaken in the plan period and fit them into an input-output table to assess their wider implications for the sectors that he wishes to develop. Such a system was used in Zambia and it would be useful to compare that with Carter's system.

FOOTNOTES TO CHAPTER IV

[1]The notation here is generally the same as in Chapter III.

[2]The number 1 in the bottom right hand quadrant of the augmented technology matrix is based on the assumption that households do not consume labour directly. This assumption may not be valid in LDC's where domestic service is cheap and widespread.

[3]Moore, F.T., "Regional Economic Reaction Paths", American Economic Review, May 155.

[4]These indices are of course derivable from the inputs coefficients matrix. Since for every industry $X_i = X_j$ and since $a_{ij} = X_{ij}/X_j$, it follows that $\phi_i = \sum_{j=1}^{n}$ and $\lambda_j = \sum_{i=1}^{n} a_{ij}$.

[5]This, of course, does not imply that the equality holds for any single sector.

[6]Chenery, H.B., and T. Watanabe, "International Comparisons of the Structure of Production", Econometrica, Vol. 26, October 1958. The ϕ_i and λ_j derived by Chenery and Watanabe were regarded by Hirschman as forward and backward linkages, though he recognized the superiority of basing the indices on the inverse matrix. See Chapter III above.

[7]This sensitivity also holds for all the indices based on averages.

[8]Chenery and Watanabe, Ibid.

[9]This was dealt with in a little more detail in Chapter III.

[10]Rasmussen, N.P., Studies in Intersectoral Relations, Amsterdam: North Holland Publishing Co., 1956.

[11]Hazari, B.R., "Empirical Identification of Key Sectors", Review of Economics and Statistics, May 1970.

[12]Kubursi, A.A., and R.H. Frank, "Sectoral Characteristics of the Ontario Structure of Production", Ontario Economic Review, Special Supplement, March 1972. Seel also, Hazari, op.cit..

[13]His use of minimum economic size poses certain problems which are, however, beyond the scope of the present analysis; but see Myint, H., "The Demand Approach to Economic Development", Review of Economic Studies, Vol. 27, February 1960.

[14]Cf. Mohammed, G., "Sectoral Interdependence and Egypt's Investment Strategy", Unpublished Ph.D. Thesis, McMaster University, 1974.

[15]Leontief, W., Input-Output Economics, New York: Oxford University Press, 1966.

[16]Japan, U.S., Norway, Italy and Spain: See Simpson, D., and T. Tsukui, "The Fundamental Structure of Input-Output Tables", Review of Economics and Statistics, Vol. 47, November 1965.

[17]Two points should be kept in mind here: (a) The matrix used in the triangulation is (I -A) rather than A because of the nature of the triangulation algorithm. This makes no difference as the difference between the two matrices, apart from the algebraic sign, is in the elements of the main diagonal. (b) In the process of triangulation all elements $\leq 1/2n$, where n is the order of the matrix, have been set equal to zero. The idea of discarding all elements below a certain value is not new. Simpson and Tsukui found it convenient to ignore all $a_{ij} \leq 1/n$. We have chosen 2n instead of n as the denominator because most of the coefficients in our table are small and it would be meaningless to reduce them all to zero in the attempt to derive the very strong sectoral relations.

[18]Cf. Chenery, H.G., et. al., Redistribution with Growth, London: Oxford University Press, 1974, Introduction.

[19]Hirschman, A.O., The Strategy of Economic Development, New Haven: Yale University Press, 1958, Chapter 6, especially pp. 113-119.

[20]I.B.R.D. Nigeria, Options for Long-Term Development, The Johns Hopkins Press, 1974, pp. 28-29.

[21]See, for instance, the technical supplement to Little, I.M.D., and J. Mirrlees, Manual of Industrial Project Analysis, Paris: O.E.C.D., 1961.

[22]Johnson, Gale, "Comments on Chapter 8 - Agriculture in N.B.E.R., Conference on Research in National Income and Wealth: Technical Supplement, Princeton: Princeton University Press, 1954.

CHAPTER V

A COMPARISON OF CARTER'S INPUT-OUTPUT SYSTEM WITH A MODIFIED SYSTEM APPLIED TO ZAMBIA

A. INTRODUCTION

In the last chapter, the conventional input-output system was shown to be of limited use as a basis for development planning. Before that (in Chapter III), it had been suggested that the inadequacy of Carter's system may be in his too strict adherence to a blueprint that was designed for developed countries. To explain the full implication of this inadequacy, we now present and discuss an alternative system that was designed specifically to aid the development planning process in Zambia. The modified system in question was proposed by Dudley Seers[1] and was later applied to the Zambian economy by a United Nations Economic Mission,[2] which incidentally, was led by Mr. Seers himself. This system is both simpler than the conventional table because of the relative simplicity of the developing economy and the limitations of data discussed in Chapter III, and more informative because of unusual detail in the household, government and rest-of-the-world accounts.

In the next section the basic structure of the Zambian input-output accounts is presented. Thereafter its essence as a description of the Zambian economy is discussed in relation to the findings of the U.N. visitors. Following that, the nature of the accounting relationships in the system and the assumptions that had to be made are discussed in presenting the application of the system to the design of a development strategy. Furthermore, we shall attempt to

establish the significance of the model as an allocative system. Finally the comparison with Carter's system is made from the viewpoint of the design of the matrices, the description and manipulative features, the planning paradigm implied and the applicability to problems of development.

The Basic Structure of the Modified Input-Output System

Table V.1 is the modified input-output table for the Zambian economy for the year 1961. For ease of exposition, the table will be divided into five sections as illustrated in Figure V.1. The producing sectors are assigned the rows numbered 1 to 9. Each row in the inter-industry section represents the payments of one production sector for basic inputs. Each column shows the allocation to producing sectors of the value of output produced in the sector named

Figure V.1. Illustrative Modified Input-Output Table

<table>
<tr><td>Column No.
Row No.</td><td>1.....7</td><td>8.....18</td><td colspan="2">19.....23.....32</td></tr>
<tr><td>1
.
.
.
.
.
9</td><td>I
Inter-industry matrix</td><td>II
Value-added matrix</td><td>III
Supply matrix</td><td>IV
Demand matrix</td></tr>
<tr><td>10
.
.
.
.
.
15</td><td colspan="4">V Balancing matrix</td></tr>
</table>

TABLE V.1 A MODIFIED INPUT-OUTPUT TABLE FOR ZAMBIA, 1961

	BASIC INPUTS							VALUE ADDED										COMPOSITION OF SUPPLY				Total Supply/Demand	COMPOSITION OF DEMAND								
	Imports	Import Duties	Electricity	Transport	Distribution	Other	Total Inputs	Employee' Income		Subsistence	Direct Tax	Mixed		Property Income Payments		Transfers	Savings and Depreciation	Total Value Added	Gross Output	Imports final, CIF	Distribution	Indirect Tax		Sales to Other Sectors	Exports	Non-African Consumption	African Subsistence	Other African Consumption	Government Consumption	Capital formation		Change in Stocks Imports
								Non-African	African			Non-African	African	Home	Abroad															Govt.	Other	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	20.7	0.5	7.4	1.3	0.1	4.0	34.0	21.0	12.2	—	25.1	—	—	—0.3	23.1	—	15.1	96.2	130.2	—0.1	0.1	—	130.4	—1.4	—113.8	—2.0	—	—0.6	—0.1	—	—5.6	—6.9
2	1.3	—	—	0.1	0.3	1.4	3.1	0.8	1.9	20.8	—	2.6	3.8	—	—	—	—	29.9	33.0	1.7	4.1	—	38.8	—5.8	—4.6	—2.7	—20.8	—3.1	—0.5	—	—0.2	—1.1
3	8.3	0.2	0.1	0.4	0.2	7.6	16.8	3.2	2.6	—	1.2	0.3	0.2	0.1	0.2	—	2.4	10.2	27.0	50.7	11.9	4.1	93.7	—10.2	—1.4	—30.4	—	—29.4	—5.7	—1.1	—15.3	—0.2
a	3.4	0.1	0.1	0.1	—	5.7	9.4	0.7	0.6	—	0.4	—	—	0.1	0.1	—	1.5	3.4	12.8	14.0	3.4	2.1	32.3	—0.6	—0.4	—13.4	—	—16.5	—1.2	—	—	—0.2
b	0.8	—	—	—	—	—	0.8	0.1	0.2	—	—	—	—	—	—	—	0.3	1.1	10.1	2.4	0.6	14.2	—0.1	—0.1	—5.6	—	—8.0	—0.4	—	—	—
c	0.2	—	—	—	—	0.6	0.8	0.4	0.3	—	0.2	—	—	—	0.1	—	0.4	1.4	2.2	0.6	0.2	—	3.0	—2.6	—	—0.2	—	—0.1	—0.2	—	—	0.1
d	2.9	0.1	—	0.3	0.2	0.5	4.0	1.5	0.9	—	0.5	0.3	0.2	—	—	—	0.5	3.9	7.9	18.0	4.2	0.7	30.8	—5.4	—0.2	—5.9	—	—2.0	—0.8	—1.1	—15.3	—0.1
e	1.0	—	—	—	—	0.8	1.8	0.5	0.6	—	0.1	—	—	—	—	—	—	1.2	3.0	8.0	1.7	0.7	13.4	—1.5	—0.7	—5.3	—	—2.8	—3.1	—	—	—
4	4.6	0.2	—	0.5	1.3	4.6	11.2	3.6	3.7	—	0.1	0.4	0.4	—	0.1	—	0.3	8.6	19.8	0.8	—	0.1	20.7	—1.8	—	—	—	—	—2.8	—8.1	—8.0	—
5	0.6	—	0.9	0.1	—	—	1.6	0.5	0.3	—	0.9	—	—	0.7	0.1	—	0.7	3.2	4.8	5.1	—	—	9.9	—7.7	—	—1.5	—	—	—0.7	—	—	—
6	1.0	—	—	—	0.1	1.7	2.8	4.1	1.7	—	0.2	0.3	0.5	0.3	1.5	—	1.9	10.5	13.3	—	—	0.6	13.9	—6.1	—5.3	—0.7	—	—0.4	—1.4	—	—	—
7	—	—	0.1	3.7	—	1.2	5.0	5.3	1.8	—	0.9	2.1	0.6	0.7	0.2	—	2.0	13.6	18.6	—	—	0.2	18.8	—18.1	—	—	—	—	—	—	—	—0.7
8	—	—	—	—	—	—	—	7.8	5.4	—	—	—	—	—	—	—	—	13.2	13.2	—	—	—	13.2	—	—	—	—	—	—13.2	—	—	—
9	—	—	0.1	—	—	0.6	0.7	4.0	4.3	5.2	4.6	0.2	—1.8	0.4	—	1.1	18.5	19.2	6.6	—	1.3	27.1	—2.8	—	—16.0	—5.2	—3.0	—0.1	—	—	—	—
10	—	—	—8.6	—6.1	—2.0	—21.1	—37.8	—	—	—	—	—	—	—	—	—	—	—	—37.8	—	—16.1	—	—53.9	—53.8	—	—	—	—	—	—	—	—
11	—36.5	—	—	—	—	—	—36.5	—	—	—	—	—	—	—	—25.0	+1.6	—1.3	—24.7	—61.2	—65.0	—	—	—126.2	—	125.1	+1.1	—	—	—	—	—	—
12	—	—0.9	—	—	—	—	—0.9	—	—	—	—32.3	—2.2	—	+0.1	—0.4	+1.2	+16.3	—17.3	—18.2	—	—	—6.3	—24.5	—	—	—	—	—	+24.5	—	—	—
13	—	—	—	—	—	—	—	50.3	—	—	+3.1	—8.1	—	+0.2	—0.2	—2.8	+5.9	—52.2	—52.2	—	—	—	—52.2	—	—	+52.2	—	—	—	—	—	—
14	—	—	—	—	—	—	—	—	—33.9	—26.0	+0.3	—	—5.7	—	—	—	+2.8	—62.5	—62.5	—	—	—	—62.5	—	—	—	+26.0	+36.5	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—47.2	—47.2	—47.2	—	—	—	—47.2	—	—	—	—	—	—	+9.2	+29.1	+8.9

E.C.A./F.A.O. Report on the Economic Development of Zambia, Ndola, Falcon Press, 1964, Appendix A, p. vii.

at the head of the column. Imports for intermediate production are included in the inter-industry matrix and are assigned to a column; there is no corresponding row for imports. Each entry in the import column is a composite of various goods. These imports are valued at the port so that import duties, distribution and transport costs are excluded. These are all assigned to separate columns. Most of the producing sectors are not assigned columns. Therefore purchases of industries from other than the Transport and Communication, Utilities and Distribution sectors - which industries will be referred to as the 'intermediate sectors' - are all lumped together in one column, 'Other Inputs'.

Value added items are assigned columns rather than rows and the value-added matrix presents a rather detailed picture of value added or national income in the Zambian economy. Wages and Salaries are differentiated into payments to Africans and payments to non-Africans; so are the profits of unincorporated enterprises and rents (mixed income). The direct taxes on industrial enterprises are assigned to a column and subsistence value added (equal by definition to gross subsistence output) is identified separately. The distributed profits and interest and rents from incorporated business are divided into domestic payments and payments abroad. The Savings and Depreciation column includes undistributed profits.

The gross output of domestic industries is of course, the sum of the value of inputs and all value added. Gross output is valued at producer prices and the cost of getting both this and imports for final use to consumers are assigned to another 'Distribution' column. Imports

for final use are differentiated according to which of the home industries would have produced them if they had been produced domestically. Therefore the column 'Imports, final' could be said to show competitive imports. It must be noted however, that an entry in this column does not necessarily mean that the country is a net importer of a particular commodity. It may, for instance, import highly refined sugar even though it has a large exportable surplus of less highly refined sugar. Duties on final imports and all indirect taxes are assigned together to a separate column.

The demand sub-matrix contains a detailed breakdown of the usual items of demand (intermediate and final use). Consumption is separated into four categories - government consumption, subsistence consumption, other African consumption and non-African consumption. There is a distinction between government and private capital formation. There are of course, separate columns for changes in stocks and for exports. Most of the entries in the demand matrix are negative because they represent receipts by the accounting entity. Inventories may be negative or positive depending on whether there has been an increase or a decrease.

The balancing sector contains the main accounts for the government, the foreign sector and households. The Rest of the World row has a negative entry for payments to other countries and a positive entry for receipts from other countries. The balance of payments is shown under the column for Savings and Depreciation. The government current account row also has negative entries (denoting receipts from taxes, interest on government held securities) and positive entries (showing payments of interest on public debt, transfer payments, etc.) The difference between

the positive and negative entries represents a surplus or deficit on current account and is also entered under the Savings and Depreciation column. A budget surplus is indicated by the positive prefix to this entry in table V.1. Household accounts are separated into African and non-African household accounts with payments entered as positive and receipts entered as negative items. The Savings and Investment row shows total savings under column 17. The allocation of this to the different categories of investment are shown by the entries under the last three columns.

MAIN FEATURES OF THE MODIFIED SYSTEM

To understand the descriptive significance of the modified system for Zambia one must understand the basic characteristics of the economy. To this end, the findings of the U.N. Economic Mission are summarized with a view to indicating those factors constraining and those contributive to an improvement in material well-being.

The Mission discovered that the majority of Zambians were "poor, uneducated (if not illiterate) and unhealthy". In very sharp contrast to this there was a very small minority of Europeans enjoying vastly superior standards of living who had "the best paid jobs..., work(ed) the most prosperous farms and own(ed) nearly all financial wealth".[3] Most Zambians (over 70%) were engaged in agricultural production, the output of which was much below potential and was mainly outside the mainstream of commercial activity.

Copper mining accounted for over half of the total commercial product, (i.e. GDP less subsistence output). However the direct monetary impact of Copper on the Zambian economy was small because (1) almost all capital was held abroad, (2) the industrial inputs of copper mining had

a very high import content and (3) the income received by Europeans (which was almost two-thirds of all wage income in the copper industry in 1961) was either spent immediately on imports or was transferred abroad when the Europeans retired.

There was however little doubt that copper was the economic backbone of Zambia because of its indirect impact. It provided a very large part of government revenues: "In 1962-63 individuals paid only £3.4 million out of a total income tax of £26 million. The bulk of income tax was therefore paid by companies, almost entirely by copper companies".[4] Income taxes yielded by far the largest part of total tax revenues in Zambia in that year. Furthermore the copper industry provided directly or indirectly the bulk of commercial and professional income.

Finally, as is common place in Africa and almost as a direct corollary of dependence on the exports of one or a few primary products, Zambia was characterized by a high dependence on imports. Over fifty percent of consumer goods and a much higher percentage of capital goods came from imports. The result was that Zambia was highly sensitive to fluctuations in the world market. Within the input-output paradigm, output could not be considered endogenously determined - the output of the main sector sold as it was in a buyers market, depended on economic development elsewhere. The Mission estimated that about 72% of non-communist world consumption of copper occurred in the United States and Europe.[5] In addition, domestic supply of all products depended heavily on imports.

Perhaps the most important manifestation of Zambia's dependence was the fact that it had proved incapable of absorbing labour in productive

employment. The U.N. mission considered this the 'greatest failure'[6] of Zambia's economic structure. Not only had urban employment not kept pace with the natural population growth, the actual number of Africans employed was lower in 1962 than in 1954. Non-African employment had remained the same.

The preceding description is the essential background to the Zambian input-output system. An 'adequate' description must provide an analytical basis for the understanding and reversal of the organic relations within the economy. Thus the interindustry relations matrix is based on two levels of aggregation. The aggregation involved in the assignment of rows to production sectors reflects the importance of sectors vis-a-vis government policy and the limitations of data in addition to the usual theoretical considerations. The importance of mining emerges clearly in the first row of Table V.1. The relative weight of subsistence activity in agricultural production is easily seen by comparing the entries in columns 10 and 19 of the second row. The manufacturing sector has been subdivided into five industries. This relative detail was made possible by "the fact that satisfactory production data (had) recently become available through the completion of the Census of Industrial Production for 1961"[7]. In essence the row classification centres around sectors that have been growing (mining); sectors that will most likely grow (manufacturing); and sectors that should be made to grow, (agriculture, construction).

The aggregation on the column side shows the basic compromise on data. The table attempts to allocate only the intermediate use of the output of three industries. This is because the data does not allow a

finer breakdown and the table would have become unnecessarily unwieldy. The inputs supplied by the intermediate industries, along with imports, account for over 70% of total inputs. In addition while the three intermediate industries sell about 87% of their output to other industries, the sales of all but these intermediate industries to other sectors are only 11% of their gross output. It is doubtful therefore that the additional benefits of allocating all intermediate inputs would have justified the time and manpower that would have been involved.

The incidence of taxation, the allocation of government grants and subsidies and the direct investment policies of government are all crucial to the development process. In this respect the modified system shows the status quo and simultaneously provides a basis for rational analysis of changes in these policy variables. The inclusion of separate columns for taxes and subsidies and import duties and the row for government current account significantly simplifies the analysis of government finance. Each sector's position with respect to the government sector is clearly described and the government budget balance - an important factor in the development budget - is obvious.

The fact that most of government revenue comes from a few companies and from custom duties often means that the most reliable statistics are for foreign trade and government accounts. The Zambian economy has been no exception. It must be mentioned however that at the time of constructing Table V.1. Zambia had just ceased to be a member of the Federation of Rhodesia and Nyasaland. Consequently the trade and government account figures had to be extracted from the federal accounts and this would undoubtedly have introduced some errors into the table. The federal figures were highly reliable since the Central Statistical

Office "is one of the best, if not the best, of the statistical offices in Africa".[8]

The interaction between Zambia and the rest of the world is another crucial factor in understanding, and hence developing a consistent strategy for transforming, Zambia's economic structure. The modified table clearly shows the divergence between the pattern of resource use and the pattern of domestic demand. While copper is hardly used as an input, only 8% of demand for textile is satisfied by domestic production and this itself has a 73% import content. Furthermore, the table permits a direct analysis of the foreign exchange gap and a study of the effects of policies regarding import substitution.

Summarizing, the modified input-output system presents a description of an economy that preserves its essential features, makes the best use of available statistics and emphasizes value added and balance of payments transactions as more significant for policy than intermediate transactions. As a result of this however, the system does not fit nicely into an explicit model and its manipulation depends essentially on the accounting relationship. This aspect will become clearer in the next section.

THE APPLICATION OF THE MODIFIED SYSTEM

The application of the system was based on two primary considerations: Zambia's dependence on the export of copper and the non-homogeneity of its social structure. The table was therefore used mainly to trace the implications of increased production for employment incomes, dividends, royalties and tax receipts. The increases in incomes was further analysed to trace the effects on the consumption patterns of the two racial groups. The technique used was to design an input-output table of the same form by successive approximation from the base year. The U.N. Mission chose 1970 as the target year, i.e., the plan period was six years.

Specifically they attempted to design an economic structure that would

1. provide at least 150,000 more jobs than in 1964.
2. yield a rise in African real consumption per capita of at least 25%
3. be compatible with a balance in foreign payments.
4. not produce inflationary pressures.
5. result in a high post-terminal rate of investment.[9]

The structure projected for the target year was therefore not a forecast but a statement of conditions necessary for the attainment of these objectives. The problem could therefore be seen as a crude constrained optimization problem.

Projection to 1970 proceeded in two stages. Stage 1 was the design of a matrix for 1965 at 1961 wages and prices. This was then adjusted for estimated changes in factor and product prices. The period

1964-65 was regarded as a period of transition to political independence so it was essential to allow for the necessary institutional adjustment. Stage 2 was the projection of matrix for 1970 at 1965 prices and wages. This was again adjusted for the effects of new tax and royalty arrangements.

We shall not attempt to describe every detail of the (long and tedious) projection process. The following analysis simply attempts to illustrate how a matrix would be projected for a target year on the basis of a base-year table.

Every producing sector in the modified system can be represented by a balance equation of the form:

$$M_i\ (1 + d_i) + \sum_{j=1}^{n} X_{ji} + X_{oi} + \sum_{j=1}^{n} V_{ji} + N_i + D_i + T_i$$

$$= X_{iJ} + E_i + \sum_{j=1}^{n} C_{ji} + K_{Gi} + K_{Pi} + S_i;\ i = 1, \ldots, n \qquad (5.1)$$

where

M_i = imports of intermediate goods by sector i

d_i = duties on intermediate imports as a proportion of M_i

X_{ji} = purchases of sector i from intermediate sector j

X_{oi} = purchases of sector i from all other industries

V_{ji} = allocations to category j of value-added of the income created in sector i.

N_i = imports of products competitive with output of sector i destined for final use.

X_{iJ} = Sales of sector i to all other producting sectors

E_i = exports of the output of sector i

C_{ji} = consumption of domestic and foreign supply of output of sector i by the j^{th} consumption group.

K_{Gi}, K_{Pi} = Capital formation by government and private enterprise respectively using the output of the ith sector.

S_i = changes in the stocks of output of sector i.

D_i = distribution costs (final) of supply of output of industry i.

T_i = indirect taxes on domestic output and import duties on final consumption of output of sector i.

The following assumptions are now made:

1. Sector i's outlay in intermediate sector j is proportional to the total outlay of sector i. These coefficients of proportionality are given by

$$\alpha_{ji} = \frac{X_{ji}}{X_i} \qquad \text{and}$$

$$\alpha_{oi} = \frac{X_{oi}}{X_i}$$

2. Intermediate imports of sector i are proportional to X_i; i.e.

$$M_i = m_i X_i$$

3. Components of value-added except subsistence value added are proportional to output, i.e.

$$V_{ji} = F_j(X_i)$$

where

$$V_{ji} = \gamma_{ji} X_i.$$

(Subsistence value added is assumed equal to gross subsistence output.)

4. Final distribution costs and indirect taxes depend proportionally on X_i and N_i, i.e.

$$D_i = \lambda_i^x X_i + \lambda_i^n N_i$$

and

$$T_i = Z_i^x X_i + Z_i^n N_i$$

5. Household consumption expenditure is simply total household income less personal savings and taxes, i.e. if

$$Y_h = \sum_{i=1}^{n} \sum_{j=1}^{p} V_{ji} ,$$

then $\sum_{i=1}^{n} \sum_{j=1}^{p} C_{ji} = Y_h - rY_h - sY_h$ where r and s are the historical tax and savings rates respectively.

6. Total consumption outlay is allocated to commodities on the basis of constant expenditure elasticities, i.e.

$$\log C_{ji} = \log e_{ji} + w_{ji} \log C$$

where C_{ji} = consumption of i by household group j

e_{ji} = constant

w_{ji} = expenditure elasticity, i.e. $\frac{\partial C_{ji}}{\partial C} \quad \frac{C}{C_{ji}}$

$$C = \sum_i \sum_j C_{ji}$$

7. Every sector's sales to other industries is proportional to the output of the selling sector. The coefficient of proportionality is given by

$$a_{iJ} = \frac{X_{iJ}}{\sum_i X_{iJ}} .$$

8. The other variables on the demand side are given. The allocation to government consumption is based on a direct assessment on the need for public goods - education, health, police and defence sources, etc. Export sales are determined from estimates of world demand and production capacity. Government investment is based on a calculation of sectoral capital-output ratios and the role that government expects to play in achieving the desired rate of investment. Private capital formation depends partly on proposed government policy concerning business incentives and on the general attitude of private enterprise towards the plan. Planned changes in stocks will take into account proposals for price stabilization and the support of expansion in retail and wholesale trade activity. Given all these, we have

$$E_i = \bar{E}_i$$
$$C_{gi} = \bar{C}_{gi} \qquad \text{where subscript g represents "government"}$$
$$K_{gi} = \bar{K}_{gi}$$
$$K_{Pi} = \bar{K}_{Pi}$$
$$S_i = \bar{S}_i$$

Incorporating the assumptions into the balance equation, we obtain

$$(m_i + d_i m_i)X_i + \sum_j \alpha_{ji}X_i + \alpha_{oi}X_i + \sum_j \gamma_{ji}X_i + (\lambda_i^X + Z_i^X)X_i +$$
$$N_i + (\lambda_i^N + Z_i^N)N_i = a_{iJ}X_i + E_i + \sum_j C_{ji} + \bar{K}_{Gi} + \bar{K}_{Pi} + \bar{S}_i \quad . \quad . \quad . \qquad (5.2)$$

Collecting terms and letting $Q_i = \bar{E}_i + \Sigma\, C_{ji} + \bar{K}_{Gi} + \bar{K}_{Pi} + \bar{S}_i$, we obtain

$$[(1 + d_i)m_i + \sum_j \alpha_{ji} + \alpha_{oi} + \sum_j \gamma_{ji} + \lambda_i^X + Z_i^X - a_{iJ}]X_i$$

$$= (1 + \lambda_i^N + Z_i^N)N_i + Q_i \quad . \quad . \quad . \qquad (5.3)$$

Equation 4.3 can now easily be solved for final imports:

$$(1 + \lambda_i^N + Z_i^N)N_i = \phi_i X_i - Q_i$$

$$\therefore \quad N_i = \frac{\phi_i}{(1 + \lambda_i^N - Z_i^N)} X_i - \frac{1}{(1 - \lambda_i^N + Z_i^N)} Q_i \qquad (5.4)$$

where $\phi_i = (1 + d_i)m_i + \sum_j \alpha_{ji} + \alpha_{oi} + \sum_j \gamma_{ji} + \lambda_i^X + Z_i^X - a_{iJ}$

In the actual application to the Zambian Economy[10] the first problem was to determine the gross outputs from the estimates of industrial experts for the year 1965. Estimates of employment were based on calculations of past trends in productivity. The historical tax and savings rates were then applied to the income figures derived from the employment calculations to arrive at household consumption figures for Africans and non-Africans separately. The components of personal consumption by commodity groups were based on income elasticity estimates from budget studies. The other components of demand were estimated taking into account the expected change in the composition of investment. It was also originally assumed that input-output ratios and other components of supply remained as in the base year. Indirect taxes and final distribution margins were projected as functions of aggregate demand/supply and imports of finished products emerged as residuals.

In introducing price and wage changes, the U.N. mission made the following specific assumptions

(1) Average annual earnings of Africans would rise by between 12% and 30% depending on the information available on sectors. Wage increases for non-Africans would be insignificantly small.

(2) Average earnings in the public sector would rise by 15%.

(3) Import prices increases would vary between 5-7% for intermediate goods and 10% for capital goods. Prices of import for final consumption would be more or less the same as in the base year.

(4) The price of copper on the world market would rise only slightly.

(5) The ratio of profits to wages would remain the same between 1961 and 1965.

In addition, indirect taxes were derived from an analysis of changes in the government budget between 1961 and 1963 and, having allowed for depreciation and taxes, gross profits were distributed among other components using 1961 proportions except for the copper sector. Here every item of value added was estimated independently.

In arriving at the final estimates for entries in the matrix, consumption figures had to be adjusted for the fact that wages had been assumed to rise faster than import prices. Imports and consumption were therefore likely to rise.

The projection to 1970 followed essentially the same procedure: specific assumptions were made concerning copper production and sales, the scope of import substitution and the level and composition of government

investment and current expenditure. Considerable data was at hand from the industrial experts to determine the levels of capacity utilization and the number and expected output of new projects by sector. Some emphasis was however placed on analysing the effects of these projected output levels on the output of the intermediate sectors. One way to do this is the following: first compute allocation coefficients given by the ratio of the sales of intermediate sector j to total outlay of the purchasing sector i; i.e. $\alpha_{ji} = X_{ji}/X_i$, i = 1, ..., n; j = 1, ..., 3. Direct requirements are then derived, as shown in Table V.2, by applying the corresponding coefficients to projected output for final demand (F) in the intermediate sectors and to projected gross output (X) in the other industries. To these direct requirements must be added the indirect requirements, two rounds of the calculation of which are shown in Table V.3. To the indirect requirements as calculated in Table V.3 must of course be added the effects of final distribution costs on the intermediate industries, before total requirements for their outputs can be derived.

The projection to 1970 of government capital formation was based on the specific investment requirements of expected government projects. Employment and earnings were again estimated from productivity calculations. When the 1970 matrix was completed, huge deficits showed up in the government current account and in the balance of payments. Changes in tax and royalty arrangements were then proposed to close these gaps. These changes included a 5% tax on copper exports, duties on 'non-essential' imports averaging 30% higher than existing rates, an average increase in personal income

TABLE V.2. ILLUSTRATIVE DIRECT REQUIREMENTS TABLE

Sector		INTERMEDIATE INDUSTRY 1	INTERMEDIATE INDUSTRY 2	INTERMEDIATE INDUSTRY 3
INTERMEDIATE INDUSTRIES	1	$\alpha_{11} F_1$	$\alpha_{21} F_1$	$\alpha_{31} F_1$
	2	$\alpha_{12} F_2$	$\alpha_{22} F_2$	$\alpha_{32} F_2$
	3	$\alpha_{13} F_3$	$\alpha_{23} F_3$	$\alpha_{33} F_3$
NON-INTERMEDIATE INDUSTRIES	4	$\alpha_{14} X_4$	$\alpha_{24} X_4$	$\alpha_{34} X_4$
	.	.	.	.
	.	.	.	.
	.	.	.	.
	i	$\alpha_{1i} X_i$	$\alpha_{2i} X_i$	$\alpha_{3i} X_i$
	.	.	.	.
	.	.	.	.
	.	.	.	.
TOTAL		R_1	R_2	R_3

TABLE V.3. ILLUSTRATIVE INDIRECT REQUIREMENTS TABLE

Intermediate Sector	ROUND 1			ROUND 2		
	1	2	3	1	2	3
1	$\alpha_{11} R_1$	$\alpha_{21} R_1$	$\alpha_{31} R_1$	$\alpha_{11} R'_1$	$\alpha_{21} R'_1$	$\alpha_{31} R'_1$
2	$\alpha_{12} R_2$	$\alpha_{22} R_2$	$\alpha_{32} R_2$	$\alpha_{12} R'_2$	$\alpha_{22} R'_2$	$\alpha_{32} R'_2$
3	$\alpha_{13} R_3$	$\alpha_{23} R_3$	$\alpha_{33} R_3$	$\alpha_{13} R'_3$	$\alpha_{23} R'_3$	$\alpha_{33} R'_3$
TOTAL	R'_1	R'_2	R'_3	R''_1	R''_2	R''_3

taxes from 1.5% to 5.1% for Africans and from 6.4% to 11.6% for non-Africans. The target matrix was then adjusted for these proposals to give an economic programme that satisfied the government's objectives and was internally consistent. Seers insists that it was not a forecast but a hypothetical statement: "If the mainly foreign-determined variables ... behave in certain ways and the output of various goods and services charges and wages have a certain trend, then the objectives of the government carry certain implications".[11]

In essence the modified system is relevant to an economy in which national inputs and productive capacity are determined by external factors. In such an economy input combinations are not decided by technical considerations but by the available supply of material inputs and therefore technical coefficients cannot be considered stable. This is another sense in which Seers' insistence on the existence of significant non-linearities in the functions describing the matrix can be interpreted.[12] Since supply relations lie at the heart of development problems the solutions should be looked for there. It is therefore more logical to focus on the sectoral pattern of outlay rather than on production functions that are unstable.

DIFFERENCES BETWEEN THE CARTER AND SEERS SYSTEMS

The main differences between these two input-output systems can be traced to the context in which they originated. The qualities of an observation inhere only partly in the observed object. They also depend partly on a priori images in the mind of the observer. It is important, therefore, to understand each system in relation to its genesis.

Carter undertook the design of an input-output table for Nigeria "at the suggestion of the Economic Planning Unit [which] felt that an input-output analysis would be a useful tool to have as the process of planning continues in Nigeria".[12] The study was undertaken after the plan had been formulated. The need to modify the conventional blueprint was, therefore, probably not urgent. More significantly, Carter's description of the economy reflects in part, some of the biases of the architects of the 1962-68 Plan.

This plan was based wholly on the philosophy of directing all possible resources into the fastest growing sectors (see reference 49, Chapter II). The problem then, was to isolate the factors which will contribute to the further expansion of these sectors. Not surprisingly, therefore, Carter concentrated on modelling the modern manufacturing sector to the relative neglect of both traditional manufacturing activity and agriculture. Modern manufacturing is the main user of scarce factors - skilled labour, capital and foreign exchange. On the other hand, the resources generally employed in agriculture and crafts are in relative abundance. Since in the planners' general approach, there was no notion of changing the technique of production, it made sense to ignore the relative abundance of factors used in agricultural production and traditional

manufacturing. Therefore, a detailed description of them is not necessary in the input-output table since, given the existing techniques, they do not contrain the growth of the economy.

It might be argued that an input-output table per se is not a planning methodology; and that Carter's table was purely tentative. Therefore, if it is to be used in planning it will have to be suitably reclassified in line with the planner's objectives. But, it is clear that the directive for building the table came from planners. Therefore, the description of the economy given in the table cannot be regarded as independent of a planning context. In making calculations for the 1962-68 Plan, the planners must have come up against certain problems which they felt could be solved through intersectoral analysis. It seems a reasonable deduction that the problems as those planners saw them provided Carter with a basis for choosing the relationships in the economy deserving a formal description.

Furthermore, Carter's table, as we saw in Chapter III, provided the basis for Clark's model of import-substitution. The questions to which that model was directed are the same as those with which Nigerian planners (to whom Clark was quite close) were concerned. But Clark did not find it necessary to question the descriptive adequacy of the table. Clark himself in a previous study of planning in Nigeria had suggested the need for Nigeria to have an input-output table.[13] It would seem as if he found the description in Carter's table quite adequate in relation to the planning problems of Nigeria.

The modified input-output table for Zambia arose from rather different circumstances. The U.N. mission to Zambia was invited to assist in the establishment of an integrated economic and social and development

plan. In particular, Zambia requested that the composition of the team should reflect the broad needs of its economy. They expected the visitors to suggest measures for the rapid improvement of African agriculture, indicate needs and possibilities in industry and advise on financial policy.[14] The U.N. table was conceived of, therefore, as the statistical infrastructure for policy decisions and the frame for the design of an overall development strategy. Thus, the table was part of a more general process of organising and orienting information towards the solution of a more broadly conceived planning problem.

This basic difference in starting points had a strong effect on the construction of the tables. The Nigerian planners' heavy emphasis on the growth rate seems to have induced Carter into attempting to devise a "good" picture maintaining the conventional stable relationships. The essence of the input-output model as stated in Chapter III was the stability of production functions. This assumption was adopted by Carter. He was also bound by the convention of keeping the number of inputs equal to the number of types of outputs. However, it should be noted that the blueprint originated from an economic machine with an internal combustion engine - the structure of most developed countries is such that the bulk of industrial machine tools is domestically produced. The allocation of industrial output is thus fundamental to the structure of production. On the other hand such industrial activity as exists in the developing countries is limited to terminal production - the assembly of imported, prefabricated consumer goods with imported machinery. Attempting to locate all inter-industrial flows where they are usually unknown, probably non-existent and largely insignificant to the production process is not only unnecessary, it is futile. The main advantage of the equality of the number of rows and

columns in Carter's table lies in the calculation of the inverse. Because most of his input coefficients were very small (absolutely, as shown in the triangulated matrix), the calculation of all direct and indirect industrial requirements seems an expensive luxury. It tends to divert analytical attention away from other important interdependencies. The Zambian example, attempting the allocation of only three basic inputs, is more practical and more useful especially if the planning bureau does not have a computer!

A comment is also necessary on the treatment of investment in the Nigerian table. The Investment column is merely a record of sales of the output of sectors which have not been used up in the production process of the purchasing sectors. In the static input-output models, such purchases never enter actual production - they are supportive of the production process by their mere existence. In the dynamic input-output models where the Investment column is converted into a matrix of capital coefficients, the analysis of growth paths is contingent on the stable relation between a sector's stock of the output of others and its own output. When these purchases include machinery and equipment, it may be a reasonable assumption. The record of sectoral Investment in the developed countries will normally include holdings of machinery and equipment. The sectoral pattern of capital stocks in plants, machinery, buildings and equipment lies at the logical heart of a systematic analysis of an economy's production structure. The level, composition and timing of Investment is in essence a basic problem in planning. The entries in Carter's Investment column are unlikely to be of much help to this problem. They are mainly accumulated stocks of inventories of consumer goods since most producers in Nigeria are in the consumer-goods business. Therefore, the

Investment column does not reflect capital coefficients in production.

In the modified input-output system, Investment distinguishes between changes in stock and actual government and private capital formation by sector. It was, therefore, relatively easy to incorporate the effects of project evaluation studies into the input-output format. As mentioned above, the projection of the matrix to 1970 specifically included the sectoral experts' project proposals including projected investment requirements. It might be hard to convert this kind of record into the capital matrix of the dynamic model. However, since the machines are usually delivered from outside the economy, the capital coefficients matrix will be unnecessary.

At the risk of stating the obvious, the relative emphasis on types of transactions deserve examination. This difference in emphasis is reflected in the manipulative aspects of the systems as will be shown presently. The essence of Carter's table is in the inter-industry flows matrix. He emphasised the detailed analysis of the industrial allocation of domestic output. His treatment of government, household and rest-of-the-world accounts is very perfunctory. He went to great pains to fit traditional cottage industries into the production picture, thereby confounding the interpretation of industrial 'inputs' and 'outputs'. More important, this would make a planning model based on his table largely insensitive to policies aimed at improving small-scale production. He failed to allocate imports for final demand to competitive sectors even though consumer goods accounted for 57% of total imports in 1960. Thus substantial information on the pattern of household consumption is lot. It is impossible, for instance, to link the sectoral balances to consumption by socio-economic group. In addition, his complete neglect of savings and

his superficial treatment of investment frustrate the systematic examination of the relations between the two. It is still possible to derive the aggregate value of GNP. If one were concerned with achieving a given change in such a generalized entity, the aggregate investment value will suffice but the whole purpose of multi-sectoral analysis is to compare the effects of changes at the sectoral level. It is hardly of any help to be informed that aggregate demand and supply are in balance when some sectors are known to be out of balance.

These problems are dealt with more seriously in the modified system. First, it is obvious that the most important sets of transactions are those that deal with income and outlay accounts and the relation of Zambia to the rest of the world. The sectoral origin of, the role of households and the importance of government in total savings are all clearly shown. The relationship between savings and investment, therefore, emerges logically. Moreover, considerable effort was put into the assignment of final imports according to domestic sectors producing similar commodities. Thus, the modified system allows rational analysis of sectoral balances in savings and investment and in import payments and export receipts.

These differences in the construction aspects lead logically to a difference in the manipulative characters of the two systems. The modified system does not emphasise a causal relationship between supply and demand. It attempts to estimate every argument in these equations independently, except in cases where there is an obvious accounting relationship. For instance, the difference between household income and household taxes plus savings is obviously household consumption. We find, therefore, that it is not simply expected that a change in final demand

will stimulate a unique supply response. Allowance is easily made for drastic changes in the pattern of demand. Very often in the planning process, a normative pattern of demand is necessary to directly reduce the levels of poverty, measured in terms of minimum requirements for food, shelter, clothing, etc.; unemployment, viewed both as an end and as a means of affecting the poverty level; and income inequality, regarded as both desirable in itself and capable of inducing the society's faith in the relevance of the plan to all, rather than to a privileged few. Unless the supply side is planned simultaneously, it may be impossible to link the patterns of resource use, demand and needs in such a way as to satisfy the planner's welfare function. The pattern of supply shown for Nigeria in Carter's table was the direct result of the colonial economic legacy. The pattern of demand was the result of efforts by the new elites to maintain the consumption patterns of the past.

The sectoral levels of gross output are endogenously determined in Carter's system once a final demand vector is given. The given final demand vector may include certain products, the production of which requires certain commodities not currently produced domestically. If planners desire the domestic production of these inputs, they must determine the initial production levels exogenously. The reason, of course, is that supply response in the conventional input-output model is a mere proportional projection of the existing structure into the indefinite future.

On the other hand, since the sectoral production levels are exogenously determined in the modified system, the structure can be made to converge towards the normative demand pattern. New types of industrial activities can be incorporated easily into the modified system. The industrial classification is broad enough at the row level since the

sectors do not necessarily have to be completely homogenous. At the column level, the system does not attempt a complete analysis of sectoral production functions - just the use of certain basic inputs. Thus while Seers' system is flexible enough to accommodate the introduction of a drastic change in the pattern of supply into the planning process, Carter's system imposes the inherited cell structure on the development process and constrains analysis to peripheral changes in the given structure.

The difference in the planning paradigm implied by the two systems is a direct reflection of the distinction between growth and development. The growth problem relates briefly to the achievement of the highest possible rate of increase in consumption level given a situation where neither the structure of production nor the pattern of demand is expected to change radically. The reproductive capacity of the economy in the long run is always based on the initial conditions. On the other hand, the development problem is the transformation of the existing pattern of supply and distribution. Here, neither the structure of production nor the pattern of demand is considered adequate to achieve the planner's preference function. The development process, therefore, cannot be regarded as determined by the initial conditions since these are the very conditions the planner wishes to change.

Carter's system is very much rooted in the growth problem. His table facilitates a clear statement of some (not all) of the initial conditions. Here again, the influence of members of the E.P.U., especially Professor Stolper, must be mentioned. As we saw in Chapter II, the 1962-68 plan was set out entirely in terms of growth rates for the main aggregates of national income.[15] This plan has been criticized as being unnecessarily narrow in its conception of the relation of planning to the

development process.[16] Correspondingly, it seems as if Carter was concerned mainly with evaluating the question of growth at the sectoral level. His table is perhaps, very useful for a historical study. However, if it is to be applied to development planning, it will be necessary to release it from its rigidity by supplementing it with detailed accounts for the non-industrial sectors, and modifying his emphasis on industrial production functions.

The modified input-output system was designed for development planning. It is, therefore, the case that the leading questions in its construction and use were questions about employment and income redistribution. In short, it saw planning as concerned with socio-economic transformation, production and distribution as interdependent and structural evolution as self-conscious.

In conclusion, it must be mentioned that because Seers' system was designed within a certain planning context, it may not be transferable to another. It would, therefore, be useful to see how his system can be related to the Nigerian planning problem.

Footnotes to Chapter V

[1]"An Accounting System for Projections in a Specialized Exporter of Primary Products". Unpublished, 1963. Referred to in Adelman, Irma and Erik Thorbecke, The Theory and Design of Economic Development, Baltimore: The Johns-Hopkins Press, paperbacks edition, 1969, p. 211.

[2]U.N./E.C.A./F.A.O. Report on the Economic Development of Zambia, Ndola: Falcon Press, 1964.

[3]Ibid., p. 7.

[4]Ibid., p. 132.

[5]See Ibid., p. 41.

[6]Ibid., p. 8.

[7]Ibid., Appendix A, p. IV.

[8]Ibid., Appendix J, p. CXIV.

[9]See Ibid., p. 14.

[10]This discussion is based on Seers, Dudley, "The Use of a Modified Input-Output System for an Economic Program in Zambia", Chapter 8 in Adelman and Thorbecke, op. cit., Appendix A.

[11]Ibid., p. 218.

[12]Carter, Nicholas, G., An Input-Output Analysis of the Nigerian Economy, 1959-60, M.I.T. Working Ppaer, No. 29-63, School of Industrial Management, 1963, p. 4.

[13]Clark, P.P., "Planning for an Economy in Transition" in Hagen, E., Planning Economic Development, Illinois: Richard D. Irwin, Inc., 1963.

[14]See Appendix L in U.N./E.C.A./F.A.O., op. cit.

[15]See Chapter II, above.

[16]See Aboyade, O., Foundations of an African Economy, New York: Frederick A. Praeger, Inc., 1966.

CHAPTER VI

TOWARDS THE ADAPTATION OF A MODIFIED INPUT-OUTPUT SYSTEM TO NIGERIA

A. INTRODUCTION

This chapter explores the possibility of using a modified input-output system in the Nigerian planning process. The exploratory exercise is necessary for two reasons. First, Nigerian planners are not happy with the absence of an integrative framework for plan formation, as a recent publication of the Central Planning Office shows:

> "Since Independence in 1960, Nigeria has launched two National Development Plans... The project content of each of these plans originated from the submissions of the various Ministries and Extra-Ministerial Departments in response to call circulars issued by the Ministries responsible for Economic Planning and Development in the Federation. All available evidence suggests that the executing agencies which made these submissions were free to submit any package of capital proposals since Government did not provide them with the policy framework within which they were to identify and articulate their programmes. The result of this omission was the emergence of sectoral programmes which were often not addressed to any coherent set of well-defined goals. In essence, the policy objectives stated for each sectoral programme in some past plan documents are little more than ex post rationalisations of the project mix as submitted by the executing Ministries, Statutory Corporations, etc." 1

A second and related reason is, as we have argued in previous chapters, that the conventional input-output model is of limited use for purposes of planning structural transformation. The limits to the conventional model derive from two sources: the structure of the model in terms of the simplifying assumptions that have to be made and the way

in which data have been collected and organised. Collection and organisation of data are selective processes; i.e., they depend on the preferences of the selector.

If Nigerian planners had tried to be more systematic in the traditional way of input-output analysis, the planning process would have consisted essentially of the following steps in an ideal setting:

(1) the determination of the desired growth rate and specification of the implied level of production;

(2) the use of an aggregate capital-output ratio to indicate the implied level of investment;

(3) the drafting of a detailed macro-economic account, i.e., total levels of consumption, imports, exports, etc.

(4) the indication of the expected distribution of these among sectors;

(5) the use of an input-output system to obtain the sectoral production levels implied by (4);

(6) the specification of individual projects required to implement production targets.

The general orientation towards increasing aggregate output has had considerable impact on the types of data which have been collected in Nigeria. Whereas several studies on national income and product have been done, there is hardly any information either on employment, especially in the rural and informal sectors,[2] or on the distribution of income. Similarly, it has had an influence on the way data collected have been used. In planning models dealing with maximisation of output, the tendency has usually been to classify sectors such that they can be used to reveal the uses of scarce factors - skilled labour, capital and foreign

exchange. We saw for instance that Clark's model of import-substitution was concerned mainly with ways of satisfying the balance of payments and savings constraints.

When interest centres around questions of structural transformation, a different type of classification of economic activity is required. Furthermore, interdependencies other than the kinds derived in Chapter IV become more important. The modified system is well-suited to the analysis of these forms of interdependence. For instance, because demand is broken down into "African", "Non-African" and "Subsistence" consumption, the system allows for explicit consideration of the relationship between the pattern of production, the income level of the consumer and the consumption behaviour of different socio-economic groups. Thus, the target of specific policies can be identified in terms of human groups.

The value-added section differentiates income by source and includes information on taxes and transfer payments. By so doing, the link between households (as producers) and the rest of the economy is explicit. Employment income, for instance, could be regarded as an index of employment.

These types of information can be meaningfully incorporated into the conventional input-output model for planning purposes. But the orientation to growth which has influenced the collection of data has also influenced the organisation of data. Therefore, if and when this information becomes available, it will still be necessary to classify them in relation to questions of structural transformation, i.e., to reorient the basis on which the input-output table itself is constructed.

It is with the lessons to be learnt from this aspect of Seers' system that we are mainly concerned in this chapter. His system clearly illustrates our contention that how one chooses to describe the economy is closely linked to what one is looking for. Thus, he started by choosing those sectors and issues around which the input-output table should be constructed. The importance of copper and consequent external determination of much of Zambian output was the dominant feature underlying the design of the Zambian table. Another important consideration was the non-homogeneous nature of the Zambian social structure.

The lessons to be learnt from the Zambian model should be seen in the light of the much simpler nature of the Zambian economy in comparison with the Nigerian. First, the Nigerian economy is not as completely dependent on one export as Zambia is on copper. Historically, Nigeria has depended on agricultural exports, mainly cocoa, groundnuts and groundnut products, palm products and to some extent, rubber and cotton. Recently, however, petroleum exports have become dominant in the export picture. Although Nigeria's export pattern is more diversified than Zambia's, it is not an important difference. Diversification per se is not helpful unless ways can be found to develop linkages between export industries and domestic activity.

Like Zambia, however, Nigeria's production pattern is still very much externally determined. According to the Second Progress Report on the Second Plan,

> It is important to remark that the rosy picture painted in this report is largely due to the rapidly growing mining sector of the economy. This sector accounts for about half the growth rate recorded, accounts for large increases in government revenue,

> is responsible for the much improved foreign exchange situation and contributes substantially to capital formation.[3]

The subsequent observation that "the traditional exports have not done so well"[4] is a distressing pointer than Nigeria might be moving towards total dependence on the export of crude oil, production of which is mainly foreign determined.

How would an input-output system be designed to reflect Nigeria's structural transformation problem? What are those aspects of the Nigerian economy that should provide the basis for sectoral classification? In the following section, we turn to these questions.

B. TOWARDS A MODIFIED INPUT-OUTPUT SYSTEM FOR NIGERIA: ELEMENTS OF DESIGN

Figure 6.1 is a useful picture of the interdependencies important to the process of structural transformation. The economy is conceptualised as consisting of four interacting blocks or sub-systems: Agriculture, Manufacturing, Petroleum, and Infrastructure. This scheme is intended to illuminate a basis for classification and aggregation of economic activities in a plan-oriented input-output table.

It should be recalled here that Seers' system reverses the usual interpretation of the rows and columns of the input-output table. In the modified system, every row (i) shows purchases of inputs by industry i. Every column (j) shows the allocation of the intermediate sales of industry j among various industries. This procedure creates no substantial difficulty. It is adhered to in this section for simplicity. Moreover, not every industry to which a row was assigned was also assigned a column. The reason is that only a few domestic industries significantly contribute inputs to other industries.

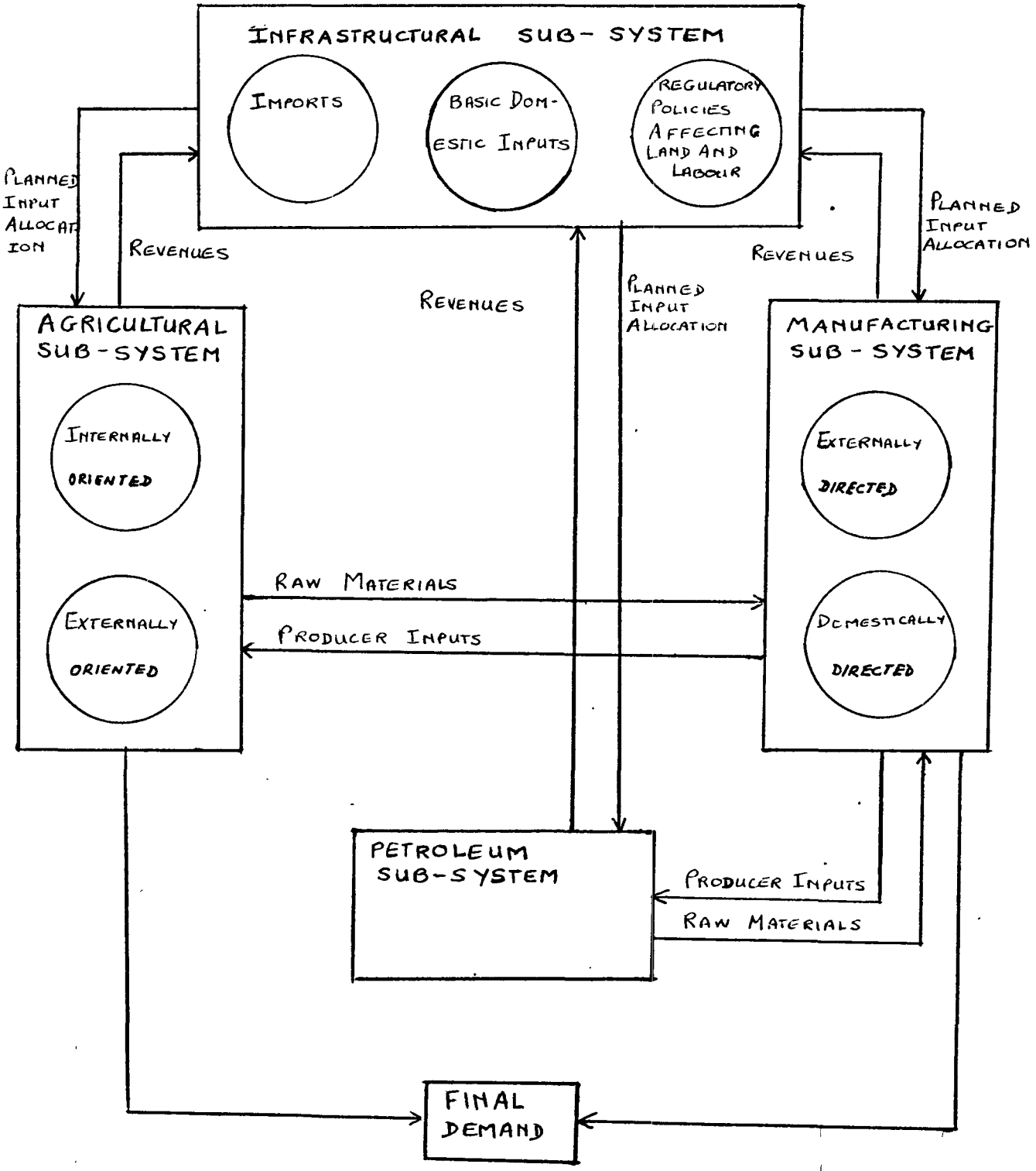


Figure 6.1 Model of Interacting Sub-Systems

The agricultural subsystem is subdivided into externally and internally oriented agriculture. Externally oriented agriculture refers to export crop production and internally oriented, to agricultural production for local consumption. The latter consists of the production of food crops and the production of industrial raw materials. The manufacturing subsystem is similarly broken down into externally directed and internally directed production. Internally directed manufacturing refers to production activity undertaken in the informal sector. Externally directed manufacturing consists mainly of large scale production, mainly of import substitutes. The infrastructural subsystem contains three sub-classes, only two of which - 'Imports' and 'Basic Domestic Inputs' - have direct bearing on the classification of economic activity. Basic Domestic Inputs refers to those economic activities that contribute inputs significantly to other sectors. 'Petroleum subsystem' is self-explanatory.

What is the rationale behind this scheme and how can it be related to the design of an input-output table? This question cannot be answered precisely, because the relevant data are not available. However, some reclassification of the data used in Carter's table can be used to throw light on these questions.

Table 6.1 is a schematic modified input-output table derived from Carter's data. This table concentrates on the allocation of imports and the five inputs which seem basic to the Nigerian economy. In addition, Carter's twenty sectors have been reclassified and aggregated into seventeen sectors.

Table 6.1: A Schematic Modified Input-Output Table*

UTILITIES	TRANSPORT	CONSTRUCTION	DISTRIBUTION	OTHER INPUTS	TOTAL INPUTS	VALUE-ADDED	SALES TO OTHER SECTORS	CONSUMPTION	INVESTMENT	EXPORTS	GROSS OUTPUT
95.1	978.4	69.5	1,991.5	629.1	6,396.4	94,529.1	3,494.6	15,120.0	-	82,310.9	100,925.5
1.8	508.1	0.4	2.3	638.5	5,454.0	49,072.3	6,386.1	44,975.0	-	3,165.2	54,526.3
54.9	5,594.8	0.3	681.3	180.5	9,018.0	39,175.5	14,829.8	30,520.2	-	5,543.5	48,193.5
-	-	-	37.0	-	377.0	14,349.1	0.2	14,725.0	-	0.9	14,726.1
-	112.6	-	168.1	-	1,126.8	384,666.6	2,490.9	381,005.1	-	2,297.4	385,793.4
-	70.7	-	141.4	2,292.0	2,836.5	9,248.9	-	12,085.4	-	-	12,085.4
34.5	105.0	1.2	100.7	107.8	921.1	6,761.7	7,234.8	264.2	-	183.8	7,682.8
13.8	1,190.8	26.1	2,088.7	8,986.9	18,864.3	16,297.5	-	34,932.6	-	229.2	35,161.8
98.5	1,237.5	10.3	2,251.3	1,184.0	9,636.8	11,937.2	214.3	21,297.4	-	62.3	21,574.0
86.4	964.7	46.7	2,227.0	1,328.5	13,232.5	9,639.6	2,412.8	18,556.6	1,737.2	165.5	22,872.1
36.2	51.6	19.2	189.1	124.9	1,018.8	5,046.5	12.0	-	-	6,053.3	6,065.3
74.0	186.0	91.0	144.0	179.0	3,440.0	93.9	-	-	-	3,346.1	3,346.1
07.2	245.3	20.0	592.7	235.7	3,760.4	4,932.0	6,598.5	800.0	1,293.9	-	8,692.4
15.9	3,041.1	2,278.7	-	3,122.5	13,189.8	178,357.2	22,429.4	151,197.5	8,007.5	9.912.6	191,547.0
-	-	-	4,605.9	7,944.1	24,417.8	80,501.6	21,846.0	67,588.2	4,273.9	1,211.3	104,919.4
-	296.7	19.2	204.3	1,017.1	2,276.2	3,203.0	2,449.3	3,029.9	-	-	5,479.2
21.0	7,181.0	-	7,006.0	17,365.0	52,346.0	38,154.0	2,582.6	2,917.4	85,000.0	-	90,500.0
49.3	21,764.3	2,582.6	22,431.3	45,335.6	168,426.6	945,777.9	92,981.3	796,314.5	100,312.5	124,482.0	114,090.3

ence is not exact, the table should be read as follows: Sector 1 = Externally oriented Agriculture; Sectors 2-5 = iculture; Sectors 6 and 7 = (Domestically Directed) Manufacturing; Sectors 8-11 = Externally Directed Manufacturing; ub-sector and Sectors 13-17 = Basic Domestic Inputs.

The seventeen sectors in our illustration are described briefly below.

Sector 1, Crops Primary for Exports and/or Industrial Use:

This sector covers the rest of agricultural production. It includes all cash crops and the processing necessary before they are exported. Therefore, it includes Carter's "Agricultural Processing" except sawmilling and tanning.

Sector 2, Livestock:

This is Carter's sector, "Livestock, Forestry and Fishing" excluding the latter two and including Leather Tanning which was in his "Agricultural Processing".

Sector 3, Forestry and Wood Products:

Here "Forestry" has been combined with "Hand Sawyers" and "Sawmilling" (which were under "Agricultural Processing" in Carter) and the main use of wood - "Furniture".

Sector 4, Fishing:

The fishing component of Carter's "Livestock, Forestry and Fishing" is isolated and presented here.

Sector 5, Crops Primarily for Domestic Non-Industrial Use:

This sector includes only roots, cereals, beans, palmwine, kola nuts and bananas and plantains. These crops constitute the bulk of product for local consumption.

Sector 6, Textiles and Apparel (Traditional):

This sector includes domestic weaving and tailoring and small-scale leather shoe-making and repairing.

Sector 7, Non-Metal Mining and Products:

Here the extraction process is combined with the fabrication process because of the internal orientation of both. The components are sand, stone and gravel, coal, cement and cement products, and mud-drilling.

Sector 8, Food, Tobacco and Beverages:

This is an aggregation of Carter's sectors 6 and 7. The category "Food-Small" has not been isolated because it is expected to shrink as more restaurant facilities become available.

Sector 9, Textiles and Apparel (Modern):

This sector is an aggregation of the production of textiles by large-scale enterprises and Carter's "Tailors and Seamstresses" which is the main recipient of the output of the textile companies. It also includes all other components of his "Apparel" except "Leather, Shoes and Repair-Small".

Sector 10, Other Manufacturing:

A pot pourri of such diverse activities as soap-making, umbrella and tarpaulin manufacture. It includes Carter's "Chemicals", and "Metallic Manufacturing", Manufactures of Wood, Plastic, Leather, Rubber and Paper"

Sector 11, Metal Mining:

The mining, mainly for exports, of various metals - gold, zircon, tin, etc., is included here.

Sector 12, Petroleum:

Oil Mining is given a sector of its own because of its importance in export revenue and its potential as the basis for petroleum based manufacturing.

Sector 13, Transport Equipment:

This is the same as Carter's Sector 16.

Sector 14, Distribution:

An aggregation of "Trade" and "Services" since, by Carter's admission, the distinction is not at all clear.

Sector 15, Transport; Sector 16, Utilities; and Sector 17, Construction; correspond to sectors of the same names in Carter's table.

Although the correspondence to our interactive system is not exact, the table can be read broadly as follows:

Row 1, Externally Oriented Agriculture;

Rows 2-5, Internally Oriented Agriculture;

Rows 6-7, Domestically Directed Manufacturing;

Rows 8-11, Externally Directed Manufacturing;

Rows 13-17, and Columns 2-5, Basic Domestic Inputs.

The aggregation involved in the assignment of rows as emphasized the importance of sectors vis-a-vis the problem of structural transformation more than usual theoretical considerations like the similarity of input structure, or complementarity of demand. The reason is that planned transformation involves a high degree of administrative allocation of resources. The manner in which these are allocated will determine which of the many alternative processes and combinations will be chosen in a particular industry. Thus we are following Ghosh's "allocation principle":

> Let us consider an economy under some form of central control and with insufficient resources and capacities in most industries in relation to the targets aimed at. In such an economy, certain technical combinations are dictated not by the normal requirements of the production processes but by scarcity and consequent

> rationing. Input ratios are conditioned by the assigned quotas and any change in the assigned quota may lead to alterations of the input coefficients. In such a situation, the stability of the production coefficients cannot be assumed for a change in final demand. Actually, allocation coefficients may prove to be more stable over a short period than technical coefficients, because rationing authorities, once the relative shares of each industry have been settled, dislike changing them since they are the outcome of a delicate balance of claims and counterclaims.[5]

However, neither the criterion of complementarity of demand nor similarity of input structure has been ignored. They have been de-emphasized because there is a basic similarity of input structure in the whole production system. We see from the table that imports and the basic domestic inputs to which columns were assigned supply 73 percent of all inputs. The proportion of total inputs used in "Externally Directed Manufacturing" contributed by these five inputs is the same as the average (73 percent). In row 10, "Other Manufacturing" we find that imports alone contribute 64 percent of total inputs. Imports and the basic domestic inputs supply 90 percent of this sector's inputs.

Furthermore, "Basic Domestic Inputs" contribute over 60 percent of total sales to other sectors. This is not surprising in view of the low degree of specialization corresponding with Nigeria's level of development.

Yet in the final analysis, classification of economic activity must be related to the problem under study and the policies to be implemented. Thus it is crucial that industries expected to play an important role in the formulation of public policy because of size or type of activity should

be identified. So should those in which the government has substantial financial interest or which are the major sources of revenue.[6] As will be seen presently, these considerations figure prominantly in the classification in Table 6.1.

The petroleum industry is a logical place to start because it fulfills all of these criteria.

Petroleum production began in 1958 and reached a level of 600,000 barrels per day in 1967. Production fell during the civil war but it has risen dramatically since, with a current level of around 2 million barrels per day. Petroleum must be viewed in the light of the World Bank observation that it "remains a typical enclave industry whose contribution to government revenue and foreign exchange earnings".[7]

Federal government revenue from the petroleum sector rose from about £1 million in 1959/60 to £320 million in 1972, or from less than 1 percent to 50 percent of total federal government revenue. Its contribution to GDP was 9 percent in 1970 but investment abroad was 60 percent of the industry's value added. Consequently, contribution to GDP was only 4 percent, and this mainly as payments to government. Furthermore, employment by this sector has stagnated at 3,000 between 1956 and 1970.[8] Clearly, there is no positive correlation between employment and production increases.

The backward linkages of this industry are small. Little demand is induced in other industries because of the absence of capital goods production. Forward linkages are similarly small. In 1970, 98 percent of estimated 8,068 million cbm. of natural gas produced in association with crude oil was flared. Its use as an input in electricity supply has been

effectively stifled by the establishment of hydro-electric generation at Kainji. Nigeria has not been able to penetrate the international market for natural gas in its direct final applications and the possibilities for transfering its methane content into other domestically usable and exportable products have been largely unexplored. However, an oil refinery was established in 1965 with a capacity of 60,000 barrels per day. Construction is now underway for a second refinery with planned capacity of 50,000 barrels per day.

In addition, allocations were made in the Second Plan for establishing a petro-chemical complex (£2.7 million), a liquefied petroleum gas plant (£1.3 million), and a nitrogenous fertilizer complex (£5.0 million). However, none of these projects has actually been undertaken and as of July 1973 a feasibility study was being undertaken only in connection with the fertilizer project.[9]

The position of petroleum in Nigeria, therefore, corresponds in essence to that of copper in Zambia. It seems desirable, therefore, to assign a row to petroleum production alone. For one thing, government revenues from petroleum are increasing more rapidly than production. This is demonstrated dramatically by recent events in the industry. The (volume) index of production rose from 100 in 1970 to 199 in 1974. In comparison, the posted price on which the calculation of taxes, royalties, etc. is based was U.S. $2.42 per barrel in 1970. New agreements were reached in 1971 raising this to $2.78 per barrel and increasing the tax rate to 55 percent from 50 percent. The posted price was raised to $8.310 per barrel in October 1973 and again in January 1974 to $14.69 per barrel. Thus a function describing the relationship of the petroleum industry to government revenue is non-linear.

Secondly, estimates of the coefficients relating to the performance of the petroleum sector are highly accurate because of its overall importance. For instance, the Central Bank has a rather detailed annual analysis of petroleum sector accounts.

Thirdly, petroleum production can hardly be said to be determined within the economy. Exports generally depend moreon the behaviour of the foreign consumer. Furthermore, the production process is effectively controlled by expatriates both in terms of ownership of capital and in terms of managerial control.

At this stage, it is not necessary to assign a column to petroleum production. As stated above, forward linkages are insignificant. There are possibilities for transforming crude oil and associated gas into other exportable products: the synthesis of methyl alcohol as an input in the manufacture of resins, plastics and acetate; the synthesis of acetylene for use in the manufacture of plastics of the vinyl acetate type; the synthesis of ammonia for subsequent production of nitrogenous fertilizers and urea; and the production of elemental hydrogen for use in organic chemical industries. These industries are highly capital intensive. Exploring these possibilities involves two things: (1) what is the target market? (2) how much of the machines needed in these industries should be produced domestically. When planners give serious consideration to these questions regarding the integration of petroleum into the economy, it may become necessary to assign a column to petroleum production. Meanwhile since petroleum is not used as an input except in oil refining, the immediate questions relate to how much revenue and foreign exchange it can generate.

Industrialization in Nigeria is of very recent origin. There was hardly any industrial activity before the end of World War II. This was not for lack of raw materials, labour or markets but because the economic structure was controlled by large foreign trading houses. These houses, led by the British United African Company, dominated the purchase and export of raw materials and the import and distribution of industrial goods. They were supported by the Colonial government in their rejection of industrialization to protect their trading interests.[10]

After World War II, the government started to promote industrial activity through fiscal incentives and tariff protection. Thus the share of modern manufacturing was 0.5 percent of GDP in 1950. Okigbo estimates that the average annual growth rate of modern manufacturing was 19.7 percent in constant 1957 prices from 1950-1957. The Federal Office of Statistics estimates it at 13.6 percent in constant 1962 prices from 1958 to 1967.[9] After 1967 modern manufacturing is not separated from "Crafts" in national account figures. However, it is still instructive to note that the average annual growth rate for "Manufacturing and Crafts" was 14.6 at 1962 factor cost from 1968 to 1973.

In 1973, the share of manufacturing and crafts was still only 7.6 percent of GDP. According to the World Bank only about 30 percent of this value added was retained in Nigeria.[11] This is not surprising since the industry is still predominantly foreign-owned and controlled. In a detailed study of Nigerian manufacturing, Schatzl found that foreign investors participate in 75 percent of all incorporated companies and have a controlling interest in 63 percent.[12]

There has been very little diversification in Nigerian manufacturing. In 1970, 36.1 percent of value added in manufacturing originated in the food, drink, and tobacco industries, while textiles account for another 24 percent. On the other hand, basic industrial chemicals, metal and metal products, and machinery and equipment accounted for 0.4 percent, 6.5 percent and 0.2 percent respectively.[13]

There are several problems to be dealt with in planning manufacturing. The limits of import substitution may have been reached in several branches of manufacturing, such as the manufacture of cigarettes, beer, matches, etc. In addition to diversifying into other areas, mainly intermediate and capital goods production, planners have to start thinking in terms of penetrating the international market for Nigerian made consumer goods.

Secondly, the contribution of manufacturing to employment is very small. About 93,000 or approximately 0.4 percent of persons gainfully employed in Nigeria in 1969 were employed in modern manufacturing.[14] Against this must be considered the growing unemployment situation. Comprehensive data on employment are not available. However, rough World Bank estimates place a probable upper limit of 300,000 on the annual increase in the urban labour supply. It is not expected that urban demand for labour can cope with this increase. Since manufacturing accounts for only 17.1 percent of urban employment, it cannot be expected to alleviate the unemployment problem.

In the construction of the input-output table, disaggregation of the manufacturing sector should reflect some of these problems. This is why we have attempted to separate "traditional" and "modern" manufacturing as in the case of "Textiles and Apparel". The same product is sometimes

produced under widely different factor proportions, (Cf. Chapter III). Government policies towards these activities will likely be different, in view of the need to raise productivity in crafts and the possibility of taking advantage of its labour-intensive techniques.

The line is drawn between externally and domestically directed activity because of the need to take into account both the type of production unit and the proportion of inputs imported. Whereas most modern manufacturing takes place in large scale units, traditional manufacturing is very small scale. We also see that whereas imports as a proportion of total inputs is 21 percent in domestically directed manufacturing, it is 47 percent in externally directed manufacturing.

Although this has not been taken into account in Table 6.1, it must be mentioned that modern manufacturing is typically urban-based. On the other hand, traditional activity is "footloose".

Agriculture has remained basic to Nigerian development despite the rapid growth of petroleum mining and manufacturing. The development of the whole economy cannot drastically outstrip the development of a sector which still produces about half the country's income and employs three-quarters of its population.[15] Nigeria's agricultural sector is characterized at present by small production units of less than three acres on the average, on which are produced both cash and subsistence food crops. Production is with elementary tools, and power equipment and machinery are almost nil. The use of chemical fertilizers of all kinds is minimal. The highest average is five pounds per acre in 1967. The degree of land-utilization is still very low, being no more than 11-16 percent of the land potentially suitable for agriculture.[16] For instance, the middle belt area which covers

approximately 75 million acres of the 179 million acres judged to be potentially suitable for farming is under-populated and under-farmed. This is mainly because the area is highly tsetse-fly infested.

Nevertheless, Nigeria is still the world's largest exporter of groundnuts. Until recently, it also led in the export of oil palm products. It ranks as the second largest cocoa exporter. These products plus rubber and cotton accounted for 30 percent of total exports in 1970. However, world demand for agricultural exports is projected to rise slower than world supply. Unless supply in Nigeria is expanded substantially, total earnings from these products will decline because of the expected price declines.[17]

On the other hand, food production hardly keeps pace with population growth, especially because the growth of the industrial sector is attracting but not absorbing increasing numbers from the rural areas. Yet demand for such products as sugar, animal products and fish can be expected to rise in response to population growth, urbanization and rising incomes. Incomes are still at such a low level that moderate increases are likely to give rise to greater demand for Engel's "noble" products. Also increased education tends to make people more aware of health and nutrition requirements.

These, and the need to correct the discrepancy between nutritional needs and the prevailing level of food production, imply planning agriculture away from export specialization towards the long run needs for food.

The planned transformation of agriculture is of utmost importance in Nigeria. In the first place, this is the sector in which most of actual production occurs. Even if agriculture tends to become

skill- and capital-intensive in the long run, relatively simple technological improvements can raise productivity significantly in the short run. In this respect, one thinks of the adoption of measures to control plant diseases and pests, the establishment of artificial insemination centres and the widespread distribution of improved seeds and fertilizers. In addition, the adaptation of the implements and the plant and animal breeding methods used in temperate regions is feasible. Thirdly, it is expected that greater agricultural specialization would result from the methods adopted to integrate the economy.

An accounting basis for assessing the structure and development of agriculture requires a disaggregation of the sector by crops. The advantage of disaggregation by crop rather than by type of production unit is that the former will better reflect the adoption of new technology.[18] Also, there is really no need to disaggregate by type of production unit since large scale farming is insignificant in Nigeria. In addition, expected specialization refers more to crop than to production unit. A disaggregation by crop would make it easier to pursue sector-specific policies; for instance, research funds and results can be more easily tied to particular sectors. This is all the more important in view of the need to integrate planned agriculture and planned industry. Here, initially, the judgment of agronomists would probably be an invaluable supplement to agricultural censuses. In fact, it may be the only way to start in Nigeria since there are no comprehensive agricultural data. At the very least, a distinction must be made between agricultural production for local consumption and export crop production. This, we have illustrated by aggregating the production and processing of export crops and separating it from agricultural

production mainly for local consumption.

The disaggregation of agriculture indicates that those industrial sectors to be based on agricultural raw materials should be isolated. It is necessary here to distinguish those industries simply processing for exports from those which will be processing agricultural raw materials for use in domestic manufacturing. Also indicated is the need to specify the type of industries that would produce the necessary agricultural inputs. One can immediately think of a distinction between the production of chemicals and the production of implements. In addition to this, it would probably be necessary to consider how far the inputs used in the indicated industrial projects can be based on domestic resources. This applies not only to raw materials but also to the choice of technique.[19]

Since most of the machinery needed in the industries indicated will be imported, at least initially, imports will play at least as basic a role in a modified table for Nigeria as it does in Seers' system. The Zambian system distinguishes between the intermediate imports of a sector and the imports of finished goods similar to those produced in the same sector. This distinction is important in estimating import duties since it allows for the different rates at which imports are taxed both according to use and according to sector.

The estimation of future import requirements from an input-output table generally requires the assumption that past coefficients are valid for the future. However, the establishment of a new set of industries changes the past relationship between inputs and outputs. In addition, since input-output coefficients are normally expressed in value terms, a change in the price of imports changes import coefficients in relation to

domestic input coefficients.[20] The building of an input-output table from micro-project analysis does not require this strong assumption, at least in principle, since anticipated imports are calculated directly. It is then possible to concentrate at the semi-aggregate level on the structure of tariffs since it is the allocation of imports to sectors that is important at this stage.

In addition to imports, three other intermediate inputs were allocated in the modified Zambian table. These are Transport and Communications, Electricity and Water, and Distribution. In addition to these, construction should be allocated in the Nigerian context. The importance of construction shows in the fact that it contributed 7.7% of GDP in 1973 (compared to 7.6% for manufacturing and crafts), and accounted for 66.4% of gross capital formation in the same year. In addition, its share in total wage employment averaged just over 22% from 1960-1970, second only to services (including government service), 31%.[21] The importance of construction is not confined to these direct contributions. Because of the various activities ancillary to construction and the demand for construction services in every sector, the effects of construction activity radiate to every phase of the economic structure. Furthermore, a demand for construction services is implied in the previous discussion of needs. The provision of adequate shelter obviously implies a certain level of construction activity. Here the results of construction activity can provide real evidence of an improvement in material well-being.

The construction industry in Nigeria is characterised by a high dependence on imported materials - currently over 50 percent.[22] However, the material input mix can be varied to conform more to the

endowment of natural resources. As Table 6.2 shows, purely local materials account on the average for only 21 percent of materials cost. But the study from which the table was derived also found a tendency "for new expatriate recruits to the architectural profession ... to rely too much on products originating in their native country ... regardless of the suitability to prevailing climatic and similar conditions".[23] The main point, however, is that construction is an important intermediate input, the structure of which can be made to conform with a general orientation of the economy towards maximizing the use of domestic natural endowments.

In the Second Plan, national value added emerged as an important criterion for assigning priorities to projects in the private sector.[24] Unfortunately, this criterion does not distinguish between types of value added. Thus it would seem satisfactory to planners if domestic owners replace expatriates even if techniques of production are not changed to reflect actual factor scarcities. Nevertheless, the concept of national value added implies a disaggregation of value added in a way similar to Seers'. It would be expected considering "Employee Income", for instance, that the ratio of expatriate earnings to output over time may be expected to approach a positive constant. It should be recalled that independent estimation of these kinds of relationships was attempted in Zambia.

To summarise, we have stressed the importance to the construction of an input-output table of the way the economy is viewed. If the table is to be used as a quantitative aid to planning, certain considerations have to be taken into account. Biasing consumption profile towards the needs of the majority implies a certain type of production. The desired

Table 6.2

Average (weighted) of Building Materials by Commodity Groups
(Percentage Distribution)

Materials by Commodity Group	% of Total Material Cost
A. Local Materials	
1. Sand	3.7
2. Gravels, stone, laterite, etc.	7.5
3. Timber, plank, wood, etc.	9.9
B. Manufactured Materials	
4. Cement	19.7
5. Structural metal parts	15.8
6. Asbestos - cement products	5.3
7. Bricks, blocks and fire clays	2.2
8. Steel doors and windows	7.8
9. Aluminum galvanised and other metal parts	4.8
10. Glass	2.4
11. Structural clay products	3.7
12. Floor tiles	4.6
13. Electrical materials fittings and equipment	2.5
14. Paints, varnishes and waxes, etc.	5.4
15. Navic louvre window frames	1.5
16. Residual (i.e., unallocated)	3.2
Total =	100.0

Source: G.A. Ogunpola: A Structural Analysis of the Building Industry in Selected Areas of Western Nigeria (A Dissertation submitted for the Degree of Master of Science in Economics of the University of Ibadan, December, 1967).

production profile must consider questions relating to the integration of petroleum production to industry and the integration of these two with agriculture. Because petroleum earns much of the foreign exchange, the usual agriculture versus industry questions of development must be viewed slightly differently in Nigeria. A serious attempt can be made to integrate the economy before petroleum reserves are depleted. In fact the question of the rate of exploitation of oil cannot be separated from that of minimizing the costs of Nigerian development. Although it may be hard to alleviate the dependence on imports in the short run, the structure of imports can be made more conformable to long run requirements.

To use the format suggested in Table 6.2 in the planning process, information about the distribution of value added, about consumption by income group, and about import dependence would be necessary. Besides these, it would be necessary to obtain suitable technical coefficients of an input-output nature from domestic research stations and/or other countries at a similar state of development. These would be necessary in determining how new industries can be integrated into the input-output framework to simulate changes that would disrupt the existing structure. At the initial stage, the usefulness of the input-output table does not depend on its sophistication. It depends more on how the planners delineate and incorporate "the exchange linkages through which the microcosms of households, farms and firms are aggregated to produce the resource allocations, the capital-output ratios and the target output".[25] The beginning of a search for such information has only just begun. It is to be hoped that those most intimately involved with planning Nigeria's development are aware of the potential of Seers' approach.

FOOTNOTES TO CHAPTER VI

[1]The Central Planning Office, Federal Ministry of Economic Development and Reconstruction, Guidelines for the Third National Development Plan, 1975-1980, Lagos: 1974, p. 7.

[2]The term "informal sector" was introduced in an ILO report on Kenya. It was given a fairly broad definition. The informal sector is characterized by: ease of entry; reliance on indigenous resources; family ownership of enterprises; small scale of operation; labour-intensive and adapted technology; skills acquired outside the formal school system; unregulated and competitive markets. See, ILO, Employment, Incomes and Equality, A Strategy for Increasing Productive Employment in Kenya, Geneva: 1972.

[3]The Central Planning Office, Federal Ministry of Economic Development and Reconstruction, Second National Development Plan, 1970-74, Second Progress Report, Lagos: 1974, p. 103.

[4]Ibid.

[5]Ghosh, A., Experiments with Input-Output Models, Cambridge University Press, 1964, p. 112.

[6]Cf. Van Arkadie, B., and C. Frank, Economic Accounting and Development Planning, Nairobi: Oxford University Press, 1966. Chapter VII.

[7]I.B.R.D., Nigeria, Options for Long Term Development, Baltimore: The Johns Hopkins University Press, 1974, p. 70.

[8]Schatzl, L., Industrialization in Nigeria: A Spatial Analysis, Munich, Weltforum Verlag, 1973, p. 25.

[9]Cf. Central Planning Unit, Guidelines .... op. cit., p. 23.

[10]Cf. Schatzl, op.cit., p. 28 and references cited therein.

[11]I.B.R.D., op. cit., especially pp. 34-46.

[12]Schatzl, op. cit., especially pp. 34-46.

[13]Central Planning Unit, Guidelines ... op. cit., pp. 18-19.

[14]Schatzl, op. cit., pp. 41-42. By 1969, virtually all industrial activity had stopped in the then Eastern Region because of the civil war. Schatzl contends, however, that this was more than offset by a compensatory increase in industrial activity in those parts of the country not directly affected by the war.

[15]I.B.R.D., op. cit., Chapter 7.

[16]Ibid.

[17]Ibid.

[18]This means that the different crops can no longer be regarded as perfectly substitutable in all industrial uses, which is what is implied when all of agriculture is put in one sector. In fact, in the strict input-output framework, it is now assumed that one crop cannot be substitued for another in industrial usage.

[19]The choice of technique is a complex question. However, Joan Robinson has suggested two interesting rules of thumb. "First, no equipment should be scrapped or methods of production rejected so long as the materials used with them and the labour operating them cannot find a better use elsewhere... Second, no technique should be chosen simply because it gives employment. The object of the operation is not to be able to court up the largest total of statistical employment but to increase production". Robinson, J., Economic Philosophy, Penguin Books, 1962, p. 115.

[20]For a discussion of these and related matters, see Elesh, G.E., The Use of Input-Output Models in Calculating Foreign Exchange Requirements in Medium-Term Plans with Some Emphasis on the Developing Countries. Paper presented at the first International Seminar on Development Planning, Ankara; Turkey, pp. 6-17, September, 1965 (mimeographed).

[21]Ogunpola, G.A., The Structure of Building Costs and its Implications for Economic Development, Department of Economics, University of Lfe, 1974, (mimeographed).

[22]Ibid.

[23]Ibid., p. 7.

[24]Cf. Kayode, M.O., "The Development Plan and the Control of the Private Sector", Quarterly Journal of Administration, April, 1972, pp. 323-332. See also pp. 41-43 above.

[25]Mackenzie, W., The Economics of Relevance, a paper presented at the Conference of the Canadian Association of African Studies, York University, Toronto, pp. 19-22, February, 1975, p. 5.

CHAPTER VII

CONCLUSION

The method adopted in this study has been to state the argument at the outset and then develop it stepwise. Consequently, no great revelation has been reserved for this chapter. Here, we merely recall, briefly, the main points of interpretation and the general implications for planning in Nigeria.

The dominant view of the problem of underdevelopment emphasizes an increase in national income; this is the view "formalized in the target of 5 percent growth rates set for the first development decade".[1] A concentration on this index and a non-cognition of the goal of structural transformation in Nigeria has produced results which distort the socio-cultural matrix without really improving the lot of the majority of the people. The assumption seems to have been implicit in Nigerian planners' logic that the relationship between sectors is fundamentally competitive. As John Cownie argued, the relationship between sectors is competitive if it can be safely assumed that resources are fixed and general, in the sense of being freely transferable between sectors.[2] However, if one chooses to emphasize (1) the dependence of development on the quantity of domestic resources which are mobilized to partake in the process, and (2) the "particularity" of existing resources, intersectoral complementarities become paramount. Because the majority of people are in the rural sector, industrial expansion would depend on that sector for markets. The generation of purchasing power in the rural sector depends on agriculture becoming more productive.

We saw in Chapter II, however, that plan biases in Nigeria produced a greater fragmentation of the economy and did not achieve the integration of the modern sector with the traditional sector into a national market. In the process, however, the planners seemed to have recognized the need for an integrative planning framework. But any analytical macro framework is merely a systematic approach to solving a problem as recognized by the planners. If the problem is seen mainly in terms of a desired growth rate, the preferred analytical tool will be designed in this context. Because of the unidimensional emphasis on growth in the 1962-68 plan, the input-output table that was designed following this plan, focussed on those sectors that were growing fastest.

Chapter III looked into the relevance of input-output analysis for less developed countries. It also examined the relationship of Nigeria's input-output table to the planning process. It was argued that the sectors accorded a detailed description agreed well with the planners' emphasis on growth. It was further argued that since pushing the fastest growing sectors was not equivalent to planning structural transformation, an input-output table designed to facilitate analysis for structural transformation involves a modification of the conventional blueprint.

To understand the relationship of Carter's table to the problem of structural transformation, we undertook an analysis of the structure of the Nigerian economy as portrayed in the input-output table in Chapter IV. Various indices were calculated. These would give a good static picture of the structure of production since they reveal the nature and extent of existing linkages. However, this information depends on how the sectors have been classified. Therefore, the classification of economic activities

should itself identify those activities with which planners have to deal in order to change the picture. In this context, the planning process and the process of data collection are intimately related and have to be recognized as such. The restrictions imposed by the Nigerian table on planning structural transformation became evident in further discussion of the place of the table in this context.

To highlight the relationship between the design and use of an input-output table, a comparative study was undertaken in Chapter V. A modified input-output system designed for Zambia in a broader planning context was examined. This was seen to have better recognized the problem of structural transformation. It was seen then that the idea of an accounting system within which a large number of variables and assumptions can be coordinated is the basic contribution of input-output analysis in the context of development planning. Beyond this, the real problem is to determine how the cells of the matrix should be filled. For this, a historical input-output system provides a relatively small contribution.

In Chapter VI, Seers' alternative was reassessed in Nigerian terms. It was seen that it made sense to focus on interdependencies other than the inter-industrial ones. It was contended that a modified system for planning development would do well to highlight the importance of sectors in relation to the planners' objectives. Thus Carter's table was reclassified to illustrate lines along which a modified system for Nigeria should go. The chapter offered an analysis of the current Nigerian economic situation to provide perspective on this suggestion.

If this study is to have a moral, it would be that there is an urgent need for planners in Nigeria to re-evaluate their view of the development process. The mere juxtaposition of ideal "developed" and "underdeveloped"

types will help neither to produce meaningful information on economic relations at the rural level nor to fill the boxes of an input-output table. Statistical effort must be redirected towards grass roots problems in order to produce figures necessary for planning. At the same time, there is an immediate need to articulate a development ideology in terms of which planning objectives can be derived meaningfully. The full significance of a plan cannot be known until its relationship to the majority of the people is made clear. The planning authorities must identify those who in their view stand to gain from planned changes.

FOOTNOTES TO CHAPTER VII

[1]Seers, Dudley, "The Meaning of Development", International Development Review, Vol. XI, No. 4, December 1969, p. 2

[2]Cownie, John, "Agriculture, Domestic Manufacturing and Structural Transformation: Assessing Economic Development", African Studies Review, Vol. 17, No. 1, April 1974, pp. 123-131.

APPENDIX 1-A

TEN-YEAR DEVELOPMENT PLAN FOR NIGERIA

SUMMARY OF ESTIMATED TOTAL EXPENDITURE - 1946-47 TO 1955-56

	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56	Total Estimated Cost
	£	£	£	£	£	£	£	£	£	£	£
plies	153,500	248,500	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	4,002,000
plies	210,000	250,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	4,060,000
t -											
xpenditure	266,000	475,000	585,000	585,000	605,000	605,000	605,000	605,000	625,000	625,000	5,581,000
ce of New Roads	6,300	22,400	51,300	85,500	121,400	159,000	197,600	325,800	273,000	313,000	1,465,300
elopment	187,400	476,800	216,000	97,000	111,800	256,400	60,300	50,700	50,800	37,000	1,544,200
ons Development	50,000	50,000	80,000	80,000	80,000	80,000	100,000	100,000	100,000	100,000	820,000
ient -											
Staff	24,368	24,368	29,534	34,274	35,804	36,650	37,724	39,254	40,214	41,174	351,740
	49,000	49,000	89,250	82,250	84,250	70,250	50,250	47,250	44,250	25,200	624,200
and Vessels	737,500	537,000	260,000	7,500	-	(200,000)	(200,000)	(200,000)	(200,000)	(200,000)	2,542,000
asures, Lagos	20,000	24,000	24,000	24,000	22,000	-	-	-	-	-	114,000 *
lth Services	102,609	156,744	215,972	281,424	363,015	577,879	657,804	821,470	878,861	1,006,999	5,062,777 †
	83,530	96,140	104,280	98,220	100,000	100,000	100,000	100,000	100,000	100,000	982,440
General Education	(306,300)	(382,100)	(387,000)	(409,400)	(416,800)	(423,200)	(405,500)	(385,440)	(441,580)	(492,420)	4,058,740 †
Technical Education	63,832	74,495	92,448	104,515	107,238	129,880	118,286	147,763	137,940	139,056	1,115,453
e Bureau											
poration	93,000	28,350	13,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	152,350
velopment	69,074	88,148	105,852	157,206	175,710	190,784	233,308	250,282	268,056	285,280	1,823,700
lopment	52,020	64,040	73,205	64,195	53,315	52,535	52,605	52,025	51,785	64,070	579,795
pment	16,500	40,670	43,462	58,870	73,825	88,296	104,850	119,109	134,280	146,274	826,136
istries											
Organization only)	12,000	12,000	(12,000)	(12,000)	(12,000)	(12,000)	(12,000)	(12,000)	(12,000)	(12,000)	120,000
opment	15,400	16,940	21,940	24,480	18,070	12,000	12,000	12,000	12,000	12,000	156,830
Peasant Textile Industries	21,325	37,400	13,850	13,690	13,970	10,000	10,000	10,000	10,000	10,000	143,235
Organizations	32,000	32,000	(40,000)	(40,000)	(40,000)	(40,000)	(40,000)	(40,000)	(40,000)	(40,000)	384,000
pment & Welfare Assistance											
g & Village Reconstruction	20,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	332,000 ±
icers	49,525	71,575	53,250	75,800	105,350	80,350	83,050	86,350	89,350	180,900	895,500
nch	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	100,000 §
mme for Development	212,800	324,500	412,000	635,500	1,041,500	1,271,500	1,272,500	1,283,000	1,276,000	1,305,000	9,034,300
ss Service	28,070	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	469,070 ‖
m Old Colonial Development											
es not yet completed	22,100	3,000	3,000	-	-	-	-	-	-	-	28,100
ning School	11,950	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	(10,000)	101,950
nt Schemes	250,000	250,000	250,000	250,000	250,000	(150,000)	(150,000)	(150,000)	(150,000)	(150,000)	2,000,000
nterest & sinking fund)	70,769	150,424	212,267	268,241	335,365	419,649	492,976	563,417	634,539	711,336	3,858,983
£	3,246,872	4,127,280	4,408,320	4,494.565	5,171,912	5,979,873	6,001,253	6,316,360	6,575,155	7,008,209	53,409,799

shown in parenthesis are very tentative and are not, in all cases, the results of any close calculations.

of maintenance and pumping sand
enditure under Local Development
ion of scheme formerly assisted under Colonial Development and Welfare Act.
of Buildings
of Cost of Census in 1951

evelopment Plan for Nigeria, 1946.

APPENDIX 1-B

AGRICULTURE DEVELOPMENT SCHEME IN THE TEN-YEAR PLAN

SUMMARY OF ESTIMATED EXPENDITURE

1947-48	1948-49	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56	Estimated Total Cost
Ł	Ł	Ł	Ł	Ł	Ł	Ł	Ł	Ł	Ł
16,900	23,300	29,700	38,100	43,300	50,500	57,700	64,900	72,100	406,400
2,160	2,820	3,480	4,140	4,740	5,340	5,940	6,540	7,140	43,800
2,400	3,280	4,160	5,040	5,840	6,640	7,440	8,240	9,040	53,520
13,998	21,222	28,096	35,120	41,994	49,318	56,192	63,666	70,690	387,220
5,520	7,280	11,040	13,800	16,560	19,320	22,080	24,840	27,600	150,800
32,860	30,440	61,020	57,600	54,240	75,880	72,520	61,160	65,800	555,860
73,838	88,342	137,496	153,800	166,674	206,998	221,772	237,346	252,370	1,597,600

APPENDIX 1-B (cont'd)

	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56	Estimated Total Cost
	£	£	£	£	£	£	£	£	£	£	£
B. PRODUCE INSPECTION STATION - Staff											
4. Trained European Staff											
Salaries and Allowances	4,300	5,300	6,300	7,300	8,300	9,300	10,300	11,300	12,300	13,300	88,000
5. African Staff											
Salaries and Allowances	1,200	2,400	3,600	4,800	6,000	7,200	8,400	9,600	10,800	12,000	66,000
6. Recurrent Expenditure (Local Transport and Travelling, Labour and Office and General)	2,000	3,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	37,000
£	7,500	10,700	13,900	16,100	18,300	20,500	22,700	24,900	27,100	29,300	191,000
C. AGRICULTURAL SCHOOL											
7. European Staff (1 Assistant Director) -											
(a) Salaries	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	12,000
(b) Passages	80	80	80	80	80	80	80	80	80	80	800
8. African Staff (2 Masters) -											
(a) Salaries	300	300	300	300	300	300	300	300	300	300	3,000
(b) Passages	30	30	30	30	30	30	30	30	30	30	300

APPENDIX 1-B (cont'd)

	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56	Estimated Total Cost
	£	£	£	£	£	£	£	£	£	£	£
9. Recurrent Expenditure (Local Travelling and Transport, Labour, Office and General, etc.)	1,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	19,000
£	2,610	3,610	3,610	3,610	3,610	3,610	3,610	3,610	3,610	3,610	35,100
TOTAL AGRICULTURAL DEVELOPMENT SCHEME £	69,074	88,148	105,852	157,206	175,710	190,784	233,308	250,282	268,056	285,280	1,823,700

Source: Ten-Year Development Plan for Nigeria.

Aboyade, O. "A Note on External Trade, Capital Distortion and Planned Development", in eds. Stewart, I.G., and Ord, H.W., African Primary Products and International Trade, Edinburgh University Press, Great Britain; 1965.

--------. Foundations of an African Economy. New York: Praeger, 1966.

--------. "A General Critique of the Plan", NJESS, July, 1962.

--------. Incomes Profile. University of Ibadan Inaugural Lectures, Ibadan: University Press, 1973.

--------. Incomes Structure and Economic Power. Presidential Address, Conference of the Nigerian Economic Society, April, 1974, Mimeographed.

Abramovitz, M., et. al., eds. The Allocation of Economic Resources. Stanford: Stanford University Press, 1959. Reprinted 1968.

Adedeji, A. Nigerian Federal Finance. London: Hutchinson, 1969.

--------. "Federalism and Development Planning in Nigeria", Ch. 3 in Ayida, A., and H.M.A. Onitiri, eds., Reconstruction and Development in Nigeria, Ibadan: Oxford University Press, 1971.

--------. (Federal Commissioner for Economic Development and Reconstruction), Foundation for Sound Development, Lagos: Federal Ministry of Information.

Adelman, I., and C. Morris, Society, Politics and Economic Development, Baltimore: Johns Hopkins Press, 1967

--------., and E. Thorbecke, eds. The Theory and Design of Economic Development. Baltimore and London: Johns Hopkins, 1966.

Akinyotu, Adetunji. A Bibliography on Development Planning in Nigeria, 1955-1968, Ibadan: Nigerian Institute of Social and Economic Research, 1968.

Aluko, S.A. "Industry in the Rural Setting", in Rural Development in Nigeria, Proceedings of the 1972 Annual Conference of the Nigerian Economic Society, Ibadan: Ibadan University Press, 1973, pp. 213-236.

Arrow, K.J. "Import Substitution in Leontief Models", Econometrica, XXII (October, 1954).

Arrow, K.J. et. al. "Capital-Labour Substitutions and Economic Efficiency", Review of Economics and Statistics, Vol. 43, August 1961.

Ashby, Sir Eric et. al. Investment in Education: The Report of the Commission on Post-School Certificate and Higher Education in Nigeria, Lagos: Federal Ministry of Education, 1960.

Ayida, A.A., and H.M.A. Onitiri, eds. Reconstruction and Development in Nigeria. Ibadan: Oxford University Press, 1971.

Balderston, J.B., and T.M. Whitin. "Aggregation in Input-Output Models". In O. Morgenstern, ed., Economic Activity Analysis, New York: Wiley, 1954.

Balewa, Sir Abubakar, Nigeria Speaks, London: Longman, Green and Co., Ltd., 1964.

Barna, T., ed. Structural Interdependence and Economic Development. London: McMillan, 1963.

--------. The Structural Independence of the Economy: Proceedings of an International Conference on Input-Output Analysis, New York: Wiley, 1954.

Bergsman, Joel and Alan Manne. An Almost Consistent Intertemporal Model for India's 4th and 5th Plans. Reprint No. 36, Research Centre in Economic Growth, Stanford University, Stanford University, Stanford, 1971.

Bhagwati, J. and R.S. Eckaus, eds. Development and Planning. George Allen and Unwin Ltd., London: 1972.

Bhambri, R.S. "Second National Development Plan", Nigerian Journal of Economic and Social Sciences, Vol. 12, No. 2, July, 1972.

Bhatia, R.J., and P. Engström. Nigeria's Second National Development Plan: A Financial Analysis, IMF, Staff Paper, Vol.XIX, No. 1, March, 1972.

Birmingham, W., and A.C. Ford, eds. Planning and Growth in Rich and Poor Countries. George Allen and Unwin, Ltd., London: 1966.

Blin, Jean Marie and Frederic Murphy. Intersectoral Interdependence and Dominance in Input-Output Systems, Discussion Paper No. 34, M.I.T., 1973.

Bognár, József. Economic Policy and Planning in Developing Countries, Akadémiai Kiadó, Budapest: 1968.

Bródy, A., and A.P. Carter, ed. Input-Output Techniques. Proceedings of the Fifth International Conference on Input-Output Techniques, Geneva, January, 1971. Amsterdam: North-Holland, 1972.

Bruno, M. "A Programming Model for Israel", in eds, I. Adelman and E. Thorbecke, The Theory and Design of Development. Baltimore: John Hopkins, 1966.

--------. "Optimal Patterns of Trade and Development", Review of Economics and Statistics, XLIX (1967), 545-554.

--------. "The Optimum Selection of Export Promotion and Import Substituting Projects", in U.M., Planning the External Sector: Techniques, Problems and Policies, New York: 1967.

Burgess, C. Input-Output Analysis and Resource Allocation. London: Cambridge University Press, 1968.

Byerlee, D. Indirect Employment and Income Distribution Effects of Agricultural Development Strategies, A Simulation Approach Applied to Nigeria, African Rural Employment Paper No. 9, Michigan State University, Michigan: 1973.

Carter, Nicholas C. An Input-Output Analysis of the Nigerian Economy 1959-60, M.I.T., Working Paper 29-63, School of Industrial Management, 1963.

Carter, A.P. Structural Change in the American Economy, Cambridge: Harvard University Press, 1970.

Carter, A.P., and A. Brody, eds., Applications of Input-Output Analysis. Proceedings of the Fourth Conference in Input-Output Techniques, Geneva, 1968, Amsterdam: North-Holland, 1970.

Chakravarty, S. The Logic of Investment Planning, Amsterdam: North-Holland, 1959.

--------. Capital and Development Planning, Cambridge: M.I.T. Press, 1969.

Chen, Nai-Ruen. An Analysis of Dualistic Development with Reference to the Commercial Economy, Working Paper No. 22, Department of Economics, Cornell, undated.

Chenery, Hollis B. Notes on the Use of Models in Development Planning, Economic Development Report #138. Centre for International Affairs, Harvard University, Massachusetts: July, 1969.

--------. Ed., Studies in Development Planning, Cambridge, Massachusetts: Harvard University Press, 1971.

Chenery, Hollis B., and P.C. Clark. Interindustry Economics, New York: Wiley, 1959.

Chenery, Hollis B. Interdependence of Investment Decisions in Abramovitz, M. et. al., Allocation of Economic Resources, Stanford University Press, 1959.

Chenery, Hollis B., and T.B. Watanabe. "International Comparison of the Structure of Production", Econometrica, October, 1958. Pg. 487-521.

Chenery, Hollis B., and K. Kretschmer. "Resource Allocation for Economic Development", Econometrica, XXIV (1956), 355-399.

Clark, P.B. Planning Import Substitution, North-Holland Publishing Co., Amsterdam: 1970.

--------. "Economic Planning for a Country in Transition: Nigeria", in Planning Economic Development, edited by E. Hagen. Richard Irwin, 1966. Ch. 9.

--------. "A Multi-Sectoral Strategy Paper for Nigeria", United States Agency for International Development, Mimeo, 1966.

Clark, P.B., A.R. Foxley, and J.U. Annamaria. "Project Evaluation Within a Macro-Economic Framework", in R.W. Eckaus and P.M. Rosenstein-Rodan, eds. Analysis of Development Problems, North-Holland Publishing Co., Amsterdam: 1973, Ch. 7.

Clark, P.B., and A.R. Foxley. "Target Shooting with a MultiSectoral Model" in R.S. Eckaus and P.M. Rosenstein-Rodan, ed. Analysis of Development Problems, North-Holland Publishing Co., Amsterdam: 1973, Ch. 13.

Cornelisse, P.A. Price Consistency in Development Planning, Rotterdam: Rotterdam University Press, 1973.

Cownie, J. Agriculture, Domestic Manufacturing, and Structural Transformation: Assessing Economic Development, African Studies Review, Vol. 17, No. 1, April 1974, Pg. 123-31.

Csikós-Nagy, Béla. Socialist Economic Policy. London: Longman Group, Ltd., 1973.

Cukor, G. "Use of Input-Output Tables in Long-Term Planning - Planning the Relations Between Industry and Foreign Trade", in eds. O. Lukács et. al., Input-Output Tables: Their Compilation and Use. Budapest: Akadémiai Kiadó, 1962.

Damachi, Ukandi G. Nigerian Modernization, The Colonial Legacy. Joseph Okpaku Publishing Co., Inc., New York: 1972.

Damachi, Ukandi G., and Hans Seibel, eds. Social Change and Economic Development in Nigeria. Praeger Publishers, Inc., U.S.A.: 1973.

Dean, Edwin. The Supply Response of African Farmers. North-Holland Publishing Co, Amsterdam: 1966.

--------. Plan Implementation in Nigeria, 1962-1966, Ibadan: Oxford University Press, 1972.

Dorfman, R., Paul Samuelson, Robert Solow. Linear Programming and Economic Analysis, New York: McGraw-Hill, Co., Inc., 1958.

Dosser, Douglas. "The Formulation of Development Plans in the British Colonies", Economic Journal, Vol. LXIX, June 1959, pg. 255-66.

Dunlop, J. and N.P. Fedorenko. Planning and Markets: Modern Trends in Various Economic Analysis. McGraw-Hill, Inc., U.S.A. 1969.

Eckaus, R.S., "The Factor Proportion Problem in Underdeveloped Areas", American Economic Review, September 1955.

Eckaus, R.S., and K.S. Parikh. Planning for Growth: Multisectoral Intertemporal Models Applied to India. Cambridge, Mass.: M.I.T. Press, 1968.

Eckaus, R.S., and P.M. Rosenstein-Rodan, ed. Analysis of Development Problems, North-Holland Publishing Co., Amsterdam, 1973.

Eckstein, O. "The Input-Output System - Its Nature and Use", In ed., O. Morgenstern, Economic Activity and Analysis, New York: Wiley, 1954..

(The) Economist: "Shaping Up"; Supplement on Nigeria. October 24, 1970.

Eicher, Carl K., and C. Leidholm, ed. Growth and Development of the Nigerian Economy. Michigan State University Press, 1970.

Ekundare, R.O. An Economic History of Nigeria, 1950-1960, London, Methuen and Co. Ltd., 1973.

Eleish, G.E. "Use of Input-Output Models in Calculating Foreign Exchange Requirements in Medium-Term Plans with Some Emphasis on the Developing Economies", Paper presented at the first Inter-regional Seminar on Development Planning, Ankara, Turkey: September 6-17.

Enthoven, A.J.H. Accountancy and Economic Development Policy. Amsterdam: North-Holland, 1973.

Evans, W.V., and M. Hoffenberg. "The Interindustry Relations Study for 1947", Review of Economics and Statistics, Vol. XXXIV, No. 2, May 1952.

F.A.O. Monthly Bulletin of Agricultural Economics and Statistics, 3. Vol. 20, March 1971; Vol. 22 (9), September 1973.

---------. Agricultural Development in Nigeria, 1965-1980, London: William Clowes and Sons Ltd., 1966.

Frank, A.G. "Sociology of Development and Underdevelopment of Sociology", in Cockroft, J.D., A.G. Frank and D.L. Johnson, Dependence and Development, New York: Doubleday and Co., Inc., 1972.

Frank, Charles R. Jr. Employment and Economic Growth in Nigeria, IBRD Mimeo, 1966.

Gamer, W.D. The Natural Gas Industry in Nigeria: A Prospectus, Research Paper No. 1, Alberta: University of Alberta, 1972.

G.A.T.T. Development Plan Studies - The First Six-Year Plan of Nigeria, Geneva: 1966.

Ghosh, A. "Input-Output Approach in an Allocation System", Economica, Vol. 25, February 1958.

--------. Experiments with Input-Output Modes: An Application to the Economy of the United Kingdom, 1948-55. Cambridge: University Press, 1964.

--------. Planning, Programming and Input-Output Models: Selected Papers on Indian Planning. London: Cambridge University Press, 1968.

Glowacki, J. Two Level Planning of Foreign Trade. Foreign Trade Research Institute, Warsaw, National Economic Planning. Great Britain: University of Birmingham, February, 1971.

Gupta, P. Planning Models in India; with Projections for 1975. New York: Praeger, 1971.

Hagen, Everett. Planning Economic Development. Richard D. Irwin, Inc., Illinois: 1963.

Hansen, B. The Economic Theory of Fiscal Policy. London: Allen and Unwin, 1958.

--------. Long- and Short-Term Planning in Underdeveloped Countries. Amsterdam: North-Holland Publishing Co., 1967.

Hansen, L.M. "Methods of Economic Programming and Analysis in the Plan", Nigerian Journal of Economic and Social Science, Vol. 4, No. 2, July 1962, pg. 104.

--------. "Comprehensive Economic Planning in Nigeria", Chapter 10, ed. Eicher, Carl K. and Liedholm, Growth and Development of the Nigerian Economy. Michigan State University Press: 1970.

Hanson, A.H. The Process of Planning. London: Oxford University Press, 1966.

Hatanaka, M. The Workability of Input-Output Analysis. Ann Arbor: Michigan University Microfilms, 1959.

Hawkins, D. and H.A. Simon. "Some Conditions for Macro-Economic Equilibrium", Econometrica, Vol. 17, pg. 245-248.

Hazari, B.K. "Empirical Identification of Key sectors", Review of Economics and Statistics, May 1970, pp. 304-305.

--------. "Interdependence of the Indian Structure of Production", Economia Internazionale, XXIV (1971), pp. 475-498.

Heesterman, A. Allocation Models and their Use in Economic Planning. Dordrecht, Holland: D. Reidel Publishing Co., 1971.

Helleiner, Gerald K. Peasant Agriculture, Government, and Economic Growth in Nigeria, Homewood, Illinois: Richard D. Irwin, Inc., 1966.

--------. "Typology in Development Theory: The Land Surplus Economy (Nigeria)", Food Research Institute Studies, Stanford University Vol. VI, No. 2, 1966.

--------. Peasant Agriculture, Development and Export Stability: The Nigerian Case, in eds. Stewart, I.G. and H.W. Ord, African Primary Products and International Trade, Edinburgh: Edinburgh University Press, 1965.

Hirschman, A.O. The Strategy of Economic Development, New Haven, Yale University, 1958.

Hopkins, A.G. An Economic History of West Africa. New York: Columbia University Press, 1973.

Idachaba, F.S. The Effects of Taxes and Subsidies on Land and Labour Utilization in Nigerian Agriculture, African Rural Employment Paper No. 7, Michigan State University, April 1973.

Iyoha, Milton . "Comment on Marketable Surplus and Growth in the Dual Economy", Discussion Paper No. 157, State University of New York, Buffalo: February 1971.

Johansen, Leif. "The Rate of Growth in Dynamic Input-Output Models" Institute of Economics, University of Oslo, July 1972.

--------. A Multisectoral Study of Economic Growth, Amsterdam: North-Holland Publishing Co., 1960.

Johnson, Gale. "Comments on Chapter 8 - Agriculture" in NBER. Conference on Research in National Income and Wealth: Technical Supplement, Princeton: Princeton University Press, 1954.

Kantorovich, L.V. The Best Use of Economic Resources. English Ed. Edited by G. Morton. Translated from the Russian by P.F. Knightsfield. Cambridge, Massachusetts: Harvard University Press, 1965.

Kayode, Femi. "The Development Plan and the Control of the Private Sector", Quarterly Journal of Administration, April 1972, pg. 323-332.

Kilby, Peter. Industrialization in an Open Economy: Nigeria 1945-1966. London: Cambridge University Press, 1969.

Koopmans, T.C., ed. Activity Analysis of Production and Allocation. New York: Wiley, 1957.

Korte, B., and W. Aberhofer. "Triangularizing Input-Output Matrices and the Structure of Production", European Economic Review, 11, Summer 1971.

Kubursi, A.A. Evaluating the Economic Impact of Government Expenditure by Department. An Application of Input-Output Analysis. Socio-Economic Planning Sciences, Vol. 8, Great Britain: Pergamon Press, 1974.

Kubursi, A.A., and R.H. Frank, "Sectoral Characteristics of the Ontario Structure of Production", Ontario: Department of Treasury and Economics: Ontario Economic Review, Special Supplement, March, 1972.

Lange, O. Essays on Economic Planning, Calcutta: Asia Publishing House, 1960.

Laurent, C.K. Agro-Industries in Nigeria, CSNRD 25, Nigerian Institute of Social and Economic Research, Ibadan: 1968.

--------, et. al. Agricultural Investment Strategy in Nigeria, CSNRD, 26, Nigerian Institute of Social and Economic Research, Ibadan: 1969.

Lawson, R. "Engel's Law and its Application to Ghana", Economic Bulletin of Ghana, Vol. 5, 1962.

Leontief, W. The Structure of the American Economy, 1919-1939, 2nd. Edition Enlarged. New York: Oxford University Press, 1966.

--------, et. al. Studies in the Structure of the American Economy, New York: Oxford University Press, 1953.

--------. Input-Output Economics, New York: Oxford University Press, 1966.

--------. "Recent Developments in the Study of Interindustrial Relationships", A.E.A. Papers and Proceedings, May 1949.

Lewis, W.A. Reflections on Nigeria's Economic Growth, Paris: OECD, 1967.

--------. Development Planning - the Essentials of Economic Policy. New York: Harper and Row, 1966.

Little, I.M.D., and J. Mirlees. Manual of Industrial Project Analysis (two volumes), Paris: OECD, 1968.

Little, I.M.D., Scitovsky, T., and Scott, M. Industry and Trade in Some Developing Countries, London: Oxford University Press, 1970.

Lukács, O., ed. Input-Output Tables. Budapest: Akadémiai Kiadó, 1962.

Machlup, F. Essays on Economic Semantics, Englewood Cliffs: Prentice-Hall, Inc., 1963.

Mackenzie, W.M. The Economics of Relevance, A Paper Presented at the Conference of the Canadian Association of African Studies, York University, Toronto: 19-22 February 1975.

--------. The Use of Aggregate Data in the Study of Agricultural Change: A Case Study of Uganda, 1955-67. Food Research Institute Studies, Vol. X, No. 1, 1971. Stanford University, Stanford: 1971.

Mackintosh, J.P. Nigerian Government and Politics. Evanston: North-Western University Press, 1966.

Malinvaud, E. "Aggregation Problems in Input-Output Models", in Barna, T. ed. The Structural Interdependence of the Economy. New York: Wiley, 1954.

--------, and Bacharach, M. ed. Activity Analysis in the Theory of Growth and Planning, New York: St. Martins, 1967.

Manne, A.S. Multi-Sector Models for Development Planning, A Survey, Technical Report No. 91, Institute for Mathematical Studies in the Social Sciences, Stanford University, 1973.

Manne, A.S., and T.E. Weisskopf. A Dynamic Multi-Sectoral Model for India, 1967-75. Reprint No. 68 in Applications of Input-Output Analysis, Carter, A.P., and A. Brady (Ed.), Amsterdam: North-Holland Publishing Co., 1970.

Manne, A.S., and A. Rudra. Consistency Model of India's Fourth Plan. Reprint 39 in The Indian Journal of Statistics, Series B, Vol. 27, Parts 1 and 2, 1965.

Manne, A.S. "Key Sectors in the Mexican Economy", 1962-72 in Adelman, I. and E. Thorbecke, ed. The Theory and Design of Economic Development. Johns Hopkins Press, Baltimore: 1966.

Meier, G.M. Leading Issues in Development Economics. New York: Oxford University Press, 1964.

Metzler, L.A. Taxes and Subsidies in Leontief's Input-Output Model. Quarterly Journal of Economics, LVII (1943-44), pp. 433-438.

Mohammed, G. "Sectoral Interdependence and Egypt's Investment Strategy" Unpublished Ph.D. Thesis, McMaster University, 1974.

Morgenstern, O. On the Accuracy of Economic Observations. Princeton, New Jersey: Princeton University Press, 1963.

---------, ed. Economic Activity Analysis, New York: Wiley, 1954.

Morishma, M., and M. Yasuo. An Input-Output System Involving Non-Transferable Goods. Technical Report No. 134, June 30, 1965. Stanford University, California.

Moore, F.T. "Regional Economic Reaction Paths", American Economic Review May 1955.

Myint, H. "Dualism and the Internal Integration of the Underdeveloped Economies", Banca Nazionale Del Lavoro, Quarterly Review, June 1970.

--------. "The Demand Approach to Economic Development", Review of Economic Studies, Vol. 27, February 1960.

N.B.E.R. Input-Output Analysis: An Appraisal (Studies in Income and Wealth, Vol. 18), Princeton, New Jersey: Princeton University Press, 1955.

Nigeria, Preliminary Statement on Development Planning in Nigeria (Sessional Paper No. 6 of 1945, Government Printer, Lagos: 1946.

--------. A Ten-Year Plan of Development and Welfare for Nigeria, 1946 (Sessional Paper No. 24 of 1945), Government Printer, Lagos: 1946.

--------. A Revised Plan of Development and Welfare for Nigeria, 1951-56, Government Printer, Lagos: 1957.

--------. The Economic Programme of the Government of the Federation of Nigeria, 1955-60 (Sessional Paper No. 2 of 1956), Government Printer, Lagos: 1956.

--------. Progress Reports on the Economic Programme 1955-60, Federal Government Printer, Lagos.

--------. Handbook of Commerce and Industry in Nigeria, Federal Ministry of Commerce and Industry, Lagos: Two editions, 1960 and 1962.

--------. Economic Survey of Nigeria, 1959 National Economic Council, Lagos, 1959.

--------. Second National Development Plan, 1970-1974, Federal Ministry of Information, Lagos.

--------. Economic and Statistical Review, 1972, Central Planning Office, Federal Ministry of Economic Development and Reconstruction, Lagos: 1973.

--------. Measuring Returns on Investment, Federal Ministry of Development and Reconstruction, Lagos: 1970.

--------. National Development Plan, 1962-68, The Federal Ministry of Economic Development, Lagos: 1963.

--------. Economic and Statistical Review, 1971, Central Planning Office, Federal Ministry of Economic Development and Reconstruction, Lagos.

--------. Guidelines for the Third National Development Plan, 1975-1980, The Central Planning Office, Federal Ministry of Economic Development and Reconstruction, Lagos: 1974.

--------. Second National Development Plan, 1970-74, First Progress Report, The Central Planning Office, Federal Ministry of Economic Development and Reconstruction, Lagos: (undated).

--------. Second National Development Plan, 1970-74, Second Progress Report, The Central Planning Office, Federal Ministry of Economic Development and Reconstruction, Lagos: 1974.

--------. National Development Plan, Progress Report, 1964, Federal Ministry of Economic Development, Nigerian National Press, Apapa: 1965.

--------. Digest of Statistics, 1970-1973, Federal Office of Statistics, Government Printer, Lagos.

--------. Gross Domestic Product of Nigeria, 1958-59 to 1969-70, Federal Office of Statistics, Lagos: November, 1972.

--------. Economic Indicators, 1972, 1973, Federal Office of Statistics, Lagos: May,

--------. Annual Abstract of Statistics, 1970-1972, Federal Office of Statistics, Lagos.

--------. Eastern Region, Outline of Development Plan, 1955-60, Enugu, 1955.

--------. Northern Region, A Statement of Policy on the Development Finance Programme, 1955-60, Kaduna: 1955.

--------. Western Region, Development of the Western Region of Nigeria, 1955-60 (Sessional Paper No. 4 of 1955) Government Printer, Western Region: 1955.

Norman, D.W. Methodology and Problems of Farm Management Investigations: Experiences from Northern Nigeria, African Rural Employment Paper No. 8, Michigan State University, Michigan: 1973.

Nowlan, D.M. The Formation of Development Strategy in Tropical Africa, Vol. 10, Great Britain, Glascow: 1973, pp. 34-56.

--------. Credit Planning in Developing Countries: Some Recent Tanzanian Experience, based on a paper read at the Canadian Economics Association Annual Meeting, Montreal; June 3, 1972.

Niculescu, B. Colonial Planning, A Comparative Study, George Allen and Unwin, Ltd., London: 1958.

Ogunpola, A. The Structure of Building Costs and Its Implications for Economic Development, Paper Presented to the 1974 Annual Conference of the Nigerian Economic Society, University of Ibadan: 1974.

Okigbo, P.N.C. Nigerian National Accounts, 1950-57, Enugu; Federal Ministry of Economic Development, 1962.

Olatunbosun, D. Nigerian Governments' Policies Affecting Investment in Agriculture, CSNRD 16, Nigerian Institute of Social and Economic Research, Ibadan: July 1968.

Onyemelukwe, C.C. Problems of Industrial Planning and Management in Nigeria, London: Longmans, Green and Co., Ltd., 1966.

Onoh, J.K. Crucial Policies in Economic Development, Netherlands: Rotterdam University Press, 1974.

Papandreou, A.G. Economic Development - Rhetoric and Reality, University of British Columbia, E.S. Woodward Lectures in Economics, 1973.

Peacock, A.T. and D. Dosser, "Input-Output Analysis in an Underdeveloped Country - A Case Study", Review of Economic Studies XXV (Oct. 1957), Pp. 21-24.

Pearson, Scott R. Petroleum and the Nigerian Economy, California, Stanford University Press, 1970.

Peleg, B., and R. Harle. On Optimal Consumption Plans in a Multi-Sector Economy, Review of Economic Studies, Vol. XXXIX (2), April 1972.

Prest, A.R. The Investigation of National Income in British Tropical Dependencies, London: University of London, 1957.

Prest, A.R., and I.G. Steward, The National Income of Nigeria 1950-57, London: H.M.S.O., 1953.

Radner, R. Notes on the Theory of Economic Planning, Athens: C. Serbinis Press, 1963.

Rasmussen, Norreghard P. Studies in Inter-Sectoral Relations, Amsterdam: North-Holland Publishing Co., 1956.

Reddaway, W.B. The Development of the Indian Economy, Illinois: Richard D. Irwin, Inc., 1962.

Robinson, E.A.G., ed. Problems in Economic Development, Ibadan: MacMillan, 1966.

Robinson, Joan. Economic Philosophy, Penguin Books, 1962.

Robinson, H., S. Smith, and K. Clare. The Economic Consideration of Transport Development in Nigeria. Stanford Research Institute Project No 1-3280, Lagos: Federal Ministry of Economic Development, 1961.

Royal Institute of International Affairs, Nigeria - The Political and Economic Background, London: Oxford University Press, 1960.

Samuels, L.H., ed. African Studies in Income and Wealth, London: Bowes and Bowes, 1963.

Samuelson, P.A. "Understanding the Marxian Notion of Exploitation: A Summary of the So-Called Transformation Problem Between Marxian Values and Competitive Prices", Journal of Economic Literature, Vol. IX, No. 2, 1971.

--------. "Abstract of a Theorem Concerning Substitutability in Open Leontief Models" in T.C. Koopman, Activity Analysis of Production and Allocation, New York: Wiley, 1957. Pp 142.

Sandee, J. A Demonstration Planning Model for India, Calcutta: Asia Publishing House, 1960.

Sawyer, J.A. Macroeconomics - Theory and Policy in the Canadian Economy, Toronto: University of Toronto, 1974.

Schatz, Sayre P. "The Influence of Planning on Development: The Nigerian Experience", Social Research, Vol. 27 (1960), No. 4, Pp 457-68.

--------. "Nigeria's First National Development Plan, 1962-68: An Appraisal", Nigerian Journal of Economics and Social Studies, Ibadan, July, 1964.

Schatzl, L. Industrialization in Nigeria, A Spatial Analysis, Munich: Weltforum-Verlag, 1973.

Schumpeter, J.A. History of Economic Analysis, New York: Oxford University Press, 1954.

Scitovsky, T. "Two Concepts of External Economies", Journal of Political Economy, April, 1954.

Seers, Dudley. "The Use of a Modified Input-Output System for an Economic Programme in Zambia", in Adelman, I. and E. Thorbecke, The Theory and Design of Economic Development, Baltimore: Johns Hopkins Press, 1969. Ch. 8.

--------. "The Stages of Economic Development of a Primary Producer in the Middle of the 20th Century", Economic Bulletin of Ghana: Vol. 7, 1963.

--------. "The Meaning of Development", International Development Review: Vol. XI, No. 4, December 1969.

--------. "International Trade and Development - The Special Interests of Africa" in Stewart, I.G. and H.W. Ord, eds. African Primary Products and International Trade, Edinburgh University Press, Great Britain: 1965, pp 19-25.

Shair, K.A. Planning in a Middle-Eastern Economy: Model for Syria, Londcn: Chapman and Hall, 1965.

Simpson, D., and T. Tsukui. "The Fundamental Structure of Input-Output Tables, An International Comparison", Review of Economics and Statistics, Vol. 47, November 1965.

Sokolski, A. The Establishment of Manufacturing in Nigeria, Frederick A. Praeger, Inc., U.S.A.: 1965.

Steel, W.F. Import-Substitution and Excess Capacity in Ghana, Economic Development Report No. 198, Harvard University, Cambridge: Oct. 1961.

Stewart, I.G., and H.W. Ord, ed. African Primary Products and International Trade, Edinburgh University Press, Great Britain: 1965.

Stokke, Olav. Nigeria - An Introduction to the Politics, Economy and Social Setting of Modern Nigeria. Uppsala: Scandinavian Institute of African Studies, 1970.

Stolper, W.F. Planning Without Facts, Cambridge, Massachusetts: Harvard University Press, 1966.

--------. "The Main Features of the 1962-68 National Plan", Nigerian Journal of Economic and Social Studies, Vol. 4, No. 2, July 1962, pp 85-91.

--------. "How Bad is the Plan?" Nigerian Journal of Economic and Social Studies: November 1964.

Stone, R. et. al. A Programme for Growth, Cambridge University, Department of Applied Economics: 1962.

--------. Input-Output and National Accounts, Paris, O.E.C.D., 1961.

Streeten, P. "Comment" on "The Development Process"; by O. Aboyade, Ch. 2 in Ayida, A., and H.M.A. Onitiri Reconstruction and Development, Ibadan: Oxford University Press, 1971.

Taskier, C.E. Input-Output Bibliography, 1960-1963, New York: United Nations, 1964.

Taylor, Lance. Multi-Sectoral Models in Development Planning, A Survey, Economic Development Report, No. 230, Centre for International Affairs, Harvard University, Cambridge, Massachusetts: March, 1973.

Thomas, Clive Y. Dependence and Transformation, New York: Monthly Review Press, 1974.

Thorbecke, E., and E. Stoutjesdijk. Employment and Output- A Methodology Applied to Peru and Guatemala; Methodology No. 2, Paris, 1971

Thonstad, T. Substitution Between Imports and Domestic Employment, Reprint Series No. 63, Oslo: University of Oslo, Institute of Economics, 1970.

Tilman, R., and C. Taylor, eds. The Nigerian Political Scene, London: Cambridge University Press, 1962.

Tinbergen, T. Development Planning, New York: McGraw Hill Book Company, 1967.

--------. On the Theory of Economic Policy, Amsterdam: North-Holland Publishing Co., 1963.

Todaro, M.P. Development Planning - Models and Methods, London: Oxford University Press, 1971.

United Nations, Planning and Plan Implementation, Paper submitted to the Committee of Development Planning, Department of Economic and Social Affairs, New York: 1967.

--------. Input-Output Bibliography, 1966-1970 (ST/STAT/SER.M/55), (3 volumes) New York: 1972.

--------. Input-Output Tables and Analysis (ST/STAT/SER.F/14/REV.1), 1973.

--------. National Accounting Practices in Sixty Countries, Series F, No. 11, 1964.

--------. A System of National Accounts (ST/STAT/SER.F/2/REV.3) November 1969.

--------. Evaluation of Industrial Projects (ID/SER.H/1), 1968.

--------. Planning the External Sector: Techniques, Problems and Policies, New York: 1967.

--------. Department of Economic and Social Affairs, A Study of Industrial Growth, New York: 1963.

Van Akardie, B., and C. Frank. Economic Accounting and Development, London: Oxford University Press, 1966.

Vielrose, R. "Manufacturing Industries in Nigeria", Nigerian Journal of Economic and Social Studies, Vol. XII, No. 1, March 1970.

Wallerstein, I. "Dependence in an Interdependent world: The Limited Probabilities of Transformation Within the Capitalist World Economy", African Studies Review, Vol. 17, No. 1, April 1974, pp. 1-26.

Watanabe, T. "A Test of the Constancy of Input-Output Coefficients Among Countries", International Economic Review, Vol. 2 (1961), pp. 340-350.

Waterson, A. Planning in Yugoslavia, Baltimore: Johns Hopkins Press, 1962.

Wells, J.C. "Issues in Agricultural Policy During the 1962-68 Nigerian Development Plan", in Eicher, C., and E. Leidholm, ed. Growth and Development of the Nigerian Economy, Michigan State University Press, Michigan: 1970.

Whetman, E., and J. Currie, ed. Readings in the Applied Economics of Africa. London: Cambridge University Press, 1967.

Winkelman, D. The Traditional Farmer, Maximisation and Mechanization, Development Centre Studies, No. 7, Paris; O.E.C.D, 1972.

Winsemius, A., and J. Pincus. Methods of Industrial Development with Special Reference to Less-Developed Areas, Paris: O.E.C.D., 1962.

Yan, Chiou-Shuang. Introduction to Input-Output Economics, New York: Holt, Rinehart and Einston, Inc., 1969.

Zelinski, J.G. "Problems of Long- and Short-Term Planning Based on Polisy Experience", The Nigerian Journal of Economic and Social Studies: July, 1965.