INDUSTRIALIZATION STRATEGIES IN A DEVELOPING SOCIALIST ECONOMY—AN EVALUATION OF THE TANZANIAN CASE

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INTRODUCTION

THE long-run policy objective of industrialization for Tanzania can be viewed as seeking the transformation of the economy from the post-colonial state of "underdevelopment" to a system capable of generating a self-sustaining development with a minimum external dependency. The investment priorities and choice of the basic industrial activities must then be related to this objective.

Given the policy objective of society, this paper is concerned with the attendant question that must be posed in regard to the possibilities, constraints, and perspectives for future development of an industrial strategy aimed at development of the basic industrial activities. This question seems particularly relevant to such a small dependent economy as Tanzania for which constraints on both technologies and resources—particularly foreign originated—are apparent beforehand. Our interest in this paper is in identifying the constraints as may be imposed by *the existing structure* of the Tanzanian economy, and assessing *inter alia* the immediate implications of pursuing the long-term policy goal. Some possibilities for overcoming the handicaps will also be examined.

I. POLICY PRIORITIES IN TANZANIA

The Arusha and *Mwongozo* declarations laid down the blueprints for a path toward the goal of building a self-reliant, socialist economy for Tanzania. Broadly viewed, the policy objectives of an industrial strategy for Tanzania are twofold: The first is to create a production structure suited to the enrichment of human habitat and to the fulfillment of basic needs of the broad masses of the workers and peasants. Secondly, a transformation of institutional structure of the economy is to be sought as a development process to disengage the economy from international capitalism. On an operational plane, this spirit of "self-reliance" can be interpreted as reflecting the pursuit of an industrialization strategy aimed at the maintenance of a reasonable balance in the structure and patterns of production and consumption.[1]

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[1] For detailed issues, see the well-known work by C. Thomas [13].

In the present Tanzanian context there then remains the question of identifying the vector of industries that would fall into the above two categories.[2] The identification of basic need–oriented industries would be relatively straightforward. As referred to elsewhere, a list of such industries would include food, paper, health, housing construction, education, communication and transport [10]. As for the choice of industrial activities pertaining to the long-run goal of attaining self-reliance, the received socialist literature emphasizes the establishment of capital goods industries. Taking into consideration the existing domestic resource constraints in Tanzania, it has been argued that these industries should include metal, nonmetal, chemical, food processing, and textile industries. These would correspond to what Rweyemamu called "the engineering industries in Tanzania" [10]. In fact, one of his major recommendations for the industrial strategy in the next five years is to concentrate on these industries.

In passing, we may also note C. Thomas's view on this issue. Thomas specifically argues for the establishment of industries that would constitute the major resource content of basic demand in a developing country. It is illuminating to quote his passage directly in order to better understand his argument.

> An examination of the input/output matrices of industrialized countries would show that the raw material content of the products are skewed in favour of a narrow range of basic materials. Two basic materials alone, iron and steel and textiles, form the backbone of modern industrial consumption. If to these are added paper, plastics, rubber, glass, leather, cement, wood, fuel and industrial chemicals, then we can account for the overwhelming bulk of basic materials used in industrial consumption. The bulk of the value added in industry is derived from this range of industries. As a result it is these industries which constitute the empirically verifiable range of strategic linkages and form the cornerstone of an industrialization program. [12, p. 40]

Thus, there appear to emerge some general agreement as to what types of industrial activities should form the vector of the "basic" industries for Tanzania. At the outset, we must be aware that the choice of these "basic industries" is guided by a long-run strategy for a transformation of the industrial structure of the economy. It is possible that this basic strategy conflicts with the more immediate policy objectives to increase national output, income, and employment,[3] or to minimize the negative impact on foreign trade balance. Our concern in what follows is in regard to these questions and, in particular, to the assessment of the existing structural characteristics of the Tanzania economy in relation to her basic industrial strategy.

II. INTER-INDUSTRY ACCOUNTING SYSTEM

Before a full discussion on the method of analysis, the first step to be taken is to

[2] For lack of better terminologies, I have called the sector of such industries as the basic industries.

[3] The justification for evaluating employment effects for a labor-abundant, socialist country can be based on the notion that the merits of industrial activities which make use of abundant resources cannot be overemphasized. See [1, pp. 156–67].

examine the basic structure of inter-industry relations as shown in the 1970 input-output table compiled for Tanzania. For analytical purposes the tableau is divided into four quadrants in Table I. Let there be altogether n number of producing sectors, k number of final use sectors, and m categories of primary inputs. Note that the symbols for the variables are denoted under different headings in the table.

Quadrant I describes the usual inter-industry transaction matrix, where X_{ij} denotes the value of input i used to produce the X_j quantity of output j. Quadrant II represents the sources of final demand for net output produced by each sector where D_{ij} is the quantity of output i demanded by sector j. Quadrant III shows a matrix of payments to various primary inputs. Note that for our purposes intermediate goods imports W_1 are considered as falling within this category. We denote by V_{ij} payments to primary input i by sector j, and by W_i the total demand for primary input i. Quadrant IV is a matrix of final demands for primary input with E_{ij} denoting the payment made to input category i in connection with final use by sector j.

It will be convenient now to express various basic identity relations in the table in matrix form. First we define the following set of the direct input coefficients per unit value of output and the corresponding matrices: $X_{ij}/X_j = a_{ij}$, and $V_{ij}/X_j = v_{ij}$.

TABLE I

A SCHEMATIC REPRESENTATION OF THE TANZANIAN I-O TABLE

		Intermediate Use (Purchasing Sector) 1 2 ... n	Final Use (Net Output) A*	B*	C*	D*	E*	Gross Output (Marginal Total)
(Producing sector)	1	X_{11} X_{12} ... X_{1n}	D_{11}	D_{12}	D_{13}	D_{14}	D_{15}	X_1
	2	X_{21} .	D_{21}	.	.	.	.	X_2
	.	. . .	.	.	.	.	.	.
	.	. . .	.	.	.	.	.	.
	.	. . .	.	.	.	.	.	.
	n	X_{n1} ... X_{nn}	D_{n1} ...				D_{n5}	X_n
		(Quadrant I)	(Quadrant II)					
(Primary Inputs)								
Imports		V_{11} V_{12} ... V_{1n}	E_{11}	E_{12}	E_{13}	E_{14}	E_{15}	W_1
Taxes, duties, and subsidies		V_{21} V_{22} ... V_{2n}	E_{21}	.	.	.	.	W_2
Wages and salaries		V_{31} V_{32} ... V_{3n}	.	.	.	.	.	.
Depreciation		V_{41} V_{42} ... V_{4n}	.	.	.	.	.	.
Surplus		V_{51} V_{52} ... V_{5n}	E_{51} ...				E_{55}	W_5
		(Quadrant III)	(Quadrant IV)					
Total production		X_1 X_2 ... X_n						

Note: A*: consumption expenditure. B*: capital formation. C*: government expenditure. D*: exports (f.o.b.). E*: increases in stocks.

$$A=\begin{bmatrix} a_{11}\cdots a_{1n} \\ \vdots \quad\quad \vdots \\ a_{n1}\cdots a_{nn} \end{bmatrix}. \qquad X=\begin{bmatrix} X_1 \\ \vdots \\ X_n \end{bmatrix}. \qquad D=\begin{bmatrix} D_{11}\cdots D_{1k} \\ \vdots \quad\quad \vdots \\ D_{n1}\cdots D_{nk} \end{bmatrix}.$$

$$W=\begin{bmatrix} W_1 \\ W_2 \\ \vdots \\ W_m \end{bmatrix}. \qquad V=\begin{bmatrix} V_{11}\cdots V_{1n} \\ \vdots \quad\quad \vdots \\ V_{m1}\cdots V_{mn} \end{bmatrix}. \qquad E=\begin{bmatrix} E_{11}\cdots E_{1k} \\ \vdots \quad\quad \vdots \\ E_{m1}\cdots E_{mk} \end{bmatrix}.$$

The basic balance equations for different sectors and primary inputs are then given by:

$$X=AX+D1^*. \tag{1}$$

$$W=VX+E1^*. \tag{2}$$

where 1^* is the column vector consisting of elements of unities.

We note that national income Y can be defined as:

$$Y=\sum_{j=1}^{n}\sum_{i=2}^{m} V_{ij}=\sum_{j=1}^{n}\left(X_j-V_{1j}-\sum_{i=1}^{n} X_{ij}\right)$$
$$=\sum_{j=1}^{n}\left(1-v_{1j}-\sum_{i=1}^{n} a_{ij}\right)X_j,$$

which by defining

$$\bar{y}=\left[1-v_{11}-\sum_{i=1}^{n} a_{i1},\ 1-v_{12}-\sum_{i=1}^{n} a_{i2},\cdots,1-v_{1n}-\sum_{i=1}^{n} a_{in}\right]$$
$$=(\bar{y}_1,\bar{y}_2,\cdots,\bar{y}_n),$$

can be expressed simply as

$$Y=\bar{y}X. \tag{3}$$

In the original I-O table, as given in the table, there altogether are forty-five producing sectors, five final use sectors, and five categories of primary inputs (including intermediate goods imports). For the sake of tractability, the producing sectors in this paper will be consolidated into an eighteen-order classification system. Table II relates the industry code numbers of the original table to the new code numbers of the consolidated scheme. Efforts have been made in our aggregation procedure to follow the standard industry classification system as closely as possible. Some arbitrariness in the classification procedure, however, appeared inevitable. The validity and implication of aggregation may well be questioned in this respect.

III. THE METHOD OF ANALYSIS

One method that has frequently been used by planners for gauging the relative performance of a particular sector in generating income, employment, or foreign exchange earnings is Rasmussen's key industry analysis based on an input-output table [8]. The useful feature of his method is that it can identify the

TABLE II

EIGHTEEN-ORDER CLASSIFICATION OF TANZANIAN INDUSTRIES

		Industry Code Numbers in "45 Order" Classification Scheme
1.	Exports crops	2, 4, 6, 7, 8
2.	Domestic agricultural goods	1, 3, 5, 9, 10, 11
3.	Fishing, forestry, and hunting	12, 13
4.	Mining	14, 15
5.	Food processing, beverage, and tobacco	16, 17, 18
6.	Textile and clothing	19, 20, 21
7.	Wood products and paper	22, 23
8.	Chemicals and petroleum	24
9.	Metal and nonmetal	25, 28
10.	Railway, automobile workshops	26, 27
11.	Small-scale industries	29, 30, 31
12.	Electricity and water	32
13.	Construction	33
14.	Hotels and restaurants	35
15.	Transport and communications	36, 37
16.	Business services	34, 38, 39, 40, 44
17.	Public services (health, education)	41, 42, 43
18.	Unspecified	45

so-called key sectors which exhibit a high degree of interdependence with other industries in the production relations. These industries have conventionally been accorded some strategic importance because of a relatively large expansionary multiplier effect on the rest of the economy (backward linkage effects), or because of a relatively large demand anticipated for their output as the economy expands generally (forward linkage effects).

Rasmussen's method essentially entails the use of the inverted input-output matrix for identifying the key sectors [8, pp. 130–40]. This method, however, entails a glaring defect in that the expansionary effects are confined to the supply side, excluding from the analysis other expansionary effects as would be induced from the demand side.[4] We may further expatiate on this point. Suppose there is an increase in final demand for output of a sector. This expansion of output would bring with it increased demands for other sectors' outputs to be used as inputs to its own sector, setting in turn into motion a chain of demands for outputs of different sectors in the economy. The results of these infinite rounds of resource use by different sectors of the economy are reflected by the values

[4] Theoretically, the inclusion of consumption expenditure in linkage effects is based on the notion that the wage good vector—part of output consumed by workers employed in the same and other industries—should be taken into account as intermediate goods indispensable for the system. There remains, of course, the question of how relevantly the actual data would reflect this. In any event, in view of the rather minor endogenous expenditure effect (see Table VI), the actual linkage effects calculated without incorporating the consumption vector do not differ greatly from the one including it.

of the coefficients of the inverted input-output matrix. The effects of an expanded final demand must not, however, be regarded as limited only to increased resource demand. An increase in output must, at the same time, be considered as giving rise to increased income which again sets into motion a chain of increased demand and income. Thus in order to appraise the linkage effects of different industries it becomes necessary to accommodate in the analysis both the supply and final demand repercussions.[5]

There are many aspects about the relative performance of a sector that would be of interest to planners. For our purposes we shall limit our present concern to assessing the short-run impact on income, employment, and foreign exchange earnings. More specifically, suppose we are interested in the effects of a unit-increase in final demand for a certain sector's net output. In order to accommodate final demand repercussions, the final demand sectors will be decomposed into two categories—endogenously-determined and exogenously-determined final demand. In the context of the Tanzanian I-O table, consumption expenditure D_{i1}'s are postulated to depend on the level of national income Y, and the remainder grouped as exogenous expenditures F.

Returning to (1) and (3) and by defining $d=(d_{11}, d_{21}, \ldots, d_{n1})=(D_{11}/Y, D_{21}/Y, \ldots, D_{n1}/Y)$, we may rewrite (1) as:

$$X=AX+d\bar{y}X+F\,, \tag{4}$$

and therefore

$$X=(I-A-d\bar{y})^{-1}F=HF\,, \tag{5}$$

where for simplicity the modified inverted matrix is denoted as H.

Next let us define the following matrices whose off-diagonal elements are all zeroes and diagonal elements consist, respectively, of value-added, employment, and trade balance coefficients (see Table VI).

$$Y^*=\begin{bmatrix} \bar{y}_1 & \cdots & 0 \\ \vdots & \bar{y}_2 & \vdots \\ 0 & \cdots & \bar{y}_n \end{bmatrix}. \qquad N=\begin{bmatrix} v_{31} & \cdots & 0 \\ \vdots & v_{32} & \vdots \\ 0 & \cdots & v_{3n} \end{bmatrix}.$$

$$T=\begin{bmatrix} x_1-v_{11} & \cdots & 0 \\ \vdots & x_2-v_{12} & \vdots \\ 0 & \cdots & x_n-v_{1n} \end{bmatrix}. \quad \text{where } x_i=D_{i4}/X_i.$$

The derivation of the trade-balance coefficients need to be explained. Strictly speaking, exports should be taken as exogenously determined. However, in the Tanzanian context the proportion of gross output exported to abroad for each

[5] In this paper, we are concerned with a full multiplier evaluation of linkages. The immediate, direct linkage effect can be calculated using direct input coefficients in the input-output table.

sector has not varied greatly from year to year. These relations, however, should be conceived of as showing only crude estimates.

Finally, it is possible to obtain a policy matrix, Y^+, for assessing the effects on the increment in income caused by an increment in exogenous demand:

$$Y^+ = Y^* H \Delta F , \tag{6}$$

where the symbol Δ stresses on the fact that final demand is given as exogenously expanded.[6] Similarly for assessing the effects on changes in employment and trade balance, we have,

$$N^+ = NH\Delta F , \tag{7}$$

and

$$T^+ = TH\Delta F . \tag{8}$$

The sum of the elements of the ith column for a particular policy matrix indicates the value of the corresponding policy variable following a unit increase in final demand for the product of sector i (backward linkage). For instance, the ith column-sum for the income matrix Y^+ represents domestic value-added created as a result of the increased final demand for the ith sector's output.

On the other hand, the sum of the elements of the jth row for a particular policy matrix, this time weighted by the relative share of each sector in total final demand expenditures, reveals the amount of the corresponding variable required by sector j per unit increase in the average final demand of all industries in the system (forward linkage).

The formulae of the linkage indices given below are for computing the linkage effects relating to the income policy matrix $Y^+ = (Y^+_{ij})$. Similar considerations apply to the linkage measures of other policy variables.

For the income backward linkage effect for sector j,

$$B_j(Y^+) = \sum_{i=1}^{n} Y^+_{ij} , \tag{9}$$

for the income forward linkage effect for sector i,

$$F_i(Y^+) = \sum_{j=1}^{n} w_j Y^+_{ij} , \tag{10}$$

where $w_j = \dfrac{\sum_k D_{jk}}{\sum_j \sum_k D_{jk}}$ is the share in total final demand of the demand for sector j's output.

We may simply interpret (9) as expressing the multiplier effect on domestic income of an increased spending on sector j's output, while (10) shows the

[6] In the conventional use of the word "linkage," reference is generally made to the material conditions for productive activities preliminary to or following the operation of a particular activity (backward or forward linkages). It is important to distinguish the notion of linkage measures as used here from the conventional usage.

income multiplier effect attributable to sector i following an overall expansion of final demand in the economy.[7]

IV. RESULTS

Tables III and IV show the results of calculations for the backward and forward linkage effects of industries. Industries are then ranked in descending order by the value of the linkage indices.

First, in order to obtain a summary description on the general pattern of interrelationships among various indices, the correlations between the rankings of all indices have been calculated (Table V). It is striking to observe that on the whole there are close positive relations between the orderings of forward and backward linkages for all the policy variables under consideration. In particular, the rankings of industries are almost identical for the foreign exchange linkage effects. The sectors ranked high in terms of backward linkage effects tend to be correspondingly high in terms of forward linkages. The glaring exceptions to this rule are in regard to Industry 1 (export crops), Industry 4 (mining), and Industries 15, 16, and 17 (basic service sectors). Exportable crops and mining industries show high values of the backward linkage index in all the policy categories, but are below the national average in terms of forward linkage effects

TABLE III

BACKWARD LINKAGE INDICES

Industry	Income $B(Y^+)$	Rank	Employment $B(N^+)$	Rank	Trade Balance $B(T^+)$	Rank
1	2.6262	1	0.6834	5	2.9798	1
2	2.5833	2	0.5856	10	0.0058	10
3	2.4361	3	0.4951	14	0.4951	4
4	2.3098	4	0.7150	3	1.3634	2
5	2.2792	6	0.5346	12	0.4514	5
6	2.1224	9	0.5297	13	1.2511	3
7	1.7924	15	0.5785	11	–0.2433	16
8	1.4015	17	0.4098	17	0.1436	8
9	1.4113	16	0.4642	16	–0.4011	18
10	1.8100	14	0.6524	8	–0.3793	17
11	2.2924	5	0.4953	15	0.2867	6
12	2.0671	12	0.6607	7	–0.0637	11
13	1.8184	13	0.6688	6	–0.1626	13
14	2.2284	7	0.6135	9	0.1535	7
15	2.0717	11	0.7079	4	0.0630	9
16	2.2011	8	0.7757	2	–0.1957	14
17	2.1172	10	1.0067	1	–0.1959	15
18	0.0628	18	0.0089	18	–0.1366	12

[7] It may additionally be desirable to weigh the above linkage indices by some measure of the evenness of their spread among industries. The more even their spread for an industry, the greater the preference for such an industry.

TABLE IV
FORWARD LINKAGE INDICES

Industry	Income $F(Y^+)$	Rank	Employment $F(N^+)$	Rank	Trade Balance $F(T^+)$	Rank
1	0.7758	13	0.2666	12	0.8817	1
2	4.5593	1	0.4444	6	0.1009	10
3	2.4147	4	0.1452	17	0.4980	5
4	0.6649	16	0.2402	14	0.6773	2
5	1.9848	6	0.3145	9	0.4070	6
6	9.9547	11	0.3117	10	0.5353	4
7	0.6779	15	0.2908	11	–0.2498	14
8	0.7757	14	0.2243	15	0.2813	8
9	0.5458	17	0.2416	13	–0.4266	17
10	0.8686	12	0.3686	7	–0.3999	16
11	1.3857	8	0.1509	16	0.5947	3
12	1.5470	7	0.6498	5	–0.2418	13
13	0.9565	10	0.7132	4	–0.5550	18
14	1.0646	9	0.3408	8	0.2156	9
15	3.5598	3	1.6856	2	0.3130	7
16	4.2269	2	1.4289	3	–0.1871	12
17	2.3183	5	2.2477	1	–0.3262	15
18	0.0274	18	0.0000	18	–0.1547	11

TABLE V
RANK CORRELATION MATRIX FOR LINKAGE INDICES

	$B(Y^+)$	$B(N^+)$	$B(T^+)$	$F(Y^+)$	$F(N^+)$	$F(T^+)$
$B(Y^+)$	1.000					
$B(N^+)$	0.331	1.000				
$B(T^+)$	0.686	–0.040	1.000			
$F(Y^+)$	0.503	0.404	0.044	1.000		
$F(N^+)$	–0.034	0.740	–0.356	0.613	1.000	
$F(T^+)$	0.666	–0.182	0.938	0.028	–0.442	1.000

for both income and employment.[8] The service sectors generally are ranked highly by the income forward linkage measures but are low by the corresponding backward measures.

A comparison between the employment and the foreign exchange linkage indices shows a negative relationship for both the backward and forward effects. That is, the industries with a relatively large employment effect tend to have somewhat a less foreign-exchange-saving effect. A casual observation of Table VI reveals that the service sectors are highly labor-intensive, and appear to have the maximum effect on employment in the long run. At the same time, these

[8] Since wages and salaries reported in the I–O tables are expressed in value, it is important to note that the employment linkage indices as computed in this paper should be interpreted only as an approximate indicator for comparing employment effects by industry.

TABLE VI

POLICY VARIABLE COEFFICIENTS

Industry	Value Added Coefficient ($\bar{y}$)	Endogenous Expenditure (d)	Labor Output Ratio (v_3)	Export Coefficient (x)	Import Coefficient (v_1)
1	0.778	0.001	0.269	0.886	0.024
2	0.835	0.192	0.162	0.009	0.140
3	0.761	0.016	0.046	0.166	0.001
4	0.651	—	0.170	0.773	0.015
5	0.408	0.039	0.083	0.170	0.041
6	0.290	0.017	0.103	0.390	0.084
7	0.421	0.003	0.184	0.066	0.212
8	0.287	0.008	0.083	0.501	0.397
9	0.307	0.001	0.120	0.135	0.356
10	0.437	0.005	0.099	0.002	0.202
11	0.697	0.014	0.087	0.066	0.152
12	0.633	0.004	0.266	—	0.099
13	0.350	—	0.261	—	0.203
14	0.519	0.004	0.166	0.165	0.060
15	0.670	0.012	0.322	0.231	0.159
16	0.788	0.046	0.415	0.012	0.025
17	0.602	0.062	0.591	—	0.072
18	0.025	—	—	0.837	0.975

Sources: Computed from the I-O Table (1970) prepared by Bureau of Statistics, the United Republic of Tanzania.

industries are characterized by a negative trade-balance coefficient.[9]

The signs of the rank correlations between the income and employment effects indicate the presence of a positive relationship as a whole. But this must not be taken as significant since the values are generally low and in one case the coefficient is even negative.

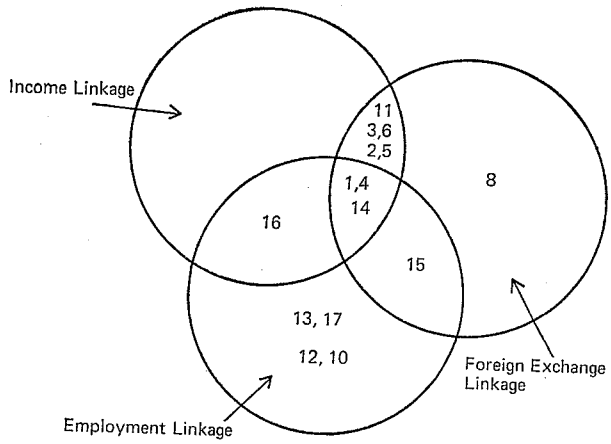
Thus, it is clear that a possible conflict exists between the trade-balance improving strategy and the employment-maximizing strategy. To visualize more schematically possibilities of any policy conflicts that may arise in connection with the short-run policy goals to maximize income, employment, and foreign exchange earnings, the sets of what could be called "strategic" industries—which should be ranked highly by measures of each linkage effect—are shown in the interlocking Venn diagrams (Figures 1-A and 1-B). The sets of income and employment maximizing industries are chosen to consist of the industries ranked at least above the median of the respective linkage indices.[10] On the other hand, the set of foreign-exchange-earning sectors is defined to include

9 A comparison of the direct coefficients (Table VI) with the linkage measures shows that the industries with high values of the direct coefficients in other policy categories (value-added and foreign exchange saving) also tend to give rise to high linkage effects—in particular, to backward linkage effects.

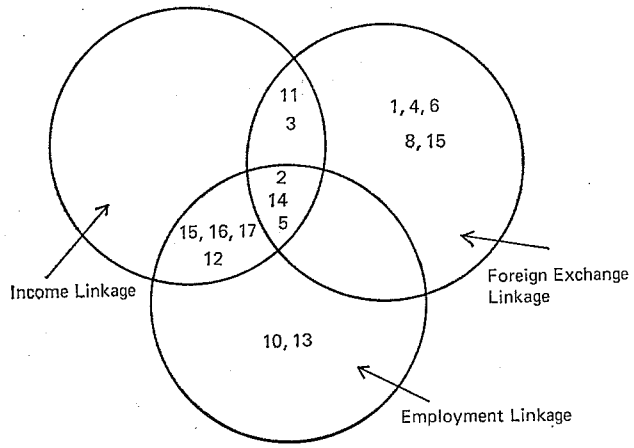
10 One may note that this ranking procedure approximates that of Rasmussen, according to which the linkage indices are normalized by the averages of the sum of the row or column elements of the inverted Leontief matrix.

Fig. 1. Industries Ranked above Median in the Linkage Measures for Different Policy Variables

A. Backward Linkage



B. Forward Linkage



these industries which have a positive impact on the foreign trade balance. There are altogether ten such industries for this set. Note that industries are represented by the industry code numbers in the diagrams.

Our particular interest from the two figures is the identification of industries located in the overlapping areas of the adjacent sets. It is striking that there are only few strategic industries, the performance of which would be acceptable by the three policy criteria postulated above. This joint set consists of Industries 1 (export crops), 4 (mining), and 14 (hotels) for the above-median values of backward linkages; and of Industries 2 (food), 5 (food processing), and 14 for the corresponding values of forward linkages. Although Industry 14—which is closely affiliated with tourism—appears in both linkage categories, this sector,

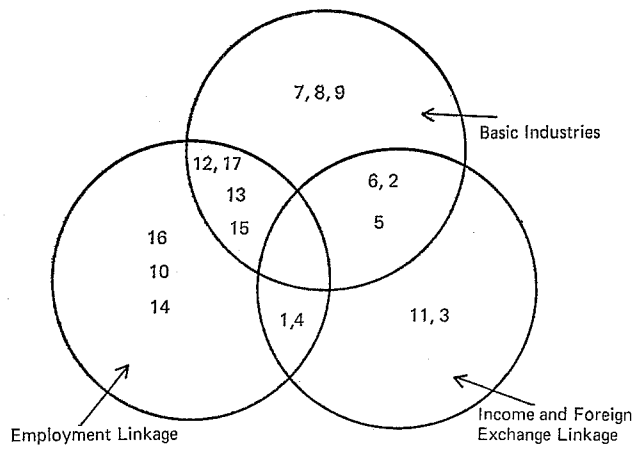
as evident from Tables IV and V, is ranked only marginally within the top half of each linkage measure.

A greater preponderance of industries, however, are located in the overlapping areas of the income—and trade balance—maximizing sets. Industries belonging to this group by both measures of linkage effects include by and large the primary sectors (2, 3, and 4) and light manufacturing industries (5, 6, and 11). It is worthy to note that the disjoint set of the income-maximizing sectors is empty for both linkage measures implying that all income-maximizing sectors either have a surplus impact of foreign balance, or have a maximizing effect on employment.

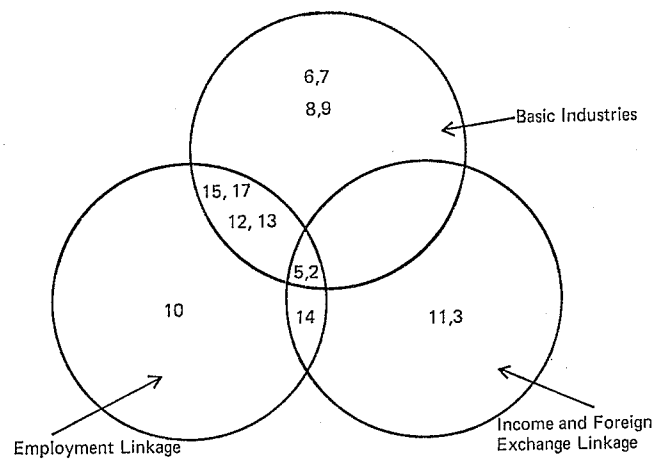
Regarding the indices of employment effect, basic service sectors (15, 16, 17) show by far the highest value of the measure. There is a certain asymmetry in

Fig. 2. The Standing of the Basic Industries in the Linkage Effect

A. Backward Linkage



B. Forward Linkage



the distributional pattern between the forward and backward linkage indices. Whereas the employment-maximizing sectors generally maximize income for the case of forward linkages, this is not true for the case of backward linkages. It also appears that the employment-maximizing sectors have a negative impact on foreign balance. This inverse relationship has already been shown in the correlation matrix. The Venn diagram only reinforces the previous results.

The discussion, so far, has abstracted from the long-run policy objectives of industrialization for Tanzania. We shall now turn to the more immediate implications of a development strategy focusing on expansion of the basic industries. It is straightforward first to identify the basic industries by the code numbers in the light of the discussions in the earlier part of the paper. The overall performance of these basic sectors in terms of the three policy criteria is summarized by another set of Venn diagrams (Figures 2-A and 2-B). For ease of presentation, since the income effects are closely correlated with the foreign balance effects in a positive direction, the two maximizing sets are now combined into one set in the figures.

A glance at the two figures reveals that among the set of basic industries only Industries 2 and 5 (food and food processing) meet the three policy goals simultaneously in forward linkage measure. Industry 16 (textile) qualifies for this category in the measure of backward linkages. The value of the income backward index, however, is barely above the median of all industries. The bulk of the basic industries—services, public utilities, and construction sectors—are relatively heavy users of labor with a favorable impact on employment for the long-run. However, with the important exception of food and its related industries, the basic sectors are also relatively heavy users of foreign exchange with a minimum impact on domestic value-added. This essentially shows an important aspect of the constraints imposed by the structural characteristics of the economy upon a policy aimed at basic industrialization for Tanzania.

V. CONCLUDING REMARKS

Thus, the major policy implications that emerge from the analysis are obvious. The push for rapid expansion of the basic and modern engineering industries, given the characteristics of industrial structure of the present Tanzanian economy, is likely to give rise to unintended effects of making the economy more import-dependent in the short run and at the same time is likely to have little expansionary impact on output and income for the economy. The important exceptions to these negative impacts are food and food processing industries. For these industries, the basic policy objectives of industrialization appear to be much compatible with the more immediate policy goals to maximize value-added and foreign exchange revenue.

The fact that the choice of industrial activities leads to a policy trade-off makes it imperative to formulate plans for a gradual and piecemeal approach to the structural transformation of the economy. The pursuit of the ultimate policy goals will be greatly facilitated by realization of the more immediate objectives

of alleviating the constraint on foreign exchange and of stimulating the industrial system's dispersionary effect on the national economy. In this connection, the potential contribution of those strategic industries with highest linkage effects on income, employment, or foreign exchange earnings must not be overlooked in an overall development effort of Tanzania.[11]

Finally, it must, of course, be understood that the process of transforming the industrial structure of the economy involves more than the choice of industrial activities. For instance, the choice of techniques for the productive system, however uncertain and complex the task might appear, could be a more important factor in a basic industrial strategy. In input-output parlance, this would imply the introduction of new activities or changes in the technical coefficients in the system. Our analysis has revealed some aspects about the structural characteristics of the economy essentially not well integrated for industrial development. Undoubtedly, the choice of techniques, as has been shown to be the case with the activity choice, must also in a fundamental relationship be guided by the consideration of the existing structural characteristics of the economy. Thus, while it will be essential to develop capital goods and engineering industries as a basic user sector in a long-run transformation of economic structure, there is much to be said for conscious, deliberate measures to encourage the choice of technologies in these key industries relying primarily on the indigenous skills and materials and at the same time exhibiting the potential to expand both real income and use of abundant resources of the economy.

[11] Many economists would agree that foreign exchange shortages have been the major obstacle to industrialization of the key sectors of the economy in many resource-poor developing countries. Also, the increase of additional national income would have the subsidiary effect that part of such increase can be directed into investment in the basic sectors. In short, these short-run objectives must be viewed as complementing with the long-run goal for the restructuring of the colonial economic structure.

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