ON SOME CONSISTENCY TESTS OF EGYPT'S FIRST FIVE-YEAR PLAN 1960/61 - 1964/65*

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This paper deals with some aspects of the consistency of Egypt's First Five-Year Plan for Economic and Social Development (to be referred to henceforth as the Plan). It will be divided into five sections. Section I examines the aims and targets in the Plan. Section II contains a general discussion of some consistency aspects of the Plan. In Section III, the consistency of the sectoral output targets will be examined and in Section IV we test the consistency of growth and balance-of-payments targets. Section V concludes the paper.

I. Aims and Targets in the Plan :

In this section we examine the Plan from the standpoint of aims and targets.(1) We shall also examine what the planners thought would be the instruments of the economic policy embodied in the Plan. But first, a brief summary of the way the Plan was constructed is in order.(2)

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(1) Aims refer to the global objectives of the policy-maker or society in question ; they are usually cast in broad, loose terms. Targets are more specific. Cf. Bent Hansen, **The Economic Theory of Fiscal Policy** (London : Georgy Allen and Unwin Ltd., 1958) ; Jan Tinbergen, **On the Theory of Economic Policy** (Amsterdam : North-Holland Pub. Co., 1952) ; and Jan Tinbergen, **Economic Policy Principles and Design, 4th** revised printing (Amsterdam : North Holland Pub. Co., 1952).

(2) Regarding this point, we shall draw heavily on the interesting material in Patrick O'Brien, **The Revolution in Egypt's Economic System** (London : Oxford U. Press, 1966) pp. 156 - 167.

It was the global target of the Plan, decided upon by the political leadership, to double national income in ten years. The National Planning Committee used an aggregate capital-output ratio to estimate the total amount of investment needed. That amount was broken down by sector. The implications for exports, imports and final demand were then derived using an input-output table. Within each sector, the individual ministries and departments were invited to propose individual projects to fit into the global frame of investment. The construction of such a frame, in a consistent fashion, was the task of the National Planning Committee (NPC).

According to the preamble of the Plan frame,[3] the aims of the Plan may be summarized as follows :

a) Raising the welfare of the populace,

b) Distributing national income such as to achieve the «socialist, democratic and co-operative society».

c) Activating the labour force by education and training.

d) Availing every able and willing citizen of an opportunity to work, and

e) Achieving balanced, self-sustained growth of the economy.

In a nut shell, these aims are rooted in growth, social justice, and full employment.

The Plan had three basic aggregate targets :

First, to increase value added by 40% over the five-year period, 1960/61 - 1964/65 ;

Second, to achieve an equilibrium in the balance of payments (no excess of exports over imports) by 1964/65.[4]

(3) U.A.R. (Egypt), National Planning Committee, **Frame of the General Plan for Economic and Social Development for the Five Years July 1960-June 1965** (Arabic) (Cairo : General Authority for Government Publishing 1960), henceforth **Plan Frame.**

(4) Some writers, notably Issawi, mention that by 1964/65 imports will decline from L.E. 229.2 million to L.E. 214.9 million, while exports will rise from L.E. 168.8 million to L.E. 229.3 million, thus turning the 1959/60 deficit of L.E. 60.4 million to a surplus of L.E. 14.4 million.

Third, to increase employment by 1026 thousand workers, from 5975 thousand workers in 1959/60 to 7001 thousand in 1964/67[5].

The planners were not perhaps thinking consciously in terms of targets and instruments, and hence were not explicit on what instruments they intended to use. But the history of economic programming in Egypt as well as the method followed in constructing the Plan may provide some clues as to the nature of the instruments therein. We have already outlined, briefly, the way the Plan was constructed. It must be added here that when it could not get the private sector to implement the investments that it envisaged, the government resorted to nationalize most of the large industrial enterprises in 1961 and 1963. We may conclude, therefore, that the total volume of investment was an instrument. But having only one instrument and more than one target violates an important rule of thumb for economic policy[6] and will likely lead to conflict among the targets.

=He cites the French-language version of the Plan Frame. However, according to the Arabic-language version of the Frame, exports are to rise from L.E. 158.3 million in 1959/60 to L.E. 214.7 million in 1964/65, with the import figures being the same as those quoted by Issawi. This means that the balance of trade will be in equilibrium by the end-year of the Plan. The reason for the discrepancy in the export figures may be due to the difference in the basis of evaluation. It seems that the figures quoted by Issawi for exports refer to the values after adding trade margins, a thing that was not included in his import figures. Cf. Ch. Issawi, **Egypt in Revolution : An Economic Analysis** (London : Oxford U. Press, 1963), p. 67 ; and **Plan Frame**, Tables 28 and 28a.

(5) This amounts to a 17% increase over the Plan period, a growth rate much lower than that of national income. This indicates a marked bias against labour-intensive projects. In fact, as O'Brien put it, «officials... appeared uninterested in capital-labour ratios». See O'Brien, **op. cit.** p. 278.

(6) There are two rules of thumb for economic policy :

1. The number of instruments must be at least as large as the number of targets, and
2. All the targets depend on all the instruments combined. In the cases which Tinbergen calls consecutive or partitionable the values of some of the instruments may depend only on the values of some of the targets. A similar situation holds for cases of corresponding consecutivity or corresponding partition. See Tinbergen, **op. cit.**, pp. 28 - 30.

We may formalize the argument with the help of the following simple model. The following notation is used.

y = increment in total output (including intermediate inputs) over the Plan.

v = increment in gross value added over the Plan

m = imports of goods and services in the target year

x = exports of goods and services in the target year

d = foreign capital inflow in the target year.

i = gross fixed investment over the Plan.

We postulate the following relationships.

$$v = \nu\, y \qquad (1)$$

$$y = i/\kappa \qquad (2)$$

$$m = \bar{m} + \varepsilon\, y + \omega\, i \qquad (3)$$

$$x = \bar{x} \qquad (4)$$

$$d = m - x \qquad (5)$$

ν, κ, ε and ω are fixed scalars, and variables with a bar are given exogenously. Equation (1) — (5) shall be solved to express the instrument, i, in terms of the target variables, v and d[7].

From (1) and (2) we get :

$$i = (\kappa/\nu)\, v \qquad (6)$$

and from (2) — (5) we obtain

$$i = \kappa\, (d - (\bar{m} - \bar{x}) \,/\, (\varepsilon + \omega\kappa) \qquad (7)$$

Thus, we have two equations determining the same unknown, i. The value of i from (6) may not be the same as that from (7). Put differently, the level of investment needed depends

(7) Since the purpose of this section is only to demonstrate the relationship between the instruments and the targets, we decided to leave out the employment targets, to make things simple. The exclusion of the latter from the analysis should not affect the conclusion.

on whether we pursue the national income target or the balance-of-trade target. Under the circumstances it is clear that certain inconsistencies may arise.

If we treat the specified «surplus» in the balance of trade (or, rather, foreign capital inflow) by 1964/65 as a target, then (6) and (7) contain two targets (v and d) but only one instrument (i). Only by sheer coincidence would a single value of i achieve both fixed targets. Most probably, however, the value of i implied by the one will differ from that implied by the other. It may be said then the two targets are, because of the nature of the instrument, in conflict(8). On the other hand, if is assumed to be a forecast rather than a target, d will then belong to the category of irrelevant variables, to use Professor Tinbergen's terminology. Here, there will be no inconsistency between the targets ; but the likelihood of d actually reaching the specified value will then depend on how accurately that value was determined in the first place.

II. Consistency Aspects of Egypt's First Five-Year Plan : General Discussion

There are, generally, three levels to the consistency aspect of the Plan. At one level, there is consistency among the aims ; at a lower level, there is consistency among the targets ; and still at a third level, there is consistency between the targets and the instruments. Since the planners were not very specific about

(8) Sukkar ran a consistency test on the aggregate targets of the Plan, which revealed inconsistency. See N. Sukkar, «Chenery-Bruno Test of Egypt's First Comprehensive Plan», unpublished Ph.D. thesis, Indiana U., 1969. We may, for short, call conflict among the aggregate targets **macro-inconsistency** and conflict among sectoral targets **micro-inconsistency.** On logical grounds, the absence of the first does not per se rule out the possibility of the latter, while the existence of the first necessarily implies the existence of the latter. If we accept the result of the test performed by Sukkar on the aggregate targets it must follow, therefore, that (at least some of) the sectoral targets must be in conflict. This is an interesting conclusion ; but equally interesting is the question : where are sectoral inconsistencies located ? We shall attempt to answer this question in sections II, III and IV.

the number and nature of instruments to be used, we shall refrain from discussing consistency between the targets and the instruments.

Looking now at aims (a) through (e) we notice that in particular, aims (a) and (e) may not be consistent. One reason is that, in order to provide every able and willing citizen an opportunity to work, it may be necessary to expand certain sectors (the ones with a larger capacity to absorb labour) faster than others. For example, it may be that, given the limited, resources available for investment, either for capital formation or for training labour, the best that could be done would be to expand cottage or handicraft industries. If by balanced growth is meant that all sectors of the economy keep in step[9], then the aim of full employment may not be consistent with the aim of balanced growth.

We now turn to a discussion of the consistency among targets in the Plan. There are two areas where there may be inconsistency. First, it is not certain whether the national-income target is consistent with the balance-of-payments target. Most probably, they are inconsistent. This is because the magnitude of the import-substitution effort would have to exceed one-third of total imports in the final year, a task that is likely to be very difficult to achieve[10]. The consistency aspects of these two

(9) This is one emphasis of the theory of balanced growth ; to avoid problems of supply. Another emphasis of the theory, based on demand considerations, prescribes a «big push» for successful development. See Albert O. Hirschman, **The Strategy of Economic Development** (New York and London : Yale U. Press, 1958), pp. 51 - 52.

(10) In 1959/60 the ratio of total imports to G N P was about 18 per cent. Applying this ratio to G N P in the target year we get L.E. 323.4 million (= 1795 × 0.18). Target imports are L.E. 214.9 million, which implies an import substitution of about one-third of imports in the target year.

In this regard, it is interesting to note that regression analysis of Egyptian imports over the period 1952/53 — 1964/65 produced an income elasticity of imports larger than one. See Essam El-Din Montasser, «Egypt's Pattern of Trade and Development», unpublished Ph.D. thesis, Princeton U., 1972, pp. 173-182. Cross-section regression analysis of 53 (developed and less-developed) countries indicated that «import requirements tend to be higher in absolute terms as total =

targets will be examined more rigorously in section IV, using input-output techniques.

Another aspect of target inconsistency arises in connection with the individual output targets for different sectors. According to the Plan frame, the main sectoral targets were as follows :

Table 1 : **Main Sectoral Targets in the First Five-Year Plan for Egypt 1960/61 — 64/65.**

(in L.E. million at 1959/60 factor prices)

	59/60	64/65	% change
Value added (total)	1282	1795	+ 40
Value added in agriculture	400	512	+ 25
Value added in electricity and manufacturing	273	540	+ 100
Value added in construction and building	52	51	— 2
Value added in infrastructure sectors	261	316	+ 12
Value added in commerce	127	162	+ 28
Value added in services	169	214	+ 27
Exports	158.3	214.7	+ 36
Imports	229.2	214.9	— 6

Source, U.A.R. (Egypt), Plan Frame, op. cit., p. 14 and pp. 68 - 69.

Thus, it was planned that value added in the six main sectors, namely, agriculture, electricity and manufacturing, infrastructure sectors, commerce and services, should increase over the plan period by 25%, 100%, — 2%, 21%, 28% and 27%, respectively. These target growth rates do not reflect any commitment to balanced growth[11]. Even more serious, it is not very

= G D P of various countries increases.» See Forets M. Dominguez, «Economic Growth and Import Requirements,» **«Journal of Development Studies»**, Vol. VI (April 1970), p. 292.

(11) As was mentioned earlier, balanced growth was one of the avowed aims in the Plan. See above, p. 36.

clear if these sectoral growth targets constitute a consistent set. It is well known from input-output analysis that the different sectors of the economy are mutually interdependent. Sectors generally supply intermediate inputs to other sectors and demand inputs from each other. This fact imposes stringent limitations on the ability of some sectors to grow faster than others — given the balance-of-payments position[12]. The quantitative production relationships among individual sectors will be the subject of a forthcoming study. We limit our discussion here to these general remarks, which should provide the necessary background for a more rigorous treatment. Such a treatment is the subject of the following sections, where a set of consistency tests is performed.

III. Testing the Consistency of the Sectoral Output Targets

The procedure to be followed here is rather straightforward. We start out with the final bill of goods (that is, the vector of final demand) envisaged by the planners in the end-year of the Plan, 1964/65. By working this bill out through an input-output model, we solve for the sectoral output levels. On comparing the computed output levels with the planned ones we get an idea as to how consistent the latter are. The basic assumption here is that the input-output table used reflects the true interdependencies in the economy, and hence, yields a consistent set of output levels. This set is the norm against which the planned set is to be examined for consistency[13].

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(12) International economic relations could free the economy, to some extent, from the limits imposed by interrelation in production. Thus some sectors may be made to grow faster than the sectors supplying intermediate inputs — the excess demand for inputs by the growing sectors to be met by importation. If a target is set in the plan for the balance of payments, the relative growth rates of different sectors must be related to one another in such a way as to take possible capacity expansion into account.

(13) There are many problems involved here, however. One is that the input-output coefficient matrix may not reflect the true technical relations in the economy. This is not a problem with the approach adopted here per se. Another, more serious, problem, is that the result may depend to a large extent on the degree of aggregation. See J.B. =

Formally, we have the standard input-output model in the structural form, using matrix notation :

$$A_d\ Y_o^* + f_p = Y_o^* \qquad (8)$$

where A_d is an N by N matrix of domestic input - output coefficients, f_p is an $N \times 1$ vector of planned final demands, and Y^{o*} is a vector of sectoral output levels. We solve (8) for Y_o^* in terms of f_p to get :

$$Y_o^* = (I - A_d)^{-1} f_p \qquad (9)$$

Y_o^* is a set of consistent output levels for the individual sectors. This is our norm, against which planned output levels, Y_p^*, will be judged.

It is not necessary for the consistency of the planned sectoral output levels that $Y_{oi}^* = Y_{pi}^*$ for all i, because one must make some allowance for random errors. We therefore set up the hypothesis that the difference between Y_o^* and Y_p^* is insignificant, in the statistical sense. There are many alternative ways of testing such a hypothesis. One particularly suitable method is to regress the computed output levels for the 1954 and 1963/64 input-output data on the planned output levels to obtain a regression equation of the form :

$$Y_{oi}^* = a + b\ Y_{pi}^* \quad (i = 1, \ldots, N) \qquad (10)$$

The joint hypothesis is then $a = o$ and $b = 1$. Since the computed output levels, Y_{oi}^*, are, by their very derivation, mutually consistent, the rejection of the above null hypothesis means that the planned output levels are not consistent. The statistic most suitable for the test at hand[14] is Hotelling's T^2.

= Balderston and T.M. Whitin «Aggregation in Input-Output Models», in O. Morgenstern, ed., **Economic Activity Analysis** (New York : John Wiley and Sons Inc., 1954), pp. 79 - 128.

(14) For the statistical - theoretical rationale for this statistic, see Ben W. Bolch and Cliff J. Huang, **Multi-variate Statistical Methods for Business and Economics**, (Englewood Cliffs, N.J. : Prentice-Hall Inc., 1974), pp. 128 - 129.

Table 2 contains the planned final bill of goods, the planned output levels estimated using the planned final bill of goods and the input-output data for 1954 and 1963/64[15]. It is clear from comparing columns (2), (3) and (4) that the planned output levels for mining and quarrying, basic metal industries and transport and communications are larger than what is implied by the planned final bill of goods. On the other hand, the planned output levels for non-metallic manufacturing and other industries are smaller than what is implied by the same bill of goods.

When the output levels estimated on the basis of the final bill of goods were regressed on the planned levels in the fashion indicated above, the resulting numerical estimates were as indicated in equations (11) and (12) below.

$$Y_{54,i}{}^{*} = \underset{(0.547)}{7.5310} + \underset{(17.677)}{0.8674}\, Y_{pi}{}^{*} \quad (i = 1, \ldots, N) \qquad (11)$$

Table 2.—Planned and Estimated Sectoral Output Levels for Egypt

(in L.E. million at 1959/60 factor prices)

No.	Sector	Planned final demand (1)	Planned gross out-put levels (2)	Gross output levels based on the 1954 input-out-put matrix (3)	Gross output levels based on the 1963 /64 input-output matrix (4)
1.	Agriculture	137.6	732.2	643.6	743.8
2.	Ginning and pressing	135.6	186.5	188.5	189.8
3.	Mining and quarrying	16.5	73.4	48.1	32.5
4.	Food processing	399.1	506.1	560.2	505.0
5.	Tobacco	17.5	18.0	30.1	17.5
6.	Spinning and weaving	141.5	239.8	245.2	238.7
7.	Clothing	33.2	33.2	34.8	34.3
8.	Paper and paper products	2.3	18.2	9.0	16.1

9.	Chemical manufacturing	34.1	92.6	70.4	94.1
10.	Coal and petroleum refining	37.1	89.8	72.8	83.5
11.	Nonmetallic manufacturing	20.9	23.7	30.3	36.6
12.	Basic metals	14.9	123.9	39.3	47.7
13.	Metal products	24.2	33.4	34.9	38.9
14.	Machinery except electrical machinery	11.6	19.0	42.3	13.4
15.	Electricity	13.7	35.1	32.2	39.8
16.	Building and construction	122.0 a	122.0	126.9	128.2
17.	Transport and communications	80.0 b	164.0	152.3	146.2
18.	Other services	330.0 b	765.0	806.6	529.4
19.	Wood and furniture	21.7	23.3	23.7	32.9
20.	Other industries	110.8	136.2	149.0	161.7

Sources and Notes :

Column (1) is derived from Table 28-a of **Plan frame** using the formula : Final demand = gross output + imports (c.i.f.) — intermediate deliveries-imports for final use.

Column (2) is extracted from Tables 18 and 20 of **Plan frame.**

Columns (3) and (4) are estimated according to equation (9), using the 1954 and 1963/64 input-output matrices, respectively, along with the planned final demand vector of column (1).

a) for this sector, we assumed that all output goes to final demand.

b) for this sector, we assumed that about one half the output goes to final demand.

(15) The computations are based on the input-output tables for the Egyptian economy for 1954 and 1963/64. For details regarding these tables, see Gouda Abdel-Khalek El-Sayed Mohamed «Sectoral Interdependence and Egypt's Investment Strategy», unpublished Ph.D. thesis, McMaster University, Hamilton, Canada, 1974, Appendix B, pp. 154-164.

$$Y^*_{63/64,i} = -4.3253 + 0./9975\ Y_{pi}^* \quad (i = 1..., N) \qquad (12)$$
$$(-0.439) \quad (28.406)$$

where $Y^*_{54,i}$ and $Y^*_{63/64,i}$ are the output levels estimated on the basis of the 1954 and 1963/64 input-output data, respectively, and the numbers in parentheses underneath the coefficients are the relevant t-scores. On the basis of these estimates the joint hypothesis was rejected[16].

We infer from this statistical analysis, then, that the planned output levels are not identical with the required output levels estimated from the planned final bill of goods on the basis of the input - output data for either 1954 or 1963/64. This leads us to the conclusion that, to the extent that the true structure of production of Egypt can be expressed by either the 1954 or the 1963/64 input - output tables, the output levels planned in the country's First Five-Year Plan 1960/61 — 1964/65, are not consistent.

IV — Testing the Consistency of Growth and Balance-of-Trade Targets

A test was also designed to determine if the targets of 40% growth in total value added and a zero deficit in the balance of trade are compatible. In this connection, a crucial question is whether the indirect import requirements of the industrialization programme embodied in the Plan have been taken into account. To do that, we take the planned final bill of goods (column (1) of Table 2) as our starting point. Also we shall

(16) The sample values of T^2 were 23567.4 and 13443.9 for the 1954 and 1963/64 equations, respectively. This is much larger than the theoretical value of 12.02 at the one per cent confidence limit and with degrees of freedom of 2 and 18. For a discussion of the computational procedure, see Bolch and Huang, ibid.

accept the export figures given in the Plan frame at their face value. It only remains to deduce the import levels implied by the vector of final demand. Utilizing input-output data, the vector of total (direct plus indirect) intermediate import requirements implied by the vector of final demand is calculated. To this is added the amount of imports required for final use. This sum is the total figure for imports, which must be matched by the total value of exports. Any discrepancy between total net exports (exports less imports) calculated here and the net exports figure in the Plan may be taken as an indication of inconsistency only if an equal saving cannot be achieved through import substitution. If it is not possible to carry out an import substitution programme which will save imports by the amount of the gap, then it may be concluded that the growth target and the balance-of-trade target in the plan are not consistent. On the other hand, if such a programme is deemed possible, it may be concluded that the two targets are consistent.

Let us formally outline the test. From the input-output table one derives the input-output coefficients for imports :

$$\alpha^{m}_{ij} = m_{ij} \,/\, Y^{*}_{oj} \quad (i, j = 1, \ldots, N) \qquad (13)$$

Deliveries from imports of the ith good to the jth industry are denoted m_{ij} , and Y^{*}_{oj} is the gross output of the jth industry. The input-output coefficients α^{m}_{ij} give the per unit direct import requirements only. The per unit direct plus indirect import requirements are given by :

$$\eta_{ij} = \sum_{k=1}^{N} \alpha^{m}_{ik} \varepsilon_{kj} \quad (i, k, j = 1, \ldots, N) \qquad (14)$$

Where ε_{kj} is the typical element of the inverse matrix $E = (I - A_d)^{-1}$. Thus, the direct plus indirect intermediate import requirements implied by the vector of planned final demand are :

$$m^*_{1i} = \sum_{j=1}^{N} \eta_{ij} \, f_{pj} \qquad (i = 1, \ldots, N) \qquad (15)$$

The vector of imports for final use, say m_2 * , is assumed to be estimated in the **Plan Frame.** The total figure for imports will thus be :

$$m^*_o = \sum_{j=1}^{N} m^*_{1j} + \sum_{j=1}^{N} m^*_{2j} \qquad (16)$$

and the balance-of-trade deficit will be

$$d = m_o * - \bar{x}_o \qquad (17)$$

where $\bar{x}_o$ is the total value of exports as **given** in the **Plan Frame.** The consistency of the growth and balance-of-trade targets will depend on whether an import substitution programme can be implemented to save d. Specifically, if it can be demonstrated that import substitution of the kind envisaged in the Plan can actually save imports of that magnitude, then the two targets are consistent. If that cannot be demonstrated, then the two targets are inconsistent. We must admit, however, that any such demonstration is, to some degree, more a matter of art and faith than science.

Table 3 contains the results of computations based on formulae (13) — (15). The final demand imports in column (1) of the table are derived, as mentioned above, straight from the **Plan Frame.** Total planned imports are also derived from the same source. To see if the planners really took account of indirect intermediate imports we applied equation (15). This was done using the planned final demand vector in column (1) of Table 2, once with the import coefficient matrix of 1954 and another time with the import coefficient matrix of 1963/1964. The results are recorded in columns (3) and (4), respectively. Estimated total imports are then taken as the sum of final demand imports for intermediate use. These are recorded in column (5) and (6).

Table 3.—Planned and Calculated Imports for Egypt in 1964/65

(in L.E. million at 1959/60 factor prices)

No.	Sector	Final Demand Imports	Total Planned Imports	Inter. Imports Bas. on the In. Output Matrix for		Total Imports Bas. on In/Out. M.	
				1954	63/64	54	63/64
		(1)	(2)	(3)	(4)	(5)	(6)
1.	Agriculture	11.8	47.9	10.0	48.5	21.8	60.3
2.	Ginning and pressing	—	—	—	—	—	—
3.	Mining and quarrying	—	—	11.4	32.8	11.4	32.8
4.	Food processing	7.2	21.5	10.1	11.5	17.3	18.7
5.	Tobacco	—	—	1.2	—	1.2	—
6.	Spinning and weaving	—	1.6	8.6	5.8	8.6	5.8
7.	Clothing	4.2	4.0	0.4	—	4.6	4.2
8.	Paper and paper products	1.0	3.5	12.1	11.4	13.1	12.5
9.	Chemical manufacturing	2.2	23.0	36.5	30.2	38.7	32.4
10.	Coal and petroleum refining	—	2.6	21.5	6.2	21.5	6.2

(Cont.)

Table 3.—Planned and Calculated Imports for Egypt in 1964/65

(in L.E. million at 1959/60 factor prices)

No.	Sector	Final Demand Inports (1)	Total Planned Imports (2)	Inter. Imports Bas. on the In. Output Matrix for 1954 (3)	63/64 (4)	Total Imports Bas. on In/Out. M. 54 (5)	63/64 (6)
11.	Nonmetallic manufacturing	1.6	1.6	0.2	0.6	1.8	2.2
12.	Basic metals	20.6	20.6	27.5	15.8	48.1	36.4
13.	Metal products	—	4.1	6.5	12.2	6.5	12.2
14.	Machinery except elect. machinery	32.2	32.2	9.2	13.9	41.4	46.1
15.	Electricity	—	—	—	—	—	—
16.	Building and construction	—	—	—	—	—	—
17.	Transport and communications	—	—	6.1	—	6.1	—
18.	Other services	—	—	3.8	8.2	3.8	8.2
19.	Wood and furniture	—	12.0	—	10.4	—	10.4
20.	Other industries	38.8	40.3*	23.6	20.4	62.4	59.2

Sources and Notes :

Columns (1) and (2) are derived from Table 36 of **Plan Frame.** Columns (3) and (4) are calculated using formula (15) Column (5) = column (3) + column (1), column 6 = column (4) + column (1).

* Planned imports for other industries were derived as a balancing item, if calculated independently it would amount to L.E. 43.4 million.

Calculations based on equation (16) produce a value for m^*_0 between L.E. 308.3 million and L.E. 347.5 million for 1964/65, depending on whether we use the 1954 or the 1963/64 input-output and import coefficient matrices. This is about 44% — 62% higher than the figure for planned imports for the target year 1964/65. Hence d, the balance-of-trade deficit, ranges from L.E. 94 million to L.E. 133 million. This range encompasses the value we would have obtained had we applied. Maizels' aggregate measure of gross import substitution(17) ; It remains now to be determined if an import substitution programme can be devised to achieve savings in imports of about half the base-year import bill over a mere five-year period. The answer depends, to a large extent, on the nature of imports to be substituted. For this reason, it is necessary to break down total imports into the main constituent commodities which are to be replaced. This entails distinguishing imports according to their industry of origin. This is already achieved since we are making use of the import coefficient matrix. By using the import coefficient matrix, intermediate imports of the same origin are lumped together(18). Thus, when one is interested in examining

(17) Maizels defines gross import substitution during a given period as «the difference between actual imports at the end of the period and what they would then have been had they formed the same proportion of total consumption as at the beginning of the period». Cf. Alfred Maizels, Industrial Growth and World Trade (Cambridge : At the University Press, 1963, pp. 150-151). To apply this definition, note that what he calls actual imports at the end of the period is, in our case, planned imports in the target year of the plan 1964/65. In the application we used the following numbers from the **Plan Frame**, Tables 28 and 28a ; total supply is L.E. 1793.8 million in 1959/60 and L.E. 2589.3 million in 1964/65; imports are L.E. 229.2 million and L.E. 214.9 million respectively ; giving a proportion of imports to total supply of 0.128 and 0.083 respectively. If the measure is applied using these values, gross import substitution in the Plan between 1959/60 and 1964/65 amounts to L.E. 117.0 million.

(18) This brings out the importance of distinguishing imported and domestic inputs in each cell of the input-output table. If only the import coefficient vector is available, it would not be possible (in estimating intermediate import requirements corresponding to any vector of final demand) to distinguish imports by industry of origin. If only an import coefficient vector is available, then the intermediated import requirements will be :

$$\begin{bmatrix} \alpha^{m}_{o1} & 0 & \dots & 0 \\ 0 & \alpha^{m}_{o2} & \dots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \dots & \alpha^{m}_{oN} \end{bmatrix} \begin{bmatrix} f_{o1} \\ f_{o2} \\ \vdots \\ f_{oN} \end{bmatrix} = \begin{bmatrix} \alpha^{m}_{o1} f_{o1} \\ \alpha^{m}_{o2} f_{o2} \\ \vdots \\ \alpha^{m}_{oN} f_{oN} \end{bmatrix} \quad (i)$$

by contrast, if an import coefficient matrix is available, then the intermediate import requirements will be

$$\begin{bmatrix} \alpha^{m}_{11} & \alpha^{m}_{12} & \dots & \alpha^{m}_{1N} \\ \alpha^{m}_{21} & \alpha^{m}_{22} & \dots & \alpha^{m}_{2N} \\ \vdots & \vdots & & \vdots \\ \alpha^{m}_{N1} & \alpha^{m}_{N2} & \dots & \alpha^{m}_{NN} \end{bmatrix} \begin{bmatrix} f_{o1} \\ f_{o2} \\ \vdots \\ f_{oN} \end{bmatrix} = \begin{bmatrix} \sum_{j=1}^{N} \alpha^{m}_{1j} f_{oj} \\ \sum_{j=1}^{N} \alpha^{m}_{2j} f_{oj} \\ \vdots \\ \sum_{j=1}^{N} \alpha^{m}_{Nj} f_{oj} \end{bmatrix} \quad (ii)$$

From (i), it is clear that $\alpha^{m}_{oj} f_{oj}$ represent imports from all industry origins required by the final demand of the jth industry. It is obvious from (ii) that $\sum_{j=1}^{N} \alpha^{m}_{ij} f_{oj}$ represents imports of industrial origin i required by final demands for all industries. Thus, in order to be able to distinguish the industrial origin of imports, the import vector is not helpful; we have to have an import matrix. Whether=

the possibilities for import substitution, the import coefficient matrix is indispensable. We used this matrix to derive our estimates and the figures in columns (3) and (4) in Table (3) are, in fact, imports by industry of origin. Import figures in columns (5) and (6) of table 3 are also distinguished by industry of origin. This allows us to calculate the corresponding vectors of imports to be substituted. These are given in Table 4.

=an import vector or an import matrix is used, the sum total of intermediate import requirements should be the same. This can be easily seen by summing the components of the right-hand side of (i) and (ii).

$$\sum_{j=1}^{N} \alpha_{oj} f_{oj} \equiv \sum_{i=1}^{N} \sum_{j=1}^{m} \alpha_{ij} f_{oj} \equiv \sum_{j=1}^{N} \left(\sum_{i=1}^{N} \alpha_{ij} \right) f_{oj} \qquad \text{(iii)}$$

The identity in (iii) is asserted by noting that $\alpha_{oj} = \sum_{i=1}^{N} \alpha_{ij}$

for a comprehensive discussion of this and other related aspects of estimating import requirements see Gamal E. Eleish, «Use of Input Output Model in Calculating Foreign Exchange Requirements in Medium-Term Plans with some Emphasis on the Developing Economies, a paper submitted to the first Interregional Seminar on Development Planning — **Planning the External Sector : Techniques, Problems and Policies** (Ankara, Turkey, 6-17 Sep. 1965) mineographed, p. 35.

Table 4.—Import Substitution in Egypt's First Five-Year Plan

(L.E. million)

No.	Sector	Imports to be substituted based on the 54 input-output matrix	Imports to be substituted based on the 63/64 input-output matrix
3.	Mining and quarrying	11.4	32.8
5.	Tobacco	1.2	—
6.	Spinning and weaving	7.0	4.2
8.	Paper and paper products	9.6	9.0
9.	Chemical manufacturing	15.7	9.4
10.	Coal and petroleum refining	18.9	3.6
11.	Non-metallic manufacturing	0.2	0.6
12.	Basic metals	27.5	15.8
13.	Metal products	2.4	8.1
14.	Machinery except elect. machinery	9.2	13.9
	Total	**103.1**	**97.4**

Source : Derived from Table 3 :

The first column of Table 4 is the difference between columns (2) and (5) of Table 3, and the second column is the difference between columns (2) and (6). It is easy to see, by referring to table 4, that imports of the output of the following industries will have to be at least partly substituted[19] : mining and quarrying, tobacco, spinning and weaving, paper and paper products, chemicals, coal and petroleum refining, non-metallic manufacturing,

(19) We only recorded the cases where the estimated import requirements based on the 1954 and the 1963/64 data exceeded the planned requirements. There were some industries for which estimated import requirements based on one set of production data exceeded the planned requirements, while estimates based on the other set fell short of planned requirements. Such cases were ignored.

basic metals, metal products and machinery except electric machinery.

It is difficult to see how imports of tobacco can be totally eliminated when tobacco can hardly be grown in Egypt. Imports of mining and quarrying products, except for those that cannot be found in Egypt, may be replaced by increasing capacity in this industry. One may not envision any serious problem with regard to replacing imports of spinning and weaving. Perhaps the most serious obstacles can be expected in connection with import substitution effort in paper and paper products, chemical manufacturing, basic metals and machinery. Obstacles may be the lack of raw materials such as may be the case with the paper and paper products industry. Most important, these obstacles may be the lack of skilled personnel : workers, managers, etc. This problem is more likely to affect such industries as chemical manufacturing, basic metals and machinery. These are exactly the industries that were given great emphasis in the plan. One may conclude, then, that it is highly unlikely that an import substitution programme such as the one portrayed in Table 4 could be successfully carried out. Consequently, the 40% growth target and the balance-of-trade target are not likely to be consistent.

V — Conclusion

This study was motivated by the fact that the choice of industries in the first Egyptian five-year plan was not based on a comprehensive planning model. In the absence of such a model, internal consistency of the plan cannot be guaranteed beforehand. This is why two types of consistency tests were performed on the plan — one, to test the consistency of individual sectoral output targets, the other, to check the consistency of the balance-of-trade target and the overall-growth target. This latter test led to the examination of the possibility of carrying out the import-substitution programme embodied in the Plan.

The foregoing analysis led to the following conclusions :

(i) The individual sectoral output targets in the plan do not seem to be consistent. The reason for inconsistency is the lack of a comprehensive framework within which to tackle the resource allocation problem. It was revealed, using statistical

regression analysis, that the planned sectoral output levels are significantly different from the set of consistent sectoral output levels generated by solving the input-output model.

(ii) The analysis also revealed that the overall-growth target and the balance-of-trade target are not consistent. It seems that the import-substitution programme implied by these targets is difficult to achieve over a period as short as five years. Our calculations have shown that about one third of the target year (1964/65) imports would have to be replaced. The imports to be replaced include such products as paper and paper products, machinery, metal products and chemicals. It is our contention, which we have argued above, that it does not seem likely that these imports will be easily replaced in view of the fact that the country has just started in these areas. One is forced to conclude, then, that either the planners over-estimated the country's capacity to replace imports as required by the overall-growth and balance-of-trade targets, or they neglected indirect import requirements.

(iii) Finally, one of our major conclusions was of a rather analytical nature. When deriving the implications of a certain set of targets to determine their consistency, it is necessary to break each target down to its constituent parts. For example, to judge the consistency of a 40% growth of total value added and an equilibrium in the balance of trade, the answer hinges on whether the 40% growth will come basically from expanding capacity in heavy industry, light industry, or agriculture, etc. Thus, the inconsistency of the growth target and the balance-of-trade target may be due to the high priority given to metals, machinery, and chemicals, and the low priority given to agriculture.