

EGYPT'S PATTERN OF TRADE AND DEVELOPMENT:  
A MODEL OF IMPORT SUBSTITUTION GROWTH.

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## Introduction

Egypt's real Gross National Product increased in 1952-64 at an average rate of 5 per cent per annum. This growth came to a halt in the mid-1960's mainly as a result of a constraining foreign-exchange bottleneck. This study diagnoses import substitution growth with the aim of prescribing alternative strategies which could reconcile growth with external equilibrium.

A macro-growth model reproducing Egypt's economic system is constructed for the period 1952-67. A characteristic of the model is the combining of input-output and multiple regression techniques in the specification of the structural equations. Particularly worth mentioning is the specification of input-output equations for aggregate consumption of industrial goods and services. This specification offers an alternative to the conventional procedures followed in projecting production levels in these two sectors.

The common practice is to specify consumption as a function of income and prices and, given the values of other components of final demand, intermediate demand is estimated through the aid of an input-output table. Final demand plus intermediate demand would then equal gross output.

The alternative we have suggested on the basis of Egypt's case follows a different order. Production levels are predetermined by inflexible plan targets. Final demand is estimated as production minus intermediate demand. Finally consumption is estimated as the residual balancing term in the supply-demand equations after deducting the values of investment and export demands.

The study shows the descriptive validity of the above-described residual approach. In the case of industry, it has the advantage of tying production targets to export performance, given the desired values of domestic final demand.

The study is divided into two parts. Part I outlines Egypt's import substitution strategy, and discusses the specifications and estimation of the structural equations of a macro-growth model constructed for the import substitution stage.\* Part II uses the constructed model for the diagnosis of past growth, and the prescription of alternative future policy designs. A modified version of Tinbergen's theory of economic policy is used in this latter part.

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\* This study is part of my Ph.D. dissertation, see Essam Montasser, "Egypt's Pattern of Trade and Development: A Model of Import Substitution Growth" (unpublished Ph.D. dissertation, Princeton University, 1972). In this dissertation I have shown that Egypt's growth during the period 1952-67 constituted a distinct phase in the country's long-term economic evolution during which import substitution industrialization served as the engine of growth.

## PART I

## A MACRO-GROWTH MODEL FOR EGYPT: 1952-67

A preliminary analysis indicates that the decline of Egyptian growth was accompanied by the following: (a) the emergence of large trade and saving gaps, (b) an inflationary rise in prices, particularly of food, (c) substantial underutilization of installed capacity in the industrial sector, and (d) accumulation of inventories of manufactured goods above the desired level.

A meaningful assessment and analysis of the factors underlying the decline of growth, with the objective of finding policy solutions for them, must be undertaken within the context of the general economic system. The built-in feedback effects of the system, particularly during a period of structural transformation, were of fundamental importance to the system's pattern of behavior, and accordingly it would not be wise to ignore them. Any piecemeal analysis would provide us only with a partial picture of what happened, which would by itself represent an unsatisfactory foundation for policy design.

In this part we discuss the formulation and estimation of a macro-growth model depicting the basic structure of the Egyptian economy during the import substitution stage. In the following part the model is used for policy analysis.

This part will be divided into two sections. Section I will provide an overview of trends in the macro-aggregates during the period of growth by

import substitution. Section II contains a discussion of the estimation of its structural parameters.

### Strategy of Import Substitution Growth

Table 1.1 contains data on the major macro-variables during the period 1952/53 - 66/67. Gross National Product increased at a moderate rate during the 1950's, accelerated in the early 1960's, and came to a halt by the middle of the decade.

In 1952 a revolutionary government acceded to power with an explicit and firm commitment to accelerate industrial growth. To achieve this goal it assumed full control of the great bulk of investment activity in the economy. Up to 1964, a rapid rate of growth of capital formation was achieved. However, from 1964 to 1967 there was an absolute decline in real investment. In June 1967 the Arab-Israeli War broke out, an event which reinforced the existing recessionary trend in the economy. Since then both investment and GNP at constant 1959/60 prices have virtually stagnated.

The growth of investment was linked to import growth in two ways. One, given the near-absence of any significant capital goods sector, the growth of investment led to a similar growth in imports of capital goods. Two, the contribution of investment to growth in national income and output led to a rapid growth in demand for food and intermediate goods. Given the inelasticity of food supply, an increasing share of total food supply had to be imported. At the same time, imports of other consumer goods were brought

TABLE 1.1

MACRO-PATTERN OF IMPORT-SUBSTITUTION GROWTH: 1952/53-66/67  
 (All values are in L.F.,<sup>a</sup> at constant 1959/60 prices)

	1953/54	1959/60	1964/65	1966/67	53/54-64/65	59/60-64/65	64/65-66/67	Average compound growth rates (percent per annum)
<u>Supply of resources</u>								
Gross national product	1115	1376	2030	2122	5.0	7.7	1.9	
Commodity imports	152	226	313	298	6.6	6.5	-2.5	
<u>Use of resources</u>								
Consumption	948	1200	1757	1858	4.6	7.5	2.4	
private	771	972	1355	1437	5.1	6.7	3.3	
government	177	228	402	421	7.4	11.3	2.4	
Capital formation	155	171	356	316	7.5	14.7	-5.8	
Changes in stocks <sup>b</sup>	--	--	+13	+19				
Commodity exports <sup>c</sup>	142	193	230	227	4.3	3.6	-0.5	
<u>Sources of financing</u>								
<u>capital formation</u>								
Domestic savings	144	176	288	290	6.3	9.8	-2.0	
private	147	166	359	345	8.1	15.3		
government	-3	+10	-71	-55	28.8		-8.0	
External finance	+10	+33	+83	+71	19.2	25.1	-8.1	

TABLE 1.1 (cont'd)

	1953/54	1959/60	1964/65	1966/67	53/54-64/65	59/60-64/65	64/65-66/67
<u>Productivity changes</u>							
Value-added (at factor cost)/employed labor	214	238	237	2.2	0.0		
Value-added (at factor cost)/net capital stock (lagged one year) <sup>d</sup>	0.77	0.53	0.50	0.45			
<u>Population &amp; labor</u>							
Population (millions)	22.5	25.8	29.5	31	2.45	2.79	2.44
Employment (millions)	6.0	7.4	7.7	7.7	4.0	4.0	2.4
<u>Per capita resources</u>							
Gross national product (p.c.)	49.5	53.3	68.8	68.4	3.0	5.1	-0.5
Private consumption (p.c.)	34.3	37.9	45.9	46.4	2.6	3.8	0.5



TABLE 1.1 (cont'd)

	Average compound growth rates (percent per annum)						
	1953/54	1959/60	1964/65	1966/67	53/54-64/65	59/60-64/65	64/65-66/67
<u>Prices<sup>e</sup></u>							
General wholesale prices	83	100	113	130	2.8	2.2	6.9
Food prices	84	100	122	154	3.4	3.9	11.5
External terms of trade	92	100	91	92			

<sup>a</sup> L.E. = Egyptian pound (according to the official exchange rate prevailing in the mid-1960's. One L.E. = \$2.4.

<sup>b</sup> Stocks of industrial goods only.

<sup>c</sup> Net adjusted for overvaluation after de facto devaluation (by 24 per cent) of L.E. in 1962.

<sup>d</sup> Capital figures do not include investment in the Aswan High Dam since it did not contribute to output during this period. For methods used in estimating and depreciating capital stock series, see statistical appendix.

<sup>e</sup> Official price indices.

Notes and Sources: See Statistical Appendix to Montasser, Ibid.

to a minimum through various highly protective import policies.

Accordingly, the growth in investment was accompanied by a growth in imports, though at a lower rate because of the import-substituting effect of the new investments. However, the growth of investment and imports was not matched by a parallel growth in domestic savings and exports, and thus led to the emergence of both a savings and a trade gap. Needless to say, the two gaps were equal ex post, and foreign resource inflows filled both of them simultaneously.

With the foreign debt reaching alarming proportions in the mid-1960's, and external finance becoming more difficult to obtain, severe curbs were imposed upon imports. Food shortages occurred, and the gap between domestic demand and supply caused a rise in food prices at a compound rate of 11.5 per cent per annum in 1964/65 - 1966/67 (see Table 1.1). Given the importance of food in a low-income economy such as Egypt's, it was inevitable that the rise in food prices lead to an inflationary rise in the general price level.

The curb on imports of producer goods hit industry the hardest. New investments in industry had to be reduced to a minimum, and some established industries were forced to slow down because of shortages in spare parts, raw materials and other intermediate imports.

Although the curb on imports was a major factor in the decline of industrial growth, it was not the only one. Poor projections of both domestic and export demand for industrial products led to substantial misallocation of

investment in the industrial sector. The ultimate outcome was that many industrial plants operated far below capacity.

### Labor Supply and Employment

A major feature of Egypt's economy is its substantial surplus labor. Although a great deal of controversy has arisen with regard to the nature and implications of the existence of this surplus labor, especially in the agricultural sector,<sup>1</sup> there has been no denial of its presence in the economy as a whole.

A majority of private and official experts had estimated surplus labor in the agricultural and services sector to range from 25 to 40 per cent.<sup>2</sup> Furthermore, surplus labor has probably been increasing because of the following factors: (a) a high and accelerating rate of population growth, whose average compound rate of growth in 1960-65 was 2.7 per cent per annum, and (b) a sharp rise in labor force participation rates especially for urban

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<sup>1</sup> For references--in English--to this problem, see Bent Hansen, "Marginal Productivity Wage Theory and Subsistence Wage Theory in Egyptian Agriculture," Journal of Development Studies, II (July 1966), 367-407, and "Employment and Wages in Rural Egypt," The American Economic Review, LIX, No. 3 (June 1969), 298-313; also see Donald C. Mead, Growth and Structural Change in the Egyptian Economy (Illinois: Richard D. Irwin, Inc., 1967) and E. Mabro, "Industrial Growth, Agricultural Under-Employment and the Lewis Model; The Egyptian Case, 1937-1965," The Journal of Development Studies, III, No. 4 (July 1967), 322-351.

<sup>2</sup> See Mead, op. cit., pp. 80-98.

females. The total civilian labor force increased at a compound rate of 4.7 per cent per annum since the 1960's, a rate which far exceeds the rate of growth of population.

The agricultural sector, which engaged 62.4 per cent of the total labor force in 1947, absorbed only 19.9 per cent of additions to labor force (i. e., new labor) during the period 1947-60 (see Table 1.2). This could be explained

TABLE 1.2  
ALLOCATION OF LABOR BY MAJOR SECTORS

	Labor shares of major sectors (percentage)			Sectoral shares of additions to labor force (percentage)	
	1947	1959/60	1964/65	1947-60	1959/60 - 64/65
Agriculture	62.4	54	51.5	19.9	39
Industry*	12.3	13.3	16.2	15.5	30
Services	<u>25.3</u>	<u>32.7</u>	<u>32.3</u>	<u>64.6</u>	<u>31</u>
Total	100	100	100	100	100

\* Includes mining, manufacturing, electricity, and construction.

Sources: For the years 1947, 1960, figures are from U.A.R., Central Agency for Public Mobilization and Statistics, Population Increase in the UAR and its Challenge to Development, Ref. No. 2006/66 (Cairo, November 1966) (in Arabic), pp. 150-51; for 1959/60, 1964/65, figures are from U.A.R., Ministry of Planning, Follow-Up and Evaluation Report on the First Five-Year Plan (1961/61-1964/65), Part I (Cairo, February 1966), p. 63.

in terms of the lack of any significant increase in the supply of arable land during this period, and the general tendency of rural youth to migrate to urban

areas in search of employment. In 1959/60 - 64/65 the labor absorption of agriculture increased slightly as a result of government policy and a substantial acceleration in the rate of growth of land supply.

A rapidly growing labor supply, a declining marginal rate of labor absorption in agriculture (which even in the mid-1960's occupied over 50 per cent of the total labor force), coupled with a government labor policy committed to full employment, meant a sharp rise of employment in the industrial and services sectors.

The rate of industrial labor absorption behaved differently over time. During the 1950's, industrial employment policies were not influenced by the need to absorb some of the existing excess labor supply above its actual labor requirements. But with the beginning of the 1960's, and with the full-scale nationalization of industry, that sector became a major absorber of surplus labor. A government committed to a policy of full employment, together with a rapidly growing labor force, imposed certain employment targets upon the industrial sector which substantially exceeded its needs. Therefore, we find that industrial employment increased at a compound rate of 2.1 per cent per annum in 1947-1960 (a period characterized by rapid industrial expansion); the corresponding rate for 1959/60 - 1964/65 was 8.1 per cent per annum. In this light, it is not surprising that, according to the Five-Year Plan (1959/60 - 64/65) Evaluation Report, the industrial employment target was more than met while industrial output was 25 per cent below its target

levels.<sup>3</sup>

Finally, given a politically tolerable rate of unemployment, employment in the services sectors (especially public services) was decided largely as a residual, thus satisfying the labor demand-supply balance equation.

The above employment strategy had a direct bearing on the savings and trade gaps in at least two major ways. One, the industrial employment policy of excess labor absorption represented a form of unemployment subsidy and contributed to a rise in the cost of industrial production and a decline in industrial profits. As will be discussed in more detail later, the former reduced the industrial sector's international competitiveness, and the latter cut into the main source of aggregate savings, i. e., industrial profits. Two, the growth in government employment in response to employment demand pressures meant ceteris paribus a net contribution to aggregate demand, with zero contribution to aggregate supply of commodity output. This also had an especially adverse effect on the balance of payments, as will be seen later.

#### Income Distribution

Two types of changes in income distribution took place in Egypt during the period 1952-67. The first was the change in functional income distribution, that is, factor shares. The instruments of change in this case were mainly employment, wage, and tax policies (including subsidies which could

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<sup>3</sup>United Arab Republic, Ministry of Planning, Follow-up and Evaluation Report on the First Five-Year Plan (1960/61 - 64/65), Part I (Cairo: February 1966), p. 9.

be considered a negative tax). The second was the change in income distribution by size, that is, by income brackets. The mechanism through which this latter change was brought about was initially the distribution of wealth via the reallocation of land favoring the landless classes, sequestration, and nationalization of private property.

The two types of income distribution overlapped, and the policies used to bring them about reinforced one another. However, what concerns us in this study is the ultimate impact of the various policies on these two aspects of income distribution. From an income-bracket point of view, the final outcome was a reduction in the number of families in the low-income brackets (i.e., with annual income below £.E. 100); an increase in the number of families in the middle range (i.e., £.E. 100-600); and an evening out of income distribution within the latter group.<sup>4</sup>

As for income distribution by factor share, the main discernible change was the rise in the share of real wage income in national income. The available statistical evidence clearly corroborates this fact. In 1954 labor's real wage share<sup>5</sup> was 40 per cent; it then increased to 42 per cent

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<sup>4</sup>An evidence to this effect could be derived from a comparison of frequency distributions of families by expenditure brackets (which in the absence of savings would be equivalent to income) based on cross-section family budget studies for 1958, 1965. See National Bank of Egypt, Economic Bulletin, XX, No. 3 (1967), 268-80.

<sup>5</sup>The real wage share is the ratio of money wages deflated by a sales price index to current price valued-added deflated by a cost-of-production index.

in 1959/60 and to 47 per cent in 1964/65.

For the industrial sector alone, in the 1950's, the share of wages followed a declining trend, from 41 per cent in 1952 to 32 per cent in 1959. But with the beginning of the 1960's, this trend was reversed and the share of wages began to increase, reaching a level of 35 per cent in 1964/65. However, if we add to total wages in this latter year non-wage labor incomes such as labor's share in profits and other fringe benefits (which increased rapidly since the nationalization of industry at the beginning of the 1960's), the share of total wage income would substantially exceed 40 per cent.

The implications of a rise in wage income for savings and consumption are quite familiar. In the case of Egypt's industrial sector, over 50 per cent of the after-wage surplus goes to savings while the rate of savings out of wage income has been estimated at around 2 per cent. Moreover, given the fact that the increase in wages benefited mostly unskilled workers who, in large part, fall in the low-income brackets, it also came to have some bearing on the pattern of consumption which favored demand for food and basic manufactured goods.

#### Fiscal Policies

Two aspects of government fiscal policies are of concern to us in this study: one, the government budget deficit on current account, with its impact on the level of aggregate savings; and two, the structure of government income and expenditure, and its potential influence on the pattern of consumption.



After an initial attempt at following a balanced budget policy which only lasted around two years, the budget policy was reversed to one of a steady and rising budget deficit. Accordingly, the real budget deficit on current account increased from £.E. 3 million in 1953/54 to £.E. 48 million in 1957/58 and to £.E. 111 million in 1963/64. For the period 1959/60 - 1966/67 the budget deficit averaged £.E. 60 million per annum at constant 1959/60 prices. This amounted to 21 per cent of average private savings during the same period. It is in fact this government dissaving which had mainly led to the emergence of the savings gap.

Underlying increasing government dissaving were inelastic tax revenues on the one hand, and rising government expenditures--especially on defense and welfare transfers--on the other. While real private income (i. e., disposable income plus business retained profits) increased at a compound rate of 5 per cent per annum in 1952/52 - 1964/65, the rate of growth of direct taxes was only 2 per cent per annum. As for indirect taxes, they increased at a compound rate of 6 per cent;<sup>6</sup> yet if we deduct from them price subsidies and other cost-of-living allowances, their rate of growth would drop to below 5 per cent. At the same time, government expenditure on goods and services increased at a compound rate of 7.5 per cent per annum.

The second important feature of fiscal policies in Egypt was the

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<sup>6</sup>The increase in revenue from indirect taxes was realized mainly from sharp rises in customs duties whose revenue constituted, in 1964/65, 75 per cent of all tax revenue.

pattern of growth of government revenue. The only tax on agricultural income was the land tax whose revenue stagnated throughout the period. Thus the increase in agricultural income was virtually exempt from any taxes. Moreover, income from wages and salaries up to £.E. 250 ~~was~~ exempt from taxes, and for the following £.E. 100, the tax rate was only 2 per cent.<sup>7</sup> This tax structure, in addition to the increase in welfare transfers from £.E. 6 million only in 1952/53 to £.E. 46 million in 1964/65, had no doubt reinforced the trend towards a rapid growth in demand, mainly for food.

#### Investment Allocation

As mentioned earlier, since the mid-1950's, the government had gained full control of all investment activity, and was thus in a position to determine both its level and pattern of growth. Therefore, the observed pattern of investment allocation could not be attributed to such factors as, for example, the tariff structure as has been diagnosed in some other cases. In fact, since imports of non-food consumer goods were reduced to an insubstantial level early in the 1950's, tariffs on imports of raw materials, intermediate, and capital goods were raised substantially in order to make up for the loss in budget revenue from import duties on consumer goods.

Three major aspects of government policies of investment allocation exercised a strong influence on the demand, supply, and imports of capital

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<sup>7</sup> For a detailed discussion of Egypt's tax structure, see Jorgen R. Lotz, "Taxation in the United Arab Republic (Egypt)," International Monetary Fund, Staff Papers, XIII, No. 1 (March 1966), 121-53.

goods. One is the substantial shift in investment allocation towards a greater emphasis on the commodity sectors. Table 1.3 clearly indicates this trend.

TABLE 1.3  
PATTERNS OF INVESTMENT ALLOCATION  
(Current Prices, £.E. million)

	1953/54		1959/60		1964/65	
	Value	%	Value	%	Value	%
Commodity sectors	53	40	85	50	247	69
Services sectors	<u>79</u>	<u>60</u>	<u>86</u>	<u>50</u>	<u>117</u>	<u>31</u>
Total gross fixed capital formation	132	100	171	100	364	100

Source: Various publications of the United Arab Republic's Central Agency for Public Mobilization and Statistics.

This trend in the pattern of investment allocation had a strong impact on the growth in demand for capital. The commodity mix of investment in services differs significantly from that of the commodity sectors in the sense that construction constitutes the major part in the former, while equipment constitutes the major part in the latter. Accordingly, the observed change in the ratio of investment in these two major sectors brought about a faster demand for capital equipment. And given the negligible size of the domestic capital sector, the large bulk of the needed capital had to be imported.

Two, a large portion of total investment in the commodity sectors was allocated to projects with a long gestation period such as the Aswan High

Dam and related electricity projects. For example, during the period 1960/61 - 1966/67, total investment in the High Dam alone amounted to 10 per cent of all investments in the commodity sectors. The contribution of the High Dam investments to output will not be felt until the 1970's and will be stretched over a fairly long period. In the meantime, it has had an immediate impact on income by a multiple of its value; and given the country's low real marginal propensity to save, such investments could only add to the existing inflationary pressures. From the point of view of the savings gap, the allocation of sizeable investments to projects characterized by a long gestation period meant a rise in investment with no parallel rise in savings and, accordingly, led to a widening of the savings gap.

Three, investment allocation within the industrial sector did not place any emphasis on the capital goods sector. After an initial--and somewhat short-lived--tendency to give more attention to the promotion of the heavy goods industries in general, the government reversed the trend, particularly since the beginning of the 1960's. Although this change in policy orientation might have been prompted by technical and economic difficulties such as the absence of the needed skills, the size of the market, etc., it was also based on welfare considerations. This is made evident by the explicit statement in the National Charter which defined the country's industrialization philosophy and objectives as ones that would endeavor "to strike a humane balance reconciling the requirements of production with those of consumption."<sup>8</sup> The

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<sup>8</sup>Quoted in United Arab Republic, Central Agency for Public Mobilization

Charter goes on to say that the theories which advocate that developing nations should specialize in light consumer goods as well as those which stress heavy industries would be rejected on the grounds that this would necessarily entail great deprivations on the part of the people. It also explains that "the U.A.R. industrial policy had been based until the end of the First Five-Year Plan (1959/60 - 1964/65) on placing relatively greater stress on consumer industries... . But in order to realize a more balanced industrial structure, the Second Five-Year Plan (1964/65 - 1969/70) will lay more stress on heavy industry."<sup>9</sup>

The outcome of this philosophy was that, in the First Five-Year Plan, while a certain balance was maintained among investments allocated to the consumer goods sectors, the share of the capital goods sectors (especially machinery) in total industrial investment did not exceed 5 per cent. The outcome of this development was that, while demand for capital goods increased rapidly as a result of the increase in the level and change in the commodity mix of investment, the growth of supply lagged behind, and thus led to the emergence of a capital goods bottleneck.

The above outline of some of the general policies constituting the import substitution strategy delineates the major roles played by those policies in building up the savings and trade gaps. Beneath the trade gap, there were

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and Statistics, Population Increase in the United Arab Republic and Its Challenge for Development (Cairo: November 1966) (in Arabic), pp. 254-55. The National Charter was ratified in 1962.

<sup>9</sup> Ibid.

the food and capital goods gap; the former fed by wage and tax policies, the latter a product of investment policies. Beneath the savings gap, one finds (a) the budget deficit cutting deep into aggregate savings, (b) industrial income policy cutting into the sources of private savings, and (c) the allocation of investment to projects with a long gestation period leading to a rise in the capital-output ratio. While the existence of any one of these disequilibria by itself could have been substituted for, and thus would not have halted growth, their simultaneous emergence caused growth to decline.

However, it would be an error to assume that the import substitution strategy was aimed at achieving short- or medium-run external equilibrium. In fact the opposite was true. According to Egypt's explicit policy, the main aim of the strategy was to maximize growth without entailing much sacrifice on current consumption, that is, through the assistance of external finance and aid. It is in this light that the strategy must be evaluated.

One might say that the strategy's built-in dependence on foreign resources had gone too far such that it had become largely self-defeating and had precipitated the decline of growth. Nevertheless, this is not our concern here. Regardless of whether the difficulties faced by the strategy were a direct outcome of its deliberate policies or had been reached by default, it created an economic structure adapted to a steady and rising inflow of foreign resources. But now that this foreign resource inflow is decreasing and becoming increasingly harder to obtain, a new strategy has to be designed with the explicit aim of bringing about the requisite structural transformation.

This latter goal could be achieved in two steps: one, by reconstructing the structure brought about by the import substitution strategy in a model form which simulates reality; two, by formulating new and feasible alternative development strategies and testing their impact on achieving the desired targets, given the old structure.

### Egypt's Import Substitution Growth Model

Before discussing the specification and parameter estimation of Egypt's growth model during the import substitution stage, a word on the statistical data used is in order. In the construction of the model, every possible effort was exerted to achieve maximum utilization of available statistical resources and to ensure its accuracy. The fact that Egypt is relatively well endowed with economic data, along with the fact that I have become quite familiar with the idiosyncracies of data sources, methods of compilation, definitions, etc., helped to minimize the data constraint. The series ultimately used in estimating the model's parameters do not in general show any major systematic bias, and thus fairly accurately represent the general trends.<sup>10</sup>

### General Features and Estimation Methods

1. The model is akin to the "two-gap" models' vintage in the sense that one of its major objectives is to project the ex ante saving and trade gaps.

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<sup>10</sup> For a more detailed evaluation of data used, their manipulation, and methods of deflation, see Statistical Appendix to Montasser op. cit.

2. It is completely recursive. This feature could be deduced from the triangular shape of the endogenous variables' matrix of coefficients (see Figure 1.1). By rearranging the endogenous variables according to the order of their interrelations, a triangular matrix of their coefficients vis à vis one another is obtained. The fact that there are no non-zero entries in the matrix above the main diagonal is indicative of the model's recursive nature.

This recursive specification was prompted by two factors. First, it fairly well describes the decision mechanisms of an economy where central planning predominates. Secondly, in a policy-decision model, it is a major convenience since it allows us to follow step by step in a cause-effect fashion the impact of changing the values of policy instrument variables on the values of target variables.

3. The econometric methods used in estimating the model's parameters were ordinary least-squares and the Cochrane-Orcutt iterative technique.<sup>11</sup> It was not felt to be necessary to use other simultaneous estimation procedures such as high stages least-squares or maximum likelihood estimators in the face of the model's pure recursiveness. The use of the Cochrane-Orcutt technique was used in estimating the parameters of equations where statistical tests (Durbin-Watson statistic) indicate auto-correlated error terms. This latter problem is frequently encountered in policy models such as ours where a relatively small number of variables are used in the

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<sup>11</sup> See D. Cochrane and G. H. Orcutt, "Application of Least-Squares Regressions to Relationships Containing Autocorrelated Error Terms," Journal of the American Statistical Association, 44, No. 245 (March 1949), 32-61.





functional equations.

4. Input-output techniques are used as a supplement to regression techniques in the estimation of the parameters of some of the structural equations. They are also used to estimate changes in these parameters over time which might well result from structural changes in the economy. This combined use of input-output and regression techniques also has the advantage of introducing intermediate demand and the required sectoral balances between demand and supply into the model.

5. In discussing the model's structural equations, alternative functional specifications will be provided for certain sectors. This approach allows for the following: (a) to state explicitly the advantages gained from choosing a certain functional specification, and (b) in some cases each of the alternative specifications shed some light on different aspects of the function being discussed. Although the estimated equations as a whole would naturally constitute an overdetermined system, in Part II we will specify two alternative determinate models which will then be used for policy design.

### Structural Equations' Specifications

#### Production Functions

##### Agriculture

The agricultural sector is divided into two subsectors, namely, the cotton and food sectors. Output of the former is completely homogeneous except for some minor variations in the structure of cotton output according

to length of staple. The food sector consists of both animal and plant production, and the latter consists of various commodities such as cereals, dry legumes, clover, sugarcane, etc. However, for all practical purposes, the commodity composition of total output in this sector was fairly stable during the sample period, and is not expected to change in any significant way in the near future. Furthermore, cereals is the dominant commodity group within that sector.

Our choice of explanatory variables to be used in the two agricultural production functions entails a brief explanation of the relationship between demand and supply for agricultural factors of production. By far, land is the scarcest factor and is, accordingly, the dominant one in the agricultural production function. On the other hand, labor is redundant as we have explained earlier and, with the exception of simple implements and draft animals, there is no significant use of capital equipment (such as agricultural machinery) in agricultural production.<sup>12</sup>

However, the virtual absence of capital as an independent factor in agricultural production does not mean that the demand for investment in agriculture is minimal. There are three types of demand for investment in agriculture in Egypt: (a) investment in land reclamation which is quite high given the fact that the country had already reached the extensive margin of its arable land early in the century; (b) given the fact that Egypt's agriculture

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<sup>12</sup>The number of all agricultural tractors was 10,000 at the beginning of the 1950's and was increased by only 1000 over the sample period.

is water-irrigated and not rain-fed, large investments are also required in water-control systems such as dams, barrages, canals, etc.; (c) due to the scarcity of arable land, maximum use is being made of it in the form of multiple-cropping where, in some areas, three crops are produced per annum. This intensive land use led to a rise in the underground water table and thus required large investments in drainage facilities as well as intensive use of fertilizers to avoid a decline in land fertility.

Taking the above into consideration we initially chose five explanatory variables in the agricultural production functions, namely, land, labor, capital (mainly in the form of drainage facilities), water, and chemical fertilizers. The coefficient of the labor variable was very small in absolute value and statistically insignificant in an econometric sense. Although this result is to be expected given the redundancy of labor in Egypt's agriculture,

it may very well have been the outcome of the crudeness of the labor series, especially for the 1950's.<sup>13</sup> Therefore, the factor labor was dropped from the equations.

As for water inputs, there is an area of interaction between it and the variable land, which required an interaction term to measure the common influence of these two variables. But, again, given the crudeness of the water series which pertains to the annual Nile water discharge at Aswan and is not identical with water use, such refinements as the use of an interaction term

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<sup>13</sup> There are no series for labor in agriculture for the 1950's; therefore, an estimate of labor for this period was obtained through interpolating of census estimates and chaining with the available series for the 1960's.

were felt to be superfluous. Accordingly, the variable water was also dropped.

The above process of elimination left us with three explanatory variables, namely, land (cropped area), capital (mainly in drainage facilities), and chemical fertilizers. The estimated parameters for these variables are as follows:

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$$\begin{aligned} \text{CORC: } V_t^c &= -8.332 + 47.283 (L_t^c) + 1.008 \left(\frac{K_{t-1}^a}{L}\right) & R^2 &= 0.948 \\ & (16.386) (11.261) & (0.762) & d = 2.189 \\ & + 3.436 (F_t^c) - 116.764 (D^{v.c.}) \\ & (4.4) & (11.938) & \end{aligned}$$

$$\begin{aligned} \text{OLSQ: } V_t^f &= -76.534 + 28.804 (L_t^f) + 2.116 \left(\frac{K_{t-1}^a}{L}\right) & R^2 &= 0.955 \\ & (73.414) (9.701) & (1.714) & d = 1.852 \\ & + 4.148 (F_t^f) \\ & (2.062) & \end{aligned}$$

$V_t^c, V_t^f$  = value-added in the cotton and food sectors respectively  
(at constant 1959/60 prices, in £. E. million).

$L_t^c, L_t^f$  = cropped area allocated to the cultivation of cotton and food  
(millions of feddans).

$K_{t-1}^a$  = capital in irrigation and drainage lagged one year (at constant  
1959/60 prices in £. E. million).

$L_t$  = total cropped area.

$F_t^c, F_t^f$  = value of chemical fertilizers used in cotton and food sectors  
(at constant 1959/60 prices, in millions £. E.).

$D_t^{vc}$  = a dummy variable which takes positive values for the four years  
(out of the total sample of 15 years) during which at least one-fifth  
or more of the cotton crop is known to have been devoured by the  
cotton worm; and zero for other years.

(Figures between brackets are the standard errors of the estimated coefficients.)

It must be pointed out that the high correlation between the capital and fertilizer series created a problem of multicollinearity which affected the values of the estimated parameters for those two variables and their variances.<sup>14</sup> It was found that when we drop one of these two explanatory variables in either of the two equations, we obtain a higher value, and a lower variance of the coefficient of the retained variable. However, we did not feel it necessary to eliminate either of them on the grounds that (a) both variables had an important impact on agricultural output, and their inclusion would improve our forecasts, and (b) both variables are expected to expand at relatively the same pace in the forecast period and accordingly the level of correlation between them will be maintained, that is, the covariance of their parameters is expected to remain fairly stable.<sup>15</sup>

With regard to the economic significance of the estimated parameters, a few comments are in order. One, while the marginal return to a unit of land allocated to cotton was £.E. 47, its alternative allocation (i. e., to food

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<sup>14</sup>The high correlation between the capital and fertilizers series is rather coincidental since there is no functional relationship between them.

<sup>15</sup>For a discussion of this type of problem from an econometric viewpoint see Charles R. Frank, Jr., Statistics and Econometrics (New York: Holt, Rinehart and Winston, Inc., 1971), pp. 295-98; also see Carl F. Christ, Econometric Models and Methods (New York: John Wiley and Sons, Inc., 1966), pp. 387-90.

production) earned only £.E. 28. This result is in conformity with other available estimates of the relative average gross returns to cotton and food crops.<sup>16</sup>

Such a large discrepancy between net returns to land in its alternative allocations suggests that substantial income gains would be derived by shifting land from food to cotton production in which the country enjoys a comparative advantage. There have been conflicting arguments as to why policymakers refrained from taking such action.

It has been argued, along lines similar to those of the optimum tariff argument, that Egypt might profit from restricting the cotton area.<sup>17</sup> This is of course assuming that the foreign demand for Egyptian cotton is inelastic.

Although such reasoning might have occasionally underlied cotton policies in the past, the motive behind recent policies was clearly different. Egypt's cotton exports have been faced with rising competition from other producers of long-staple cotton. This, in addition to other factors such as the improved textile technology which undermined the advantages of long-staple cotton and the surge in the production of cheap synthetic fibres, reduced the

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<sup>16</sup> Hansen and Marzouk estimate the average gross returns to land allocated to cotton and cereals in 1955/59 at £.E. 63 for the former and £.E. 29 for the latter. However, the rise in the share of rice (which is the most profitable of the cereal group) in cereals output and the increasing severity of the damage caused to the cotton crop by the cotton worm must have led to a rise in the value-added productivity of cereals relative to cotton; see Development and Economic Policy in the U.A.R. (Egypt) (Amsterdam: North-Holland Publishing Co., 1965), p. 56, Table 3.4.

<sup>17</sup> See Bent Hansen, Cotton vs. Grain on the Optimum Allocation of Agricultural Land, Memo No. 275 (Cairo: Institute of National Planning, April 1963).

country's ability to manipulate cotton prices in world markets. In fact, the most important factor underlying the government's cotton policy was one of a technical nature. This involved following the triennial crop-rotation system where cotton would be cultivated on any plot of land only once every three years which, in turn, means that the cotton area in any year cannot exceed one-third of the total cultivated area. Past experience indicates clearly that such crop rotation is, ceteris paribus, the most beneficial one for land productivity given the exhaustive effect of cotton production on land fertility. A recent study sponsored by the Rand Corporation points out that "even in 1950/52 when there was no governmental restraint on cotton growing, and when cotton prices were abnormally high (due in large part to the Korean War) cotton acreage hardly exceeded 2 million acres."<sup>18</sup> (Total cultivated area was 6.3 million acres.)

Nevertheless, it must be pointed out that the share of cotton area in total cultivated area had dropped below the one-third limit imposed by the crop-rotation system. This could have been the outcome of the peasants' reaction to the government's cotton price policy, regardless of restrictions on cotton area. In Part II, we will provide an estimate of the gains in terms of a rise in national income, which could be derived from increasing the share of cotton in the total cropped area

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<sup>18</sup> Marion Clawson, et al., The Agricultural Potential of the Middle East (New York: American Elsevier Publishing Co., Inc., 1971), p. 70.



$$\text{i. e. , } \left[ \frac{\partial(\text{GNP})}{\partial\left(\frac{L^c}{L}\right)} \right]_t .$$

Also, we will assess the sensitivity of the trade gap to such a policy change.

The size of the other two coefficients, namely, those of capital in drainage and of chemical fertilizers, indicates their importance as policy instruments for promoting agricultural growth. As for the fertilizers' coefficient, it is quite remarkable considering the already high intensity of fertilizer use in Egypt, and the high levels of land productivity already realized. The above-mentioned study notes the following in this respect:

Egyptian agriculture consumes about twice as much of all nutrients per acre as does the U.S. But it must be kept in mind that all of Egyptian agriculture is irrigation agriculture, in which the combination of water and fertilizer offers much better possibilities than that of dry land farming.<sup>19</sup>

### Industry

The industrial sector covers the mining, manufacturing, electricity, and construction sectors. However, for all practical purposes, manufacturing is the predominant sector within this group. The other three constitute on average less than 10 per cent of total industrial output, and mining and electricity alone constitute only 3 per cent of this total.

Industrial output is specified as a function of capital stock at the beginning of the period, i. e., a fixed coefficient production function of the Leontief type, with labor being redundant. As we have seen earlier, for the

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<sup>19</sup>Ibid., p. 44.

major portion of the sample period, industrial labor had become a redundant factor. Therefore, omission of labor from the industrial production function was felt to be permissible.<sup>20</sup>

However, given the supply of capital, an important determinant of industrial growth is the extent to which installed capital capacity is utilized. Therefore, a capacity utilization term was added as an additional explanatory variable, with capacity output being estimated through the peak-to-peak method. The estimated function is

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$$\text{CORC: } V_t^i = 73.272 + 0.45 (K_{t-1}^i) - Ex_t^i \quad R^2 = 0.99$$

(3.408) (0.003)

d = 2.198

where:  $V_t^i$  = value-added in the industrial sector at constant 1959/60 prices (in millions £. E.)

$K_{t-1}^i$  = net capital stock in industry, lagged one year, at constant 1959/60 prices (in millions £. E.)

$Ex_t^i$  = excess industrial capacity-output, i. e., capacity-output minus actual output.

The capital coefficient indicates a net marginal capital/capacity output ratio of 2.2. This concurs well with an engineering estimate for manufacturing.<sup>21</sup> (Note that the engineering estimate is for actual and not

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<sup>20</sup> Another factor which discouraged us from including labor as an explanatory variable in the industrial production function is the absence of reliable labor series for the 1950's to cover all industrial establishments.

<sup>21</sup> See Ministry of Planning, op. cit., p. 96. It is quite possible that the much higher capital-output ratios in electricity and mining more than offset the low ratio for construction.

capacity output.)

As for the stability of the capital coefficient, over the immediate post-sample period, several factors must be taken into consideration. One, substitution between capital and labor is not likely to exert any significant influence on the size of the capital coefficient. Two, changes in commodity composition will probably be in the direction of more capital-intensive sectors such as the capital goods sectors and the intermediate goods sectors catering to them.<sup>22</sup> Three, this last trend will probably be offset by one in the opposite direction resulting from the coming to fruition of investments in electricity projects with a long gestation period. It would therefore not be unjustifiable to assume that the estimated capital coefficient will remain stable in the near future.

### Services

A major feature of the structure of the services sector is the predominance of the government sub-sector. Over the sample period, government output constituted on the average around 45 per cent of total services output. Furthermore, the growth of government services accounted for the great bulk of aggregate services growth. While the output of government services increased at a compound rate of 8.1 per annum, the output of services, other than government, increased at the more modest rate of 3 per cent per annum.

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<sup>22</sup>To estimate the change in the capital coefficient due to such a factor through the use of the input-output table would require information about the change in commodity composition by sector.

Determining the limits to services growth in Egypt entails an explanation of the nature of demand for capital and labor in services, and its relation to supply.

Unlike industry, capital did not represent a limiting factor on the growth of aggregate service output in Egypt's case. While for such services sectors as housing and public utilities, the capital/output ratio was estimated to be 26.5 and 29.3, respectively, for government services the ratio is only 0.8.<sup>23</sup> Moreover, both housing and public utilities account for only around 10 per cent of total services. If we add to this evidence the fact that there has been quite a wide margin within which capital shallowing took place in services, one can safely conclude that while capital was essential for some services sectors it was not a limiting factor on the growth of aggregate services, especially in the light of the commodity composition of this sector as described above.

On the other hand, labor supply has been an important factor in the growth of government services. With labor supply increasing at a much faster rate than labor demand, and with a government committed to a policy of full employment, this meant that a large portion of the surplus labor was absorbed in the government sector. (Note that after the evacuation of the British troops in the mid-1959's, over a hundred thousand workers became unemployed and most of them had to be hired by the government.) Given the system of national accounts, such an increase in government employment and wages is tantamount

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<sup>23</sup> Ibid.

to an increase in government services output regardless of whether the marginal productivity of this additional labor is negative, zero, or positive.

Under such circumstances one might conclude that, given the existence of a large pool of excess labor in the economy and in view of the flexibility of the capital/output ratio in services, the supply of services output in the short- or medium-run is highly elastic. In the case of government services there might be a constraint on its growth in the form of limits on the size of the budget deficit. But even this limit was greatly relaxed during the period under study due to the contribution of domestic deficit financing, and large inflows of foreign resources which allowed for a large budget deficit. Of course, ultimately, the supply of real commodity output imposes a limit on the extent and time horizon of government budget deficit ; otherwise inflation would ensue.

Accordingly, one can conclude on a priori grounds that labor and capital played varying roles in the growth of output of different services sectors. Capital was the more dominant factor (and perhaps the limiting one) in such sectors as transport and communications, housing and public utilities; while labor was of greater importance in explaining the growth of output in the remaining services sectors, especially government.

On these grounds, in our specification of the services production functions, we divided total services into two subsectors according to the roles played by labor and capital in their growth. The estimated functions are:

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$$\text{CORC: } V_t^{\text{soh}} = -7.137 + 0.162 (K_{t-1}^{\text{soh}}) \quad R^2 = 0.99$$

(16.454) (0.011) d = 1.902

$$\text{CORC: } V_t^{\text{os}} = -51.765 + 0.61 (K_{t-1}^{\text{os}}) + 157.447 (N_t^{\text{os}}) \quad R^2 = 0.984$$

(95.088) (0.359) (114.618) d = 1.789

-98.751 ( $D^{\text{vos}}$ )  
(32.982)

where:  $V_t^{\text{soh}}$  = real value-added in transport and communications, housing, and public utilities services sectors (i.e., social overhead sectors).

$V_t^{\text{os}}$  = real value-added in other services sectors, namely, commerce and finance, government and home services.

$K_{t-1}^{\text{soh}}, K_{t-1}^{\text{os}}$  = real capital stocks in social overhead and other services sectors respectively.

(Note that all the above variables are at constant 1959/60 prices.)

$N^{\text{os}}$  = labor in other services sectors.

$D^{\text{vos}}$  = a dummy variable to allow for the impact of the Suez War, precipitated by the nationalization of the Suez Canal Company in 1956, on output.

Three comments on the estimated parameters for services production are in order. First, the capital coefficient for "social overhead" services pertains to a capital-output ratio of 6.3 which is below the engineering estimates for these sectors. However, this could be explained in terms of the declining marginal capital coefficient during the sample period, a phenomenon whose policy foundation we explained earlier. Secondly, the capital coefficient

in the "other services" sectors pertains to a capital-output ratio of 1.6 which is only slightly higher than the engineering estimate (perhaps due to the capital-intensive nature of defense expenditure whose share in total government expenditures increased over the sample period). Lastly, the labor coefficient is large in size and statistically more significant than in the case of other sectors.

At this point it must be noted that while the weighted marginal capital-output ratio for all services (over the sample period) is over 2, the investment accelerator coefficient is only 0.28, i. e.,  $I_t^S = 99.684 + 0.279 (\Delta V_t^S)$   
(7.87) (0.20)

where:  $I^S$  = real total gross fixed investment in services

$V^S$  = total real services valued-added.

This would seem to indicate that if the sample period trends in capital demand and supply in the services sectors as a whole continue in the future, it would lead to a substantial capital shallowing in that sector which, in turn, would lead to the creation of capacity bottlenecks. Once again, this finding is corroborated by other statistical evidence as has been stated earlier.

### Consumption Functions

Two alternative disaggregations of aggregate consumption are provided below. The first divides total consumption by type of consumer and by commodity into (a) household food consumption, (b) household non-food consumption, and (c) government consumption. The second divides total non-food consumption (of both household and government) into (a) consumption of industrial goods,

and (b) consumption of services. That is, food consumption is common to both classifications.

Furthermore, while the multiple regression technique was used in estimating the parameters of the household and government consumption functions, an input-output approach was used to estimate consumption of industrial goods and services. The hypothesis is that this latter residual approach gives a better description of the pattern of consumption behavior in the case of industrial goods and services, and therefore provides us with a better forecasting tool in the medium run. We will start by discussing the regression estimates, and this will be followed by a detailed analysis of the input-output residual estimates and the hypothesis underlying them.

Household consumption: The micro theory of consumer's choice shows demand for a commodity as a function of both the price of the commodity relative to other commodities and the consumer's disposable income. By analogy, then, total demand for a commodity or a group of commodities would be a function of relative prices and aggregate household disposable income.

In the case of Egypt's household consumption function, we followed the above a priori theoretical specification with minor modifications. Since population is a major factor affecting consumption in Egypt, we entered it as an independent explanatory variable. Furthermore, considering the major changes in income distribution which took place since 1952, several proxy variables reflecting these changes were attempted.<sup>24</sup> Although the coefficients

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<sup>24</sup>Two proxy variables were tested. The first is an index of the ratio of agriculture to industrial wage rates. The hypothesis behind this variable is



of these variables had the right sign, they were statistically insignificant and were consequently dropped. The functions which were finally chosen are the following:

$$c_t^f = -210.312 + 3.949 (Y_t^{\text{dp.c.}}) + 18.118 (\text{POP}_t) - 0.462 (\text{tot}_t^i) \quad R^2 = 0.965$$

(46.33) (1.81) (4.17) (0.65)  $d = 1.829$

$$c_t^{i+s} = -771.229 + 13.861 (Y_t^{\text{dp.c.}}) + 19.281 (\text{POP}_t) + 2.176 (\text{tot}_t^i) \quad R^2 = 0.987$$

(67.63) (2.64) (6.08) (0.96)  $d = 1.453$

where:  $C^f, C^{i+s}$  = food and non-food consumption respectively, at constant 1959/60 prices (in million (£. E))

$Y^{\text{dp.c.}}$  = per capita private income, at constant 1959/60 prices (£. E.)

POP = population size (in millions)

$\text{tot}^i$  = internal terms of trade as measured by the ratio of food to industrial prices, i. e.,  $P^f/P^i$  (1959/60 = 100) (an index)

The variable private income is derived by deducting government net income from GNP. It thus includes household disposable income plus business retained profits. In addition, since government net income equals government current receipts minus transfers, transfers are therefore included as part of income.

The values and signs of the estimated parameters are in conformity with both a priori theory and cross-section statistical evidence. First the

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that given the difference between rural and urban consumption patterns, a faster growth of average wages in agriculture might favor a faster growth of food consumption. The second proxy variable is the conventional one, that is, the ratio of wage to non-wage income.

(average) income elasticities of food and non-food consumption are 0.48 and 1.05 respectively. On the one hand, these tally well with the estimates obtained from family budget studies for 1958 and 1965.<sup>25</sup> On the other hand, they fulfill one's expectations on the basis of Engel's Law which asserts that household expenditures on food grow at a lower rate than income, and vice versa for non-food expenditures. Second, the sign of the internal terms of trade coefficient is negative for food, and positive for non-food consumption. This indicates that a rise in food prices relative to those of industrial goods would have a negative effect on the consumption of commodities other than food. Also, the average price elasticity of food consumption is quite low (0.143) which is to be expected given both the country's low income per capita and the composition of food consumption which consists mainly of cereals.

However, it must be added that with regard to the income elasticity of demand for food, family budget studies suggest a positive correlation between it and the general income level, at low-income brackets.

Specifically, it shows that for urban low-income brackets (below £.E. 200 per household), the income elasticity of demand for food is only 0.49. As we move to higher income brackets (£.E. 200-600) the income elasticity increases to 0.71, then it declines steadily as we go up the income ladder.<sup>26</sup>

The gist of the above is that given the fact that the major portion of

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<sup>25</sup> See National Bank of Egypt, Economic Bulletin, XX, No. 3 (1967), 264-76 (in Arabic).

<sup>26</sup> See National Bank of Egypt, Economic Bulletin, XXII, No. 4 (1969), 332-48.

the population falls in the below-£. E. -200-income range,<sup>27</sup> and that the share of this group in marginal income is rising, a growth in average income per capita would bring about an upward shift in the food elasticity.<sup>28</sup> This fact must be taken into consideration in any attempt to project future food demand.

Government consumption: A number of factors led to the sharp rise in government consumption, foremost among which were defense expenditures, and the increasing direct involvement of the government in the social and economic life of the country, as has been referred to earlier. Such factors are not necessarily a function of growth in GNP. However, by way of simplification, and for lack of quantifiable variables to explain the growth in government consumption, we related it to GNP.<sup>29</sup> The government function, along with two other functions--one for total household consumption and the other for total consumption of both household and government--are given below. The latter two functions are given primarily for purposes of comparison:

$$C^g = -49.473 + 0.223 (\text{GNP}_t) \quad R^2 = 0.948$$

$$(43.48) \quad (0.02) \quad d = 1.651$$

<sup>27</sup> Over 46 per cent of all urban families had an average income below £. E. 200 in the early 1960's.

<sup>28</sup> In the case of some European countries, H. S. Houthakker found a negative correlation between food elasticity and income. He reports that "the figures for Germany, 1927-28, for the U. K. and for the Netherlands, all of which refer to different social groups, suggest that the elasticities for food may decrease with an increase in the general level of income," see "An International Comparison of Household Expenditure Patterns, Commemorating the Centenary of Engel's Law," Econometrica, XXV (October 1957), 542.

<sup>29</sup> Alternatively we will be treating government consumption and income as exogenously determined, when testing alternative policy designs.

$$C_t^h = 39.538 + 0.784 (Y_t^d) \quad R^2 = 0.984$$

(55.36) (0.04) d = 1.661

$$C_t^t = 2.689 + 0.871 (GNP_t) \quad R^2 = 0.998$$

(18.06) (0.01) d = 1.902

where:  $C^g$ ,  $C^h$ ,  $C^t$  = government, household, and total consumption,  
respectively

$Y^d$  = private income (i. e., GNP minus government  
net income)

GNP = gross national product

(All values are at constant 1959/60 prices in million £. E.)

The income (GNP) elasticity of government consumption is 1.18 while that of household is 0.95; and the weighted average of the two is 1.0. These figures point clearly to the impact of the rapid growth in government consumption on the level of aggregate consumption and savings. As is seen from the household and total consumption equations, while the marginal propensity to save out of private income is 0.22, private and government marginal propensity to save is only 0.13.

Consumption of industrial goods: A major characteristic of Egypt's recent import substitution industrialization was the balancing role played by consumption in the industrial supply-demand balance equation. The level and allocation of investment within the industrial sector and, accordingly, the supply of industrial goods, were determined exogenously through short- and medium-run plans (especially since the late 1950's). A basic assumption underlying the planning of the pattern of industrial growth was that the newly

established industries would begin first by substituting for imports, and then cater to exports. Often, the size of the newly established industries was determined on the basis of the above assumption, and with unrealistically high ambitions for export targets. This actually boils down to assuming that industrial exports would behave in a residual fashion, in the sense that whatever remains after satisfying all categories of domestic use would be exported.

In theory, this is tantamount to assuming that the potential external demand curve for Egypt's industrial exports is infinitely elastic which is not an unrealistic assumption given the small size of these exports.

However, the ex post pattern of export behavior was substantially different. Firstly, given the overvalued exchange rate (this point will be returned to when discussing export functions) the domestic prices of the newly produced industrial goods were significantly above world market prices, with a detrimental impact on the country's capacity to compete in foreign markets. Secondly, the lack of experience about export markets of most industrial entrepreneurs (a large number of them were newly appointed ex-army officers), the inadequacy of exports' infrastructure in general, the built-in inward orientation of the pattern of industrial growth, the poor product quality, and the like--all these factors combined to slow down ex post industrial exports to a level far below the desired one.

The outcome of this situation, with the pattern of supply growth<sup>30</sup> out

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<sup>30</sup>Note that industrial output in any year is determined by previous investment, and by plan targets.

of harmony with domestic final demand elasticities (intermediate demand being technologically fixed) and with a very low output elasticity of exports, was that it led to the emergence of large quantities of industrial goods that were neither sold at home nor exported.

In the long run, such surpluses can serve as a primum mobile in the Hirschman sense, that is, they would stimulate efforts to promote industrial exports. But in the short and medium run the outlets for these surpluses were to be as follows: first, the accumulation of large inventories; second, the dumping of some of these goods into the domestic market; and third, a slowdown in production--in that order. This last step was usually undertaken with some measure of reluctance and after a substantial time lag because of its impact on employment and growth.

However, what concerns us at this point is the second step, that is, the dumping of the excess commodities in the domestic market. To get rid of some of the unwanted stocks, industrial planners used all sorts of sales-promotion methods such as installment plans, reduction of prices, and the like. In addition, in view of the fact that the industrial sector is both owned and controlled by the government, some of the accumulated stocks were directly consumed by the government.

In other words, it was consumption rather than exports which performed the balancing function in the industrial balance equation. Therefore a residual specification of the equation for consumption of industrial goods would provide an appropriate description of its behavioral pattern, and an accurate tool for

its estimation.

The methodology used in deriving the input-output equation for total (i. e., household and government) consumption of industrial goods is based on the identity of the input-output row and column sums. Algebraically,

$$(1) \quad O_t^i = d_t^i + C_t^i + I_t^i + E_t^i - \Delta St_t^i = i_t^i + V_t^i + M_t^i + T_t^{ii}$$

where:  $d$  = intermediate sales

$C$  = total consumers' demand (both household and government)

$I$  = investment demand

$E$  = export demand

$\Delta St$  = changes in stocks

$i$  = intermediate purchases

$V$  = value-added

$M$  = imports

$T^i$  = indirect taxes

(The superscript  $i$  refers to the sector, and the subscript  $t$  to the time period.)

$$(2) \quad \alpha_t^i = \frac{d_t^i}{C_t^i + I_t^i + E_t^i}, \text{ i. e., } \alpha_t^i = \text{the ratio of intermediate sales of the}$$

products of sector  $i$ , to final demand for it (at any time period) and

$$(3) \quad \beta_t^i = \frac{i_t^i}{V_t^i}, \text{ i. e., } \beta_t^i = \text{the ratio of intermediate purchases by sector } i$$

to value-added in that sector (also at time  $t$ ).

Substituting equations (2), (3) in identity (1) we get:

$$(1 + \alpha_t^i)(C_t^i + I_t^i + E_t^i) - \Delta St_t^i = (1 + \beta_t^i)(V_t^i) + M_t^i + T_t^{ii}.$$

Thus:

$$(1 + \alpha_t^i) C_t^i = (1 + \beta_t^i) V_t^i + M_t^i + T_t^{ii} + \Delta St_t^i - (1 + \alpha_t^i)(I_t^i + E_t^i),$$

then:

$$C_t^i = \frac{(1 + \beta_t^i)}{(1 + \alpha_t^i)} (V_t^i) + \frac{1}{(1 + \alpha_t^i)} (M_t^i + T_t^{ii} + \Delta St_t^i) - I_t^i - E_t^i.$$

For simplification as well as standardization of all input-output functional specifications used in our model (which will greatly facilitate our manipulations of the model later), we will replace the coefficient

$$\frac{(1 + \beta_t^i)}{(1 + \alpha_t^i)}$$

by  $(\alpha ci)$ , and the coefficient  $\frac{1}{(1 + \alpha_t^i)}$  by  $(\beta ci)$ , where the second and third letters in  $(\alpha ci)$  and  $(\beta ci)$  refer to the name of the variable to be estimated, and the name of the sector respectively, i. e.,

$$(4) \quad C_t^i = \alpha ci (V_t^i) + \beta ci (M_t^i + T_t^{ii} + \Delta St_t^i) - I_t^i - E_t^i.$$

Equation (4) represents the input-output specification for aggregate consumption of industrial goods. Needless to say, the estimation of  $(\alpha ci)$ ,  $(\beta ci)$  requires the estimation of  $(d_t^i)$  through the solution of an input-output table for each year; the formula used for that would be:

$$[A] \cdot (O_t^i) = (d_t^i)$$



where:  $A$  = the input-output matrix of production coefficients

$O$  = the vector of sectoral gross output

$d$  = the vector of sectoral intermediate sales

As for  $(i_t^i)$ , it is derived as follows:

$$i_t^i = O_t^i - V_t^i.$$

With  $(d_t^i)$  and  $(i_t^i)$  derived as described above, they would be plugged in equations (2), (3) and we would then be in a position to estimate the values of  $(\alpha ci)$ ,  $(\beta ci)$ .

Finally, given the estimated values of  $(\alpha ci)$ ,  $(\beta ci)$ , and given the values of the model's endogenous variables  $V^i, M^i, E^i$  and the exogenous variables  $I^i, \Delta St^i, T^{ii}$ , we would be in a position to estimate  $C^i$  from equation (4).

A final comment on the stability of the coefficient  $(\alpha ci)$  in the course of time is in order. As we have seen

$$(\alpha ci)_t = \frac{(1 + \beta_t^i)}{(1 + \alpha_t^i)},$$

and accordingly its size varies with relative changes in  $\beta_t^i$  (i. e., the ratio of intermediate sales to final demand), and  $\alpha_t^i$  (i. e., the ratio of intermediate purchases to value-added). In the course of industrial growth, one would expect  $\beta^i$  to decline as a result of a gradual shift in the structure of industry from simple processing of raw materials (with its low value-added) to more complex industrial processes. At the same time, one would expect  $\alpha^i$  to rise as industrial sectors become more interdependent; that is, in the course of industrial growth industries with high forward-linkage would increase their

share in total industrial output relative to those with high backward-linkage. Consequently, the time trend of the coefficient ( $\alpha_{ci}$ ) would be to decline, albeit at a slow rate.

In the case of Egypt our estimates of ( $\alpha_{ci}$ ) for the sample period showed it to be fairly stable (only a slight decline around a mean value of 1.25). This is understandable in the light of the fact that there had not been any major structural changes in the industrial sector over the sample period.

Consumption of services: A consumption function similar to that for industrial goods is specified for services. The rationale of the input-output specification in the case of services is that the growth of the great bulk of services output was but little related to ex ante demand for services. However, the equation for services consumption is much simpler than its industrial counterpart; the reason being that in the case of services the exports, imports, investment, and changes in stocks' terms are excluded on the grounds that services output is a home commodity and is not used for fixed or inventory investment. Accordingly, the services function becomes:

$$C_t^s = \alpha_{cs} (V_t^s) + \beta_{cs} (T_t^{is})$$

where:  $C^s$  = total consumption of services (by household and government)

$V^s$  = value-added in services sectors

$T^{is}$  = indirect taxes on services

(All variables are at constant 1959/60 prices.)

It is to be noted that our estimate for ( $\alpha_{cs}$ ) indicates a rise in its

size from 0.9 at the beginning of the sample period to 0.94 in the terminal year. A valid explanation for this rise would be that it was caused by the rise in the share of intermediate purchases to total value-added--especially in government services.

### Export Functions

The export performance of the Egyptian economy during the period under study was far from satisfactory. If we adjust the value of exports (for the period after the depreciation of the Egyptian pound in 1962) to allow for a statistical bias towards overstating the value of exports, we find that between 1953/54 and 1966/67 real exports increased at an annual compound rate of 2.0 per cent. This rate is less than half the median rate of 5.0 per cent reported for a group of 32 developing nations, and below the lower quartile rate of 2.2 per cent.<sup>31</sup> Consequently, the share of Egypt's exports in total world exports declined from 0.49 per cent in 1953 to 0.34 per cent in 1965; and its share in the total exports of Third World countries declined from 1.91 per cent to 1.6 per cent over the same period. This is contrary to what one would have expected given the country's poor natural resource endowment, and rapidly rising demand for food imports.

The country's poor export performance was closely related to the structure of exports, and its pattern of change. One must distinguish here

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<sup>31</sup>Chenery, H.E. and Strout, A.M., "Foreign Assistance and Economic Development," The American Economic Review, LVI, No. 4, Part 1 (Sept. 1966), 679-733.

between two major components of exports, namely, agricultural and industrial exports. The former consist of cotton, which up to the mid-1960's still constituted over two-thirds of total exports, and food--mainly rice--whose share in exports, even though it was rising, did not exceed 5 per cent in the terminal year. On the other hand, industrial exports consist of exports of manufactured goods and minerals--mainly crude oil--with the former constituting over 85 per cent of total industrial exports.<sup>32</sup> In the light of this structure, and over the time range of this study, it would not be misleading to concentrate on only the two major groups of exports, that is, cotton and manufactures, in attempting to explain the past and future growth behavior of total exports.<sup>33</sup>

The main determinant of cotton export growth was the relative increase in cotton production and its domestic use. We have seen earlier that the land area allocated to cotton production did not increase during the sample period (in fact it slightly declined), and with no trend towards increasing cotton land productivity, this meant near-stagnation in cotton output. At the same time, domestic use of raw cotton as an input in the rapidly expanding textile industry increased steadily. This naturally meant a long-run trend towards a decline in the volume of cotton exports.

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<sup>32</sup>There is an increasing trend towards undergoing simple processing of mineral products before exporting them. This leads to a shift of products from the mineral export group to the manufactures group.

<sup>33</sup>At the outset, it must be pointed out that major changes in the geographical structure of Egypt's exports (and imports) took place during the sample period. While in 1950, 67 per cent of total exports went to Western Europe and Northern America, and only 10 per cent went to Eastern Europe, by 1964/65 the corresponding percentages were 23 per cent and 54 per cent respectively.

In discussing the growth behavior of industrial exports, it would be helpful to distinguish between textile exports and other industrial exports due to the special conditions characterizing the external demand for the former. The rising competition in external markets for textiles, and increasing resort to protectionist policies in many countries, resulted in a steady decline in their prices.

These circumstances are particularly unfortunate for Egypt since over 45 per cent of all its industrial exports consist of textiles. The unfavorable external market conditions (for textiles) resulted in steadily declining marginal returns to textile exports. In fact it was estimated that the total net losses resulting from changes in textile export prices during the First Five-Year Plan period (i. e., 1959/60 - 1964/65) were £. E. 34 million which amounted to 25 per cent of the total value of textile exports over the same period.<sup>34</sup>

It is important to stress the fact that the deterioration in the export price of textiles and some other industrial exports did not characterize western markets only. According to a Ministry of Planning estimate, allocation of total losses from unfavorable export price movements, by country, ranked Arab League countries first, followed by Eastern bloc countries.<sup>35</sup>

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<sup>34</sup> See S. Ahmed ElBawab, Losses and Gains in Mineral and Industrial Exports in the First Five-Year Plan (1960/61 - 1964/65). Mimeographed Memo (Cairo: Ministry of Planning, April 1967) (in Arabic).

<sup>35</sup> Ibid.

This ranking was on the basis of losses per unit of exports.<sup>36</sup>

Finally, with regard to industrial exports other than textiles, they consist of a large number of items which add up to a small absolute sum (an average of £.E. 20 million per annum in 1959/60 - 1964/65). The obstacles to their growth were of a more general nature, to wit, high cost (and prices), poor quality, and the need to build an export infrastructure that would be able to handle and expand these kinds of emerging non-traditional exports. However, it must be pointed out that in spite of the smallness of the size of this export group, maximum efforts must be exerted to promote it given the highly elastic world demand for it, and accordingly, its more promising future growth potential.

Prices and foreign-exchange policies:<sup>37</sup> We mentioned above that rising costs and prices represented a major obstacle to the growth of non-traditional exports. A few words about what is exactly meant by that are warranted. An examination of the movement of domestic industrial prices, world market prices (as represented by the U.S. wholesale industrial price-index), and the price of the Egyptian pound since the pre-World War II years to the present, would lead us to the following conclusions:

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<sup>36</sup> This is particularly serious for the country's foreign-exchange receipts given the fact that over 50 per cent of Egypt's total industrial exports go to these two country groups.

<sup>37</sup> For a detailed discussion of the evolution of Egypt's foreign-exchange policies, see M. S. Mourad and F. Moursi, Foreign-Exchange Budget and the External Finance of Development: A Special Study of the U.A.R. (Cairo: Dar El Maaref, 1967) (in Arabic); for a summary discussion, see Hansen and Marzcuk, op. cit., pp. 191-98.

1. During World War II domestic industrial prices increased at a much higher rate than world market prices (as represented by both U.K. and U.S. prices). The reasons were mainly the sharp rise in the Allied Troops' expenditures in Egypt, accompanied by a decline in domestic production and imports due to war conditions.

2. The devaluation of the Egyptian pound in 1949 pari passu with the Sterling pound did not rectify the decline in the purchasing power of the former relative to the latter (nor to the U.S. dollar). The reason is that all of Egypt's trade at that time was with Britain and other members of the Sterling bloc that also followed the British in devaluing their currencies. Furthermore, whatever little effect the devaluation of the Egyptian pound produced was negated by the inflationary price rises which accompanied the rise in cotton prices and income during the Korean boom. Evidence of the lack of effectiveness of the 1949 Egyptian pound devaluation on the country's price competitiveness was that immediately after it a policy of variable multiple-exchange rates was begun and pursued right through the 1950's.

3. After 1953 the inflationary tendencies in the economy receded. The pursuing of more prudent fiscal and industrial cost and price policies certainly helped greatly in that direction. Consequently, one can conclude that from 1953 to 1961 there was no further deterioration in the country's price competitiveness.

4. In 1962 the Egyptian pound was further devalued by 24 per cent vis à vis the U.S. dollar. However, in the light of the above historical

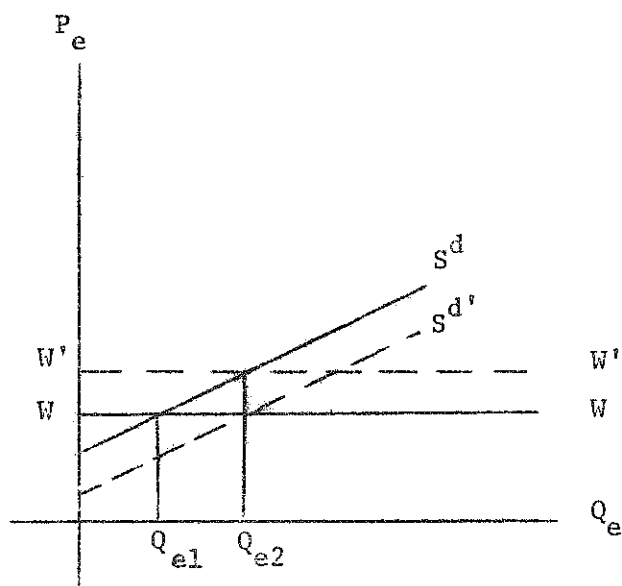
sketch, this devaluation represented nothing more than a formalizing of the already prevailing de facto devaluation of the Egyptian pound through the multiple-exchange rate system. In addition, over the five years 1962-1967, domestic industrial prices increased by 15 per cent while U.S. prices increased by 5 per cent only. This meant that whatever gains were achieved in price competitiveness through the 1962 devaluation were once again more than negated by the subsequent price rise.

The outcome of these developments was that the domestic prices of most of Egypt's industrial exports were above those prevailing in world markets. To export some of these commodities in spite of this overvaluation requires the adoption of one of two policy options: (a) a future devaluation of the Egyptian pound, thus lifting the world market price in terms of domestic currency from  $WW$  to  $W'W'$  which would allow for an increase in exports from  $Q_{e1}$  to  $Q_{e2}$  (as is seen in Figure 1.2 below) or (2) subsidizing the overvalued exports, thus shifting the domestic supply price to the right from  $S^d$  to  $S^{d'}$ .

For reasons that have not been stated explicitly, Egyptian policy-makers chose the second option. Thus the government trading companies were allowed to sell at prices substantially below the posted ones. Needless to say, the first policy alternative would benefit the country more in at least two ways: (a) Not all of the country's exports pass through the channels of the government trading companies; in fact, enterprises--including public ones--have the right to export directly but in most cases without government



Figure 1.2



subsidies, and since they would not want to incur losses, they refrain from exporting altogether, and (b) an appropriate devaluation of the Egyptian pound would relieve the government budget from the burden of export subsidies.

#### Statistical Estimation

In the light of the above analysis two export functions were specified: one for cotton, and one for industrial goods (minerals and manufactures). Food exports are taken to be exogenously determined.

An input-output equation similar to the ones used for consumption of industrial goods and services was used to estimate cotton exports as a residual. This specification implicitly assumes infinitely elastic world demand for Egyptian cotton. However, given the narrow range of variation in cotton exports, such an assumption would not be altogether unrealistic.<sup>38</sup> The equation used

<sup>38</sup> A similar specification was undertaken by Eric Thorbecke and Alfred J. Field for Argentinian exports, see "Relationships Between Agriculture, Non-agriculture, and Foreign Trade in the Development of Argentina and Peru,"

in the estimation is as follows:

$$E_t^c = \alpha_{ec} (V_t^c) + \beta_{ec} (T_t^{ic} - \Delta st_t^c)$$

where:  $E^c$  = cotton exports

$V^c$  = value-added in cotton sector

$T^{ic}$  = indirect taxes on cotton

$\Delta st^c$  = changes in cotton stocks

(All variables are at constant 1959/60 prices, in £.E. millions.)

It must be noted that such terms as consumption, investment, and imports are excluded from the above equation since there is no final consumption or investment demand for raw cotton, and its only source of supply is domestic production. As for the coefficient ( $\alpha_{ec}$ ) its value for the sample period ranged from 1 to 0.79 showing a steady temporal decline. This is to be expected due to the fact that while both the numerator and denominator of the parameter increased steadily during the sample period, the latter (i. e., the ratio of intermediate purchases of raw cotton to exports) increased at a substantially faster rate than the former (i. e., the ratio of intermediate inputs to value-added).

As for industrial exports, a multiple regression function was specified for it, with industrial output and an index measuring changes in the country's price competitiveness in world markets, as explanatory variables. The estimated function is:

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in The Role of Agriculture in Economic Development, ed. by E. Thorbecke (New York: Columbia University Press, 1969), pp. 165-212.

$$E_t^i = 63.666 + 0.161 (V_t^i) - 0.664 \left( \frac{p^d / p^{U.S.}}{R} \right) + 11.634 (D^{ei}) \quad R^2 = 0.990$$

(49.03) (0.01) (0.40) (3.40) d = 1.934

where:  $E^i$  = exports of industrial goods at constant 1959/60 prices  
(£.E. millions)

$V_i$  = value-added in the industrial sector at constant 1959/60 prices  
(£.E. millions)

$p^{U.S.}$  = U.S. general industrial wholesale price-index, 1959/60 = 100

$p^d$  = domestic industrial value-added implicit price deflator,  
1959/60 = 100

$R$  = an index of the price of foreign-exchange (U.S. dollars)

$D^{ei}$  = a dummy variable taking the value of one for the four years  
1962/63 - 1966/67, and zero for the remaining years.\*

It must be noted that in the price term we used an implicit value-added industrial price index in lieu of the domestic sales price index. The reason is that while domestic sales prices were not binding to exporters, in most cases factor costs represented a minimum below which they would not want their revenues to be. Accordingly, the cost of production became the more binding price factor, and since the implicit value-added price index was more of a cost index, it was consequently chosen.

As would be expected on a priori grounds, the sign of the price term is negative. As for the size of the output coefficient, it points to an average

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\* Devaluation of the Egyptian pound after 1962 brought about an upward shift in industrial exports, mainly due to the upward bias it introduced in export prices. The dummy variable  $D^{ei}$  allows for this statistical phenomenon.

output elasticity of exports of 1.1.

### Import Functions

For the period 1952/53 - 1964/65 real commodity imports increased at an average compound rate of 6.6 per cent per annum while real GNP increased at a rate of 5 per cent per annum (see Table 1.1); this points to an average import elasticity of more than one.<sup>39</sup> The high income elasticity of imports in spite of the inward import-substituting nature of this period's growth is understandable in the light of the rapidly accelerating rate of growth of capital formation,<sup>40</sup> and the inelastic supply of food and raw materials.<sup>41</sup>

However, the growth behavior of the aggregate import coefficient conceals a complex pattern of interaction between domestic structural changes and imports. To grasp this pattern of interaction is not only essential for our analysis but also a sine qua non for the estimation of relatively stable parameters for the import functions.

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<sup>39</sup>The income elasticity of imports shows a steady decline at the margin; see Table 1.1.

<sup>40</sup>As Carlos F. Diaz-Alejandro has pointed out, the import intensity of import substitution is a function not only of the level of investment but also of the rate at which it changes (i. e., its second derivative), see "On the Import Intensity of Import Substitution," Kyklos, 18, Fasc. 3 (1965), 495-511.

<sup>41</sup>Cross-section evidence points to an income elasticity of import of around one. However, for countries with a low-resource endowment, the import elasticity would be substantially greater than one, see Loreto M. Dominguez, "Economic Growth and Import Requirements," The Journal of Development Studies, VI, No. 3 (April 1970), 283-99; see also Hollis B. Chenery, "Patterns of Industrial Growth," The American Economic Review, LI, No. 4 (September 1960), 624-54, and "The Effects of Resources on Economic Growth," in Economic Development with Special Reference to East Asia, ed. by K. Berrill (New York: St. Martin's Press, 1964), pp. 19-52.

Accordingly, we have disaggregated total imports into: food, manufactured consumer goods, intermediate goods, and capital goods. An independent function was specified for each category except for manufactured consumer goods which is treated as exogenously determined. This is due to the fact that a great deal of import substitution had taken place in this category since the First World War, and by the early 1950's its imports had been curtailed to less than 10 per cent of total commodity imports. Over the remainder of the sample period its share declined to less than 5 per cent of the total. Furthermore, imports of manufactured consumer goods, modest as they were, were wholly determined by exogenous government policies of import controls.

The other three categories all increased at a rapid rate. The growth in food imports was mainly the outcome of the accelerating rate of population growth together with the government income and price policies which encouraged food consumption as we have explained earlier. The rise in food demand was, of course, in contrast to an inelastic supply.

The growth in intermediate imports was a direct outcome of rapid industrial growth. While a substantial share of the growth in industrial output was import substituting, it generated at the same time a demand for other intermediate imports. The emergence of new types of intermediate imports as industrialization proceeds is particularly accentuated in countries with a low-resource endowment, such as Egypt. Structural change in industry brings about a shift from simple processing of domestic raw materials as in

the case of textiles, food, and cement production to more complex industries whose manufactured inputs as well as raw materials have to be imported. It is this process of structural change, in addition to the acceleration in the rate of industrial growth, which maintained a high rate of growth of intermediate goods imports, and which will most probably continue to maintain as high a rate in the future in spite of positive import substitution.

Lastly, the rapid growth of imports of capital goods hardly needs an explanation. The rapid growth in investment and the change in its structure favoring industry led to a rapid growth in demand for capital goods in the form of machinery and equipment. This rapid growth in demand coupled with the smallness of the size of the domestic capital goods sector meant that the bulk of the needed capital goods had to be imported.

In the light of the above-described supply-demand relations, three different functions were specified for the three commodity group imports as follows:

Food imports: An input-output equation is specified for food, that is:

$$M_t^f = C_t^f + E_t^f - \alpha_{mf} (V_t^f)$$

where:  $M_t^f$  = food imports

$E_t^f$  = food exports

$V_t^f$  = net food production

(All values are at constant 1959/60 prices, and in £. E. millions.)

The parameter  $\alpha_{mf}$  is equal to the ratio of gross food output to its value-added. But since  $V_t^f$  as used in the model includes some non-food

items such as clover, and at the same time excludes processed food, the parameter  $\alpha_{mf}$  was adjusted to take these two factors into consideration.

Intermediate goods imports: A multiple regression equation was specified for intermediate goods imports with industrial net output as an explanatory variable. The choice of industrial output instead of gross domestic product or total commodity output was based on the fact that by far the great bulk of these imports was used in industry which, in turn, supplies other sectors with their requirements of intermediate goods.<sup>42</sup> The estimated function is:

$$M_t^i = -24.054 + 0.390 (V_t^i) - 40.922 (D^{mi}) \quad R^2 = 0.971$$

$$(10.85) \quad (0.02) \quad (8.9) \quad d = 1.689$$

where:  $M^i$  = imports of intermediate goods

$V^i$  = industrial value-added

$D^{mi}$  = a dummy variable which takes a value of one in 1966-67, and zero in the remaining years.

(All values are at constant 1959/60 prices, and in £. E. millions.)

The dummy variable is included in the function to allow for the sharp and sudden decline in intermediate imports as a result of the foreign-exchange crisis of the mid-1960's. The coefficient of the industrial value-added variable corresponds to an import elasticity of 1.2.

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<sup>42</sup> According to the 1962/63 input-output table, the import coefficient of agriculture (i. e., the ratio of imported inputs used in agriculture to agricultural output) was less than 3 per cent, and for services it was around 2 per cent. (Note that the great bulk of chemical fertilizers used in agriculture was supplied--increasingly so--from domestic output.)

The above specification was preferred to the alternative one of estimating intermediate imports through the use of the inverse of the input-output matrix of import coefficients on the grounds that for post-sample projections (and even within the sample period) major changes would have taken place in the entries of the matrix of import coefficients as a result of import substitution. Accordingly, in the absence of any information pertaining to the changes in the input-output import coefficients, we felt that the econometric approach would provide a more reliable forecasting tool given its aggregative nature and our a priori analysis with regard to its future stability.

Prices and the pattern of import substitution industrialization: A brief comment on the role of prices, including the price of foreign exchange, on the pattern of industrial growth and accordingly on import substitution and the commodity composition of imports, would be in order at this point. The process of import substitution industrialization in Egypt greatly undermined the role of prices with a detrimental effect on industrial exports (as we have seen), and on the real foreign exchange cost of the domestic import substitution industries (the two, i. e., exports and import substitution, are not unrelated).

The great bulk of the industrial sector, especially its modern factory part, has been owned and controlled by the government. Even the small private industrial sector was largely under government tutelage through such mediums as: financing, licensing of both investment and imports, and dealings with the public sector. In this way, the government was in a position to plan



the pattern of industrial growth as it wished. In doing so, the government not only totally ignored market prices (of both factors and commodities) but also did not pay any attention to the dictates of comparative advantage as measured by the real commodity exchange rates of the import substituting industries.<sup>43</sup> This, of course, led to distorted cost-price relations in the economy which will have to be corrected if the country is to improve industrial productivity, and raise the industrial export coefficient in any significant way in the future.

In our econometric estimation of the import functions (of both intermediate and capital goods), we have included a price term in the form of commodity group terms of trade, adjusted for changes in the official price of foreign exchange. The results were negative: the price coefficient did not have the right sign (in most cases), and was statistically insignificant. Although this might have been prompted by the poor quality of price indices, it partially reflects our above analysis.

Capital goods imports: There are three different ways of specifying the capital goods import function. One, by using a multiple regression function with investment being the main explanatory variable, supplemented by the balance of payments (on current account) as a proxy variable for foreign-exchange availability. However, this approach is inadequate in that

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<sup>43</sup> For a discussion of such issues, see B. Balassa and D. M. Schydrowsky, "Effective Tariffs, the Domestic Cost of Foreign Exchange, and the Equilibrium Exchange-Rate," Journal of Political Economy, 76 (May, June 1968).

it does not allow explicitly for import substitution, and changes in the commodity composition of investment. When proxy variables for such factors are included in the equation, multicollinearity substantially blurs the picture.

Two, by specifying capital imports as a residual in a foreign-exchange balance equation, that is, capital imports would be equal to total foreign-exchange receipts from both exports and foreign aid minus imports other than capital. But this approach, in addition to its not allowing for import substitution in the capital goods sector, assumes a prior knowledge of foreign aid inflows.

Three, by estimating capital imports as a residual from an input-output sectoral balance equation as we have done earlier for other sectors. From a policy-design point of view this approach has the advantage of allowing for import substitution by entering domestic output of capital goods explicitly into the equation. And even though it does not allow for the foreign-exchange constraint on capital goods imports, this does not represent a problem for us here since the objective of our model is to test alternative strategies aiming at reducing the need for large amounts of foreign aid. In other words, the extent of foreign resource inflows is determined endogenously from the model, and the objective of the different tested policy mixes is to minimize these inflows.

For the above reasons, this latter specification was preferred to the other two. The equation is as follows:

$$M_t^k = \alpha mk (I_t^{tg.f.}) - \beta mk (V_t^i) - T_t^{ik}$$

where:  $M_t^k$  = imports of capital goods (machinery and equipment)  
 $I_t^{tg.f.}$  := total gross fixed investment  
 $V^i$  = net industrial output  
 $T^{ik}$  = total indirect taxes on capital goods

(All values at constant 1959/60 prices, and in £.E. millions.)

The parameter  $\alpha_{mk}$  refers to the share of investment expenditure on machinery and equipment, and  $\beta_{mk}$  to the ratio of gross capital output (also machinery and transport equipment) to total industrial value-added. Both parameters showed a slight temporal rising trend over the sample period, with the former increasing as a result of the change in allocation of investment favoring industry with its high capital content. The size of  $\alpha_{mk}$  ranged from 0.35 in the early 1950's to an average 0.45 in the 1960's while  $\beta_{mk}$  increased from 8 to 10 per cent in the 1950's to 10 to 13 per cent in the 1960's.

Since the multiple regression specification provides a summary measure of the relation between investment and capital imports, we have included it here as well. The function is:

$$M_t^k = 6.646 + 0.266 (I_t^t) + 0.176 (BOP_t) \quad R^2 = 0.904$$

(6.16) (0.03) (0.03) d = 1.758

The investment coefficient corresponds to an average import elasticity of 1.1.

### Savings Functions

Our discussion in section one of this chapter clearly suggests a bifurcation of total savings into private and government budget savings; private

savings include both business and household.

In specifying the savings functions we followed this division. Government saving equals government income minus government consumption, with both income and consumption related to the growth in GNP. On the other hand, private savings was specified as a function of private income (i. e., household disposable income plus retained business profits) and the industrial surplus. The estimated functions are:

$$Y_t^g = -10.233 + 0.168 (\text{GNP}_t) \quad R^2 = 0.937$$

(17.76)    (0.01) d = 1.916

$$C_t^g = -49.473 + 0.223 (\text{GNP}_t) \quad R^2 = 0.948$$

(43.48)    (0.02) d = 1.651

$$S_t^p = -141.747 + 5.832 (Y_t^{\text{dp.c.}}) + 0.529 (S^i) - 59.848 (D^{\text{sp}})$$

where:  $Y^g$  = government net income (i. e., government receipts minus transfers)

$C^g$  = government expenditure on goods and services

$S^p$  = private savings (i. e., household and business savings)

$Y^{\text{dp.c.}}$  = private disposable income per capita

$S^i$  = the after-wage industrial surplus (i. e., industrial value-added minus total industrial wages)

$D^{\text{sp}}$  = a dummy variable which takes a value of one in 1961/62, and zero for all other years.

(All values are at constant 1959/60 prices, and £.E. millions; disposable income per capita is in £.E.)

The dummy variable used in the private savings function is to allow for the sharp fall in private savings in 1961/62, the year of the massive

nationalizations and their aftermath. It prevents the sharp decline in that year's savings--which was due to factors exogenous to the model--from distorting our estimates of the parameters of private savings.

As for the size of the parameters of the three equations, it conforms well to the picture we have drawn earlier with regard to the growth and structure of savings, and the factors influencing it. The extent of government dissaving could be deduced from the fact that while the average GNP elasticity of government consumption was 1.14, the corresponding figure for government income was only 0.97. The factors influencing the government's saving behavior were the growth of military expenditures, and government employment on the expenditure side, and the inelasticity of tax structure on the receipts side.

With regard to the growth of private savings, we mentioned earlier several factors such as the rise in the share of aggregate wages in national income, the impact of consumption liberalization policies, and the like, which could have had a dampening effect on private savings. Under such circumstances one would have expected a low private savings propensity. But as can be seen from the following equation, private savings were not that low considering the country's low average income level. Thus:

$$S_t^P = -46.237 + 0.227 (Y_t^d) - 57.780 (D^{SP}) \quad R^2 = 0.896$$

$$(51.42) \quad (0.03) \quad (27.18) \quad d = 1.546$$

According to the above equation the marginal propensity to save out of aggregate disposable income was 0.227 which is close to the rate of 0.26 of national marginal savings estimated for the upper quartile of a sample of

32 developing nations.<sup>44</sup> This might appear to be a contradiction, and some clarification is therefore in order.

Two major factors could be cited as underlying the fairly high level of the observed private marginal savings in spite of general unfavorable developments in the economy. The first involves the utilization of para-fiscal measures as an instrument for promoting compulsory private savings. In 1956 a "Pension and Insurance Fund" for government employees and a "Social Insurance Fund" for non-government employees were set up. These funds were gradually extended to cover all employees, and subscription to them became compulsory. Slightly over 50 per cent of these funds was paid by the government or other employers, and the remainder was deducted from the employees' wages and salaries. Later on in the mid-1960's a third scheme was added in the form of a compulsory half-day saving of all wages and salaries.<sup>45</sup>

Given the fact that (a) household voluntary savings were quite small, and accordingly their decline in compensation for compulsory savings negligible, and (b) the outgoing payments during the first decade after the installment of the social insurance plans greatly fell below the incoming payments, one can conclude that these schemes contributed to net household savings substantially. In fact by examining the data for 1964/65 - 1966/67, one can roughly

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<sup>44</sup>Chenery and Strout, op. cit., p. 684.

<sup>45</sup>For a description of the evolution of Egypt's social insurance schemes, see Hansen and Marzouk, op. cit., pp. 216-19; see also Lotz, op. cit., pp. 138-40.

speaking estimate the contribution of these measures to household savings to be on the average £. E. 40 million (i. e., over 10 per cent of total private savings) while all voluntary savings amounted to only £. E. 25 million.<sup>46</sup>

As for government contribution to the social insurance funds, it is a matter of bookkeeping entries. On the other hand, the contributions of non-government employers is more in the nature of a savings tax and thus could not be considered an addition to private savings.<sup>47</sup>

The second factor which helped maintain a high private savings propensity was the low initial wage share in the national income as a whole, and the industrial sector in particular. According to the cross-section evidence provided by Kuznets, the share of wages (employees' compensation) rise in the course of growth of per capita income. For countries with an average per capita gross domestic product of over \$350, the share of the employees' compensation is over 55 per cent while for countries with income per capita of \$100-199, it is only 47 per cent.<sup>48</sup> In the case of Egypt, estimates for the late 1950's indicate that the share of all employees' compensation, including salaries imputed to self-employers, amounted to only one-third of total

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<sup>46</sup>United Arab Republic, Ministry of Planning, Follow-Up and Evaluation of Economic Growth in the U. A. R. for 1966/67 (Cairo, August 1968 (in Arabic), p. 157.

<sup>47</sup>The use of social insurance as a vehicle for promoting savings has been used by other developing countries as well; see Franco Reviglio, "Social Security: A Means of Saving Mobilization for Economic Development," International Monetary Fund, Staff Papers, XIV, No. 2 (July 1967), 324-68.

<sup>48</sup>Simon Kuznets, Modern Economic Growth: Rate Structure, and Spread (New Haven, Conn.: Yale University Press, 1966), p. 405.

income (i. e., around 33 per cent), and for industry it was perhaps even below that.

Such a structural phenomenon is understandable in the light of Egypt's surplus labor which must have kept wages down in a classical Lewis fashion. Consequently when the share of wages started to rise with the beginning of the 1960's, this initial low share substantially reduced the impact of such a rise on private savings (mainly industrial savings).

Furthermore, since industry was almost wholly nationalized at the beginning of the 1960's, it ceased to pay any dividends to stockholders--with the exception of the little it still paid to some enterprises with mixed government-private ownership. This factor could be looked upon as one that partially compensated for the sharp rise in the above-wage payments to employees in the form of profit sharing and other fringe benefits.

To sum up: Both social insurance schemes and the initial low share of wages helped reduce the detrimental effect of some of the economic policies of the import substitution strategy on saving, and helped to maintain a high private saving propensity in spite of it. Nevertheless, the former is a temporary source of net savings by its very nature since soon the outgoing payments to beneficiaries of social insurance will catch up with the incoming payments. And as for the latter, the rise in industrial wage rates at a faster pace than that of average productivity and prices already discounted an important mechanism of growth in savings and capital formation. Arresting this trend and imposing a productivity ceiling on wage rises is a sine qua non for stable growth in Egypt in the 1970's.



## Model Equations and Identities

Structural Equations: 1952/53 - 1966/67ProductionAgricultureCotton

$$\text{CORC: } (1) \quad V_t^c = -8.332 + 47.283 (L_t^c) + 1.008 \left( \frac{K_{t-1}^a}{L} \right) + 3.436 (F_t^c) - 116.764 (D^{v.c.})$$

(16.386) (11.261) (0.762) (4.4) (11.938)

$R^2 = 0.948$   
 $d = 2.189$

Food

$$\text{OLSQ } (2) \quad V_t^f = -76.534 + 28.804 (L_t^f) + 2.116 \left( \frac{K_{t-1}^a}{L} \right) + 4.148 (F_t^f)$$

(73.414) (9.701) (1.714) (2.062)

$R^2 = 0.955$   
 $d = 1.862$

Industry

$$\text{CORC: } (3) \quad V_t^i = 73.272 + 0.45 (K_{t-1}^i) - Ex_t^i$$

(3.408) (0.003)

$R^2 = 0.99$   
 $d = 2.198$

Social overhead services (transport and communications, housing, and public utilities)

$$\text{CORC: } (4) \quad V_t^{\text{soh}} = -7.137 + 0.162 (K_{t-1}^{\text{soh}})$$

(16.454) (0.011)

$R^2 = 0.99$   
 $d = 1.902$

Other services (including government)

$$\text{CORC: } (5) \quad V_t^{\text{os}} = -51.765 + 0.61 (K_{t-1}^{\text{os}}) + 157.447 (N_t^{\text{os}}) - 98.751 (D^{\text{vos}})$$

(95.088) (0.359) (114.618) (32.982)

$R^2 = 0.984$   
 $d = 1.789$

ConsumptionFood

$$\text{OLS Q: } (6) \quad C_t^f = -210.312 + 3.949 \left(\frac{Y^d}{\text{POP}}\right)_t + 18.118 (\text{POP})_t \\ (46.33) \quad (1.81) \quad (4.17) \\ - 0.462 (\text{tot}^i) \\ (0.65)$$

$$R^2 = 0.965 \\ d = 1.829$$

Industrials

$$\text{I/O: } (7) \quad C_t^i = \alpha_{ci} (V_t^i) + \beta_{ci} (M_t^{c+i+k} + T_t^{ii} + \Delta ST_t^i) - I_t^{t.g.f} - E_t^i$$

Services

$$\text{I/O: } (8) \quad C_t^s = \alpha_{cs} (V_t^s) + \beta_{cs} (T_t^{is})$$

Household (industrials and services)

$$\text{OLSQ: } (7+8) \quad C_t^{h(i+s)} = -771.229 + 13.861 \left(\frac{Y^d}{\text{POP}}\right)_t + 19.281 (\text{POP})_t \\ (67.63) \quad (2.64) \quad (6.08) \\ + 2.176 (\text{tot}^i) \\ (0.96)$$

$$R^2 = 0.987 \\ d = 1.453$$

ExportsCotton

$$\text{I/O: } (9) \quad E_t^c = \alpha_{ec} (V_t^c) + \beta_{ec} (T_t^{ic} - \Delta ST_t^c)$$

Industrials

$$\text{OLSQ: } (10) \quad E_t^i = -9.122 + 0.121 (V_t^i) + 1.098 (t) + 15.947 (D^{ei}) \\ (7.154) (0.044) \quad (1.026) \quad (3.481)$$

$$\text{OLSQ: } (10)' \quad E_t^i = 63.666 + 0.161 (V_t^i) - 0.664 \left(\frac{P^d/P^w}{R}\right) \\ (49.03) \quad (0.01) \quad (0.40)$$

$$+ 11.634 (D^{ei}) \\ (3.40)$$

$$R^2 = 0.99 \\ d = 1.934$$

ImportsFood

$$I/O: \quad (11) \quad M_t^f = C_t^f + E_t^f - \alpha mf (V_t^f)$$

Intermediate goods

$$CORC: \quad (12) \quad M_t^i = -24.054 + 0.390 (V_t^i) - 40.922 (D^{mi}) \quad R^2 = 0.971 \\ (10.85) \quad (0.02) \quad (8.9) \quad d = 1.689$$

Capital goods

$$I/O: \quad (13) \quad M_t^k = \alpha mk (I_t^{t.g.f.}) - \beta mk (V_t^i) - T_t^{ik}$$

$$OLS \underset{\sim}{Q}: \quad (13)' \quad M_t^k = 6.646 + 0.266 (I_t^{t.g.f.}) + 0.176 (BOP_t) \quad R^2 = 0.904 \\ (6.16) \quad (0.03) \quad (0.08) \quad d = 1.758$$

Savings and governmentPrivate savings

$$CORC: \quad (14) \quad S_t^P = -141.747 + 5.831 \left( \frac{Y^d}{POP} \right)_t + 0.529 (S_t^i) - 59.84 (D^{SP}) \quad R^2 = 0.927 \\ (107.09) \quad (3.49) \quad (0.36) \quad d = 1.277$$

Industrial surplus

$$CORC: \quad (15) \quad S_t^i = \alpha si (V_t^i)$$

Government net income

$$CORC: \quad (16) \quad Y_t^{g*} = -10.233 + 0.168 (GNP_t) \quad R^2 = 0.937 \\ (17.76) \quad (0.01) \quad d = 1.916$$

Government consumption (of goods and services)

$$CORC: \quad (17) \quad C_t^{g*} = -49.473 + 0.223 (GNP_t) \quad R^2 = 0.948 \\ (43.48) \quad (0.02) \quad d = 1.651$$

Indirect taxes

$$(18) \quad T_t^i = \alpha ti (GDP_t)$$

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\* Alternatively, they will be treated, in the course of our policy design, as exogenously determined.

Labor

$$(19) \quad N_t^a = N_o^a + \lambda^{na} (1+na)^t \Delta L_t$$

$$(20) \quad N_t^i = N_o^i + \lambda^{ni} (1+ni)^t \Delta K_t^i$$

$$(21) \quad N_t^{soh} = N_o^{soh} + \lambda^{nsoh} (1+nsoh)^t \Delta K_t^{soh}$$

$$(22) \quad N_t^e = N_o^e + \lambda^n (1+n)^t \Delta POP_t - Ue$$

Definitions, identities, and equilibrium conditions

$$(23) \quad N_t^{os} = N_t^e - [N_t^a + N_t^i + N_t^{soh}]$$

$$(24) \quad L_t = L_{t-1} + \sigma L \quad (i_{t-1}^{L.W.})$$

$$(25) \quad L_t^c = \alpha L \quad (L_t)$$

$$(26) \quad L_t^f = (1 - \alpha L) L_t$$

$$(27) \quad K_t^a = 0.97 (K_{t-1}^a) + I_t^a \quad (K_{1929}^a = 0)$$

$$(28) \quad K_t^i = 0.95 (K_{t-1}^i) + I_t^i \quad (K_{1929}^i = 0)$$

$$(29) \quad K_t^{soh} = 0.97 (K_{t-1}^{soh}) + I_t^{soh} \quad (K_{1929}^{soh} = 0)$$

$$(30) \quad K_t^{os} = 0.98 (K_{t-1}^{os}) + I_t^{os} \quad (K_{1929}^{os} = 0)$$

$$(31) \quad I_t = I_t^a + I_t^{L.W.} + I_t^i + I_t^{soh} + I_t^{os} + I_t^v$$

$$(32) \quad I_t^{t.g.f.} = I_t - I_t^v$$

$$(33) \quad V_t^a = V_t^c + V_t^f$$

$$(34) \quad V_t^s = V_t^{\text{soh}} + V_t^{\text{os}}$$

$$(35) \quad \text{GDP}_t = V_t^a + V_t^i + V_t^s$$

$$(36) \quad \text{GNP}_t = (1 + \alpha t i) \text{GDP}_t - \text{b.f.p.}$$

$$(37) \quad Y_t^d = \text{GNP}_t - Y_t^g$$

$$(38) \quad C_t = C_t^f + C_t^i + C_t^s$$

$$(38)' \quad C_t = C_t^f + C_t^{h(1+s)} + C_t^g$$

$$(39) \quad E_t = E_t^c + E_t^i + E_t^f$$

$$(40) \quad M_t = M_t^c + M_t^f + M_t^i + M_t^k$$

$$(41) \quad S_t^g = Y_t^g - C_t^g$$

$$(42) \quad S_t = S_t^g + S_t^p$$

$$(42)' \quad S_t = 1 - C_t$$

$$(43) \quad F^s = I_t - S_t$$

$$(44) \quad F_t^t = M_t - E_t + \text{BIT}$$

$$(45) \quad V_t^{\text{ic}} = \text{Ex}_t^i + V_t^i$$

$$\left[ (46) \quad \text{Ex}_t^i = f \left( \Delta \frac{E^i}{V^i} \right)_t \quad f < 0 \right]$$

List of variablesEndogenous variables (all values are at constant 1959/60 prices)

$V^c$  = value-added in cotton sector

$V^f$  = value-added in food sector

$V^a$  = real value-added in the agricultural sector

$V^i$  = value-added in the industrial sector (mining, manufacturing, electricity, and construction)

$V^{soh}$  = value-added in social overhead services (i. e., transport and communications, housing, and utilities)

$V^{os}$  = value-added in other services (i. e., commerce, and finance, government)

$V^s$  = value-added in services sector

GDP = gross domestic product (at factor cost)

GNP = gross national product

$T^i$  = total indirect taxes

$Y^g$  = net government income

$Y^d$  = private income (i. e., household disposable income plus undistributed industrial profits)

$C^f$  = food consumption

$C^i$  = consumption of industrial goods

$C^s$  = consumption of services

$C^{h(i+s)}$  = household consumption of industrial goods and of services

$C^g$  = government consumption of goods and services

$C$  = total consumption

$S^p$  = private savings (i. e., household and business savings)

$S^g$  = government budget (current) savings

$S$  = total savings

$S^i$  = industrial after-wage surplus

$E^c$  = exports of raw cotton

$E^i$  = exports of industrial goods

$E$  = total commodity exports

$M^f$  = food imports

$M^i$  = imports of intermediate goods

$M^k$  = imports of capital goods

$M$  = total imports

$F^s$  = savings gap

$F^t$  = trade gap

$I$  = total investment

$I^{t.g.f.}$  = total gross fixed investment

$K^a$  = net capital stock in irrigation and drainage

$K^i$  = net capital stock in industry

$K^{soh}$  = net capital stock in social overhead services

$K^{os}$  = net capital stock in other services

$L$  = total cropped area

$L^c$  = cropped area allocated to cotton cultivation

$L^f$  = cropped area allocated to food crops

$N^a$  = labor in agriculture

- $N^i$  = labor in industry  
 $N^{soh}$  = labor in social overhead services  
 $N^{os}$  = labor in other services  
 $N^e$  = total employed labor  
 $Ex_t^i$  = excess capacity output in industry  
 $V^{i.c.}$  = industrial capacity output

Predetermined variables (i. e., exogenous and lagged)

- $F^c$  = chemical fertilizers used in cotton production  
 $F^f$  = chemical fertilizers used in food production  
 $K_{t-1}^a$  = capital stock in irrigation and drainage lagged one year  
 $K_{t-1}^i$  = capital stock in industry lagged one year  
 $K_{t-1}^{soh}$  = capital stock in social overhead services lagged one year  
 $K_{t-1}^{os}$  = capital stock in other services lagged one year  
 POP = population size  
 $tot^i$  = internal terms of trade between the food and industrial sectors (i. e.,  $p^f/p^i$  where  $p^f$  refers to food prices, and  $p^i$  to industrial prices)  
 $T^{ii}$  = indirect taxes on industrial goods  
 $\Delta ST^i$  = changes in industrial stocks  
 $T^{is}$  = indirect taxes on services  
 $T^{ic}$  = indirect taxes on cotton  
 $\Delta ST^c$  = changes in stocks of raw cotton  
 $t$  = time



$E^f$  = food exports

$T^{ik}$  = indirect taxes on capital goods

BOP = balance of payments on current account (Central Bank figures which are different from Customs figures because of leads and lags in payments for imports and exports)

$N_o^a$  = labor in agriculture in initial year

$N_o^i$  = labor in industry in initial year

$N_o^{soh}$  = labor in social overhead services in initial year

$N_o^{os}$  = labor in other services in initial year

$U_e$  = unemployed workers counted as part of the labor force (civilian)

$I^a$  = investment in irrigation and drainage

$I^{L.W.}$  = investment in land reclamation and water control (such as the High Dam)

$I^i$  = investment in industry

$I^{soh}$  = investment in social overhead services

$I^{os}$  = investment in other services

$I^v$  = investment in inventories

$M^c$  = imports of consumer goods

BIT = balance of invisible trade including net factor payments abroad ( $\pm$ )

$p^d$  = implicit price deflator for industrial value-added

$P^w$  = world market prices as represented by U.S. industrial wholesale price index

R = the price of foreign exchange

B.F.P. = balance of net factor payments abroad

## PART II

## ECONOMIC POLICY, ANALYSIS, AND DESIGN

In part I we outlined some of the major economic policies and trends which, in my opinion, had a bearing on the difficulties encountered in the mid-1960's. We also delineated, in greater detail, the specifications and estimation of the structural equations of a growth model which attempts to depict the behavior of the economic system during the import substitution state (1952/53 - 1966/67).

In this part we use the model for the purpose of policy analysis and design. First, we attempt to explain the way in which the complete model functions, its underlying structural interrelations, and its causal ordering. Secondly, we use the model to attempt to replicate the actual economic system during the period 1952-67. Thirdly, having passed the above test, the model will be used in conducting a two-gap analysis, and in undertaking experiments aimed at identifying the dominant gap. This is a preliminary step to policy analysis for, if the prescribed economic policies are to be effective, they must be directed towards the binding bottlenecks. Finally, the model will be used to test alternative future strategies aiming at reorienting the economic system towards its long-run growth path and the requisite external equilibrium. In this last section, we will be using Tinbergen's theory of economic policy with some modifications to suit the case of Egypt.

### Model Specification and Causal Order

In Part I we alluded to the wholly recursive nature of the model. To illustrate this point, we showed the complete triangularity of the matrix of coefficients of the model's endogenous variables.<sup>1</sup> Below, some of the implications of this characteristic for the model's utilization as a tool of policy analysis will be elaborated upon.

A revealing and compact approach to summarizing the model's operational features is to represent it as an ordered arrow diagram. Such a diagram combines Tinbergen's arrow diagram technique with H. A. Simon's causal ordering technique in order to provide an expository device for the model's structure and its causal relations. This is illustrated in Figure 2.1.

In addition to its expository function, this kind of arrow diagram is helpful in the planning and designing of economic policies.<sup>2</sup> It helps to select appropriate policy instruments from among the parameters in order to achieve assigned policy targets. However, this latter function will be relegated to the last section of this part, and accordingly we will concentrate on using the arrow diagram as a framework in our discussion of the model's

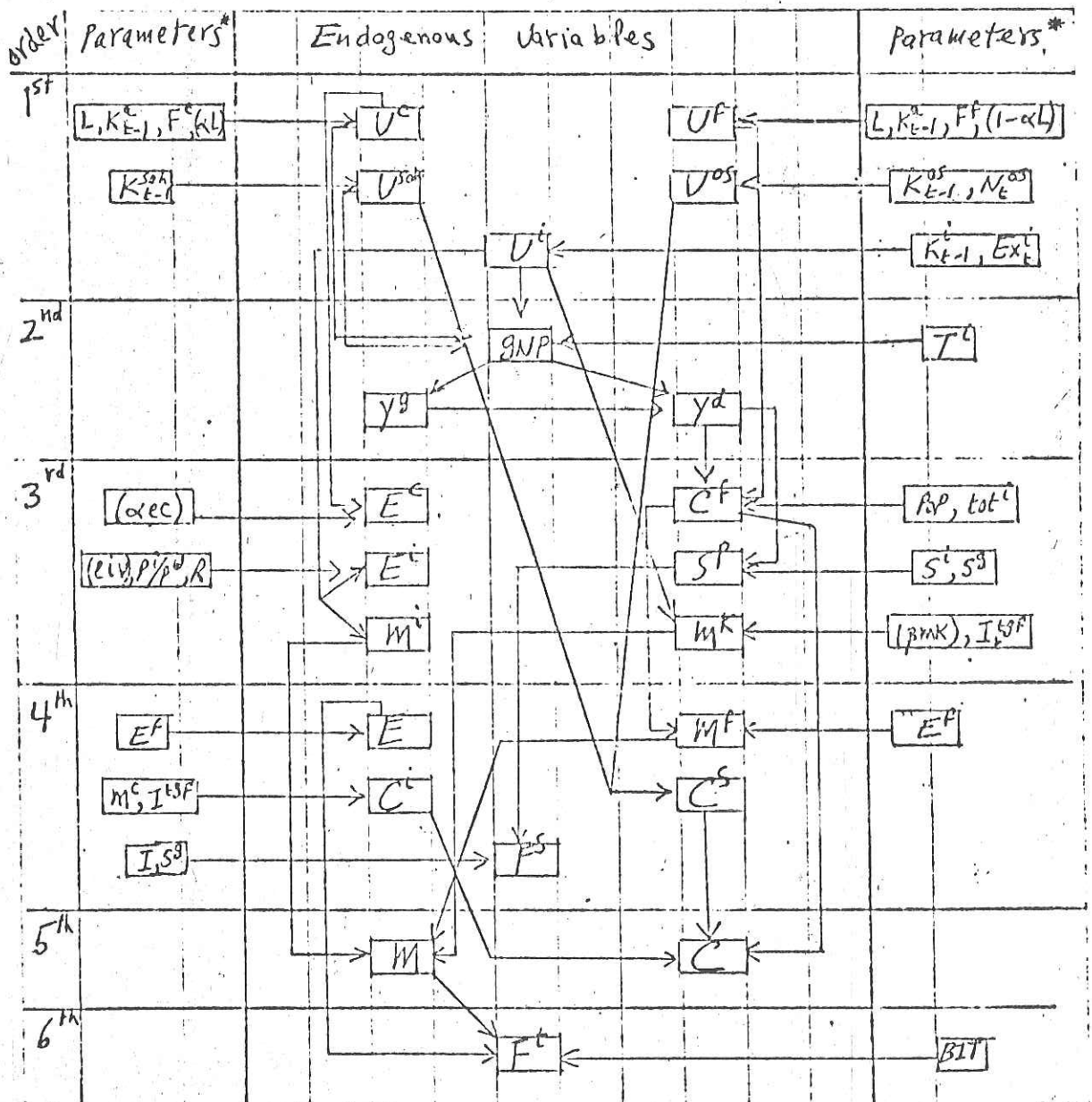
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<sup>1</sup>Note that the triangular matrix of coefficients of the endogenous variables does not necessarily mean a corresponding triangular matrix of predetermined variables. This latter matrix is not triangular in the case of our model. This fact is important for the selection of policy instruments aiming at achieving certain policy targets as will be seen in the last section of this part.

<sup>2</sup>For a brief, but incisive, discussion of the use of arrow diagrams, see B. Hansen, Lectures in Economic Theory, Part II (Lund: Studentlitteratur, 1967).

Figure 2.1

ARROW DIAGRAM OF MODEL STRUCTURE AND CAUSAL ORDERING



\*The term parameters refers to (i) exogenous variables, (ii) lagged endogenous variables, and (iii) some government-controlled structural parameters and endogenous variables which are candidates for use as policy instruments.

structure. From this point of view, the interpretation of the diagram is fairly straightforward. All we need to add is some of the implicit hypotheses underlying it.

Let us first start by examining the situation in the system's labor sector. The growth in labor supply makes attainment of full employment difficult without rapid economic growth. Over the sample period, population grew at a marginal compound rate of 2.7 per cent per annum. At the same time, the labor force increased at a marginal rate of around 5 per cent per annum. The reason for the discrepancy is largely due to the rise in the labor force participation rate--particularly of women.

With a government committed to a policy of full employment, rapid growth of capital formation becomes a sine qua non to provide employment for the sharply rising labor supply. On the one hand, large investments are required to expand the capital intensive sectors, namely, industry and social overhead services. On the other hand, equally large investments are required in agriculture to substitute for the scarcity of arable land and irrigation water. The growth of agriculture is of paramount importance on at least two counts: (a) an increase in arable land would help slow down the outflow of labor from the agricultural to the services sector, and (b) an increase in agricultural output is needed to feed the growing population and provide the country with the great bulk of its exports.

With the aim of accelerating capital formation, the government assumed full control of all investment activities in the country (since the mid-1950's).

For the sample period real investment increased at an annual compound rate of 8 per cent (the marginal rate was 14 per cent), a rate which was substantially above its previous level. However, the growth of investment, and its pattern of allocation, culminated in the emergence of various gaps and an excess capacity in the industrial sector. Judging from this point of view, the pattern of investment allocation was ceteris paribus an unbalanced one.

From this brief explanation, it is seen that the level and allocation of investment is the driving force behind the model. They are under full government control and are therefore treated in the model as exogenously determined.

Observe at this point the specification and implications of the demand for labor equations. Given the rate of growth of the labor force (determined exogenously by population growth and changes in the labor force participation rate) and a politically tolerable rate of unemployment, the level and allocation of investment has a substantial bearing on the relation between aggregate demand. The allocation of investment (at year  $t$ ) to agriculture (land reclamation), industry, and social overhead services determines capital stocks and labor demand in these sectors (given the capital-labor ratios). The remainder of employed labor is then absorbed by the sector referred to as "other services" whose main component is the government sector.

Now, a rapid growth of capital formation in the commodity (and social overhead) sectors would be favored on two grounds: one, it contributes to capacity output and thus relieves the pressures on the balance of payments through either import substitution or exports, and two, it reduces the

employment pressure on the growth of the sector "other services" which is a purely home sector, and does not contribute to investment goods. In fact, the growth of this sector beyond the minimum requirements contributes to income and aggregate demand for commodity output but not to its aggregate supply (neither directly nor indirectly).

Needless to say, the above conclusions need not be altered if the government chooses to force certain employment targets on, say, the industrial sector above the latter's requirements. It would increase the industrial wage bill but not industrial output, with all that this implies. In our model, such a policy of labor allocation would show up in the form of a change in the capital-labor ratio.

There are only two alternatives to cope with the employment problem: one, the choice of labor intensive production techniques; two, a sufficiently rapid growth of capital formation mainly in the commodity sectors. Egypt's import substitution strategy opted more (by choice or by default) for the latter alternative, and the rest of the model, by and large, examines the consequences of this option.

As is seen from Figure 2.1, net output in agriculture, industry, and social overhead services is determined by the beginning of year capital stocks and the total cropped area, assisted by supplementary factors, namely, fertilizers in the case of agriculture. Net output in "other services" is influenced more by labor inputs whose size is determined as a residual, as explained above. The sum of sectoral value-added determines Gross Domestic

Product at factor cost and, given the structure and rates of indirect taxes and the balance of factor payments abroad, this gives GNP.

Note that according to this model, capacity output is dependent on the beginning of year land and capital stocks which are predetermined variables. The only non-predetermined variable influencing capacity output in year  $t$  is labor in other services. Nevertheless, actual output fluctuates with such factors as capacity utilization,<sup>3</sup> fertilizers (positive), and the degree of cotton pest infection (negative) as well as with other factors influencing land productivity in agriculture. The allocation of land between cotton and food is an important policy variable which affects the aggregate value productivity in agriculture. The model does not allow for the assessment of the impact of capital allocation within the industrial sector except in one indirect case. The specification of the capital goods import function shows how a rise in the share of the capital goods' industrial subsector in total industrial value-added would alleviate the foreign-exchange constraint, and thus contribute to growth.

Having obtained the value of GNP, this determines government net income which we have related, historically speaking, to GNP. Of course, the relationship between the growth in government income and the growth in GNP is quite loose. We have used it only as an indicator of the trend. Alternatively, government income and, for that matter, consumption could be treated as exogenously determined. In fact, this would even be desirable if

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<sup>3</sup>There is no significant underutilization of capacity in sectors other than industry.



we are to use these government variables as policy instruments in designing economic policies, as will be done in Section 4.

GNP and government net income together determine disposable private income. The latter determines food consumption and private savings, given such exogenous variables as population, internal terms of trade between the food and industrial sectors, and the industrial after-wage surplus. At the same time, the sectoral production functions, together with gross fixed investment, determine exports of cotton and industrial goods, and imports of intermediate and capital goods.

Food production, having been determined in the first round, and food consumption in the third round, they together determine food imports. Food exports, which is exogenous in the model, could be looked upon as negative food imports.

Having determined sectoral production, exports, and imports, we would be in a position to determine consumption of industrial goods and services using supply-demand balance equations for these two sectors. These, together with food consumption, determine total consumption.

#### Two Alternative Models

Before we proceed any further, some clarification about the uses of the alternative consumption and saving specifications is required. The "complete model" as laid down at the end of Part I is overspecified. The reason is that the national income identity, i. e.,  $C+S = C+I-F$  dictates upon us that, given the level of GNP (determined from the supply side), both

aggregate consumption and aggregate saving cannot be estimated independently; one of them has to be estimated as a residual.

Therefore, in order to avoid overdeterminacy, we have to be explicit about the alternative combinations of the consumption and saving functions we will be using each time the model is solved. From this point of view, we will distinguish between two alternative general model specifications.

#### Model I

This model is a conventional one in the Keynesian tradition. According to this model, aggregate savings are estimated autonomously using equation (14), and identities (41), (42) (whether we treat government savings as exogenously determined or estimate it from the government income and consumption functions is immaterial for the point we are discussing). Having estimated aggregate savings this way, aggregate consumption would then be estimated as a residual, i. e.,  $C_t = GNP_t - S_t$ . Thus in Model I, equations (7), (8), (7+8)' and identities (38), (38)' are eliminated (i. e., not utilized). Model I, as stated above, will be used in the projection of the ex ante saving and trade gaps.

#### Model II

This model is based on my input-output specification for consumption of industrial goods and services. This specification was prompted by the structural relations and the limited structural flexibility characterizing the Egyptian economy during the sample period explained in Part I. According

to Model II, aggregate consumption (of both household and government) is determined by equations (6), (7), (8) and identity (38)--given, naturally, the production and trade equations. Having estimated aggregate consumption in this way, aggregate savings would then be determined as the non-consumed output, i. e.,  $S_t = GNP_t - C_t$ . Thus, in Model II, equation (14) and identity (42) are eliminated, and equations (7+8)' and (38)' are likewise not utilized. Model II will be used in connection with our discussion of the interdependence of the saving and export coefficients which have been exhibited by Egypt's case.

Now, having clarified this point, let us return to our previous discussion with regard to the steps followed in estimating the ex ante saving and trade gaps. Having estimated aggregate saving autonomously through Model I, and given the value of total gross investment, the saving gap would be determined as  $I_t - S_t$ . As for the trade gap, it is determined as commodity imports minus commodity exports and the balance of invisible trade (including net factor payments abroad). It must be pointed out that the balance of invisible trade had shown a sustained and rising surplus throughout the sample period, and had thus contributed substantially to the reduction in the size of the trade gap. As for the balance of factor payments, it was quite insubstantial since the country was still in the grace period with regard to the payment of the rising foreign debt.

Three general concluding remarks are in order at this point. First, the approach which involves using alternative functional specifications in a policy model such as ours endows it with the requisite flexibility. It serves

as a substitute for the largeness<sup>4</sup> and comprehensiveness of the model, and allows us to examine different aspects of the economic system. Secondly, in a developing, centrally planned economy like Egypt's, limited structural flexibility becomes quite pronounced, and must be accounted for in any attempt to reproduce the system. In such an economy, the situation is usually as follows. Production is determined through the plan and is inelastic both upward and downward. At the same time, exports are quasi stagnating while the structure of imports becomes increasingly rigid. As a result, the role of foreign trade in bringing about sectoral commodity balances is greatly undermined, and other equilibrating mechanisms must be substituted for it. It is in this light that we deemed it imperative to incorporate sectoral supply-demand balances in the model.<sup>5</sup> The value of this feature of the model will be amply demonstrated in the last section of this part.

Finally, we have specified capital formation, and accordingly growth, as exogenously determined. We have opted for this specification because it provides us with more degrees of freedom in our policy analysis and design. But it is not necessary for the model. There are two alternative specifications. One would be to treat the level of investment as endogenously determined and equal to the sum of domestic production and imports of investment goods, that is, to endow the model with a Mahalanobis feature. This would be

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<sup>4</sup>Substantially larger models suffer from the problem of error accumulation which can be quite detrimental especially when the margin of error in the used time-series is substantial.

<sup>5</sup>This is achieved through the various input-output functional specifications.

appropriate if the supply of investment goods is the limiting factor on investment. The second would be to treat investment as endogenously determined and equal to the sum of domestic savings and foreign resource inflows. In either of these two cases the model could be used to test the impact of different assumptions regarding foreign resource inflows and investment allocation on growth.

### Testing the Model's Performance

Before using the model for projections and policy design, one must first assess its ability to accurately simulate the actual economy. One such approach would be to compare the fitted values of the various structural equations with the actual ones for the sample period. However, a more stringent test is to assess the performance of the model as a complete system. This could be done by inserting in the model's equations for each year the model's projected values of the current and predetermined variables instead of the actual values. This latter test has the advantage of revealing any systematic bias built in the model's structure.

Table 2.1 gives the results of both the above-mentioned tests. For each of the major endogenous variables, three estimates are given: (a) equation estimates, (b) model estimates, and (c) actual estimates. In cases where alternative functional specifications were provided, such as in the case of consumption and savings, the results of the alternative equation estimates are also given.

TABLE 2.1  
 ACTUAL AND ESTIMATED VALUES OF THE MODEL'S ENDOGENOUS VARIABLES

	v <sup>C</sup>		v <sup>f</sup>		v <sup>a</sup>	
	Actual	Regression projection	Actual	Regression projection	Actual	Regression projection
1952/53			224	226.6	335	328.6
1953/54	79	77.7	245	250.9	324	354.1
1954/55	86	90.9	242	263.2	328	337.4
1955/56	82	82.9	257	254.5	339	339.6
1956/57	80	77.4	269	262.2	349	373.7
1957/58	100	106.4	266	267.3	366	381.4
1958/59	112	116	275	265.4	387	395.7
1959/60	114	107.3	291	288.4	405	397.7
1960/61	116	110.3	287	287.4	403	362.7
1961/62	73	75.1	300	287.6	373	427.6
1962/63	113	109	313	318.6	426	437.3
1963/64	107	107.1	346	330.2	453	472.1
1964/65	118	115.4	359	356.7	477	491.2
1965/66	130	135.2	352	356	482	477.6
1966/67	116	115.4	351	362.2	467	

TABLE 2.1--Continued

	$V^{soh}$		$V^{os}$		$V^s$		$V^i$	
	Actual	Regression projection	Actual	Regression projection	Actual	Regression projection	Actual	Regression projection
1952/53					443		200	
1953/54	119	117	351	333	470	450	209	210
1954/55	128	122	358	353	486	475	219	218
1955/56	136	134	360	364	496	498	232	231
1956/57	134	143	346	345	480	488	249	247
1957/58	139	145	365	370	504	515	274	275
1958/59	149	153	373	373	522	526	295	295
1959/60	172	165	395	417	567	582	313	313
1960/61	183	183	436	434	619	617	342	342
1961/62	200	198	438	448	638	646	400	399
1962/63	212	218	467	470	679	688	432	434
1963/64	230	230	503	501	733	731	484	483
1964/65	245	245	540	535	785	780	500	499
1965/66	267	258	580	559	847	817	514	515
1966/67	276	280	574	584	850	864	511	513

TABLE 2.1 --Continued

B. National Income

	GNP		$y^g$		$y^p$	
	Actual	Regression projection	Actual	Regression projection	Actual	Model projection
1952/53	1058					
1953/54	1085	1069	173	173	912	896
1954/55	1115	1129	151	179	964	978
1955/56	1151	1150	205	187	946	945
1956/57	1158	1154	173	183	985	981
1957/58	1227	1247	186	198	1041	1061
1958/59	1289	1286	239	209	1050	1047
1959/60	1376	1382	238	218	1138	1144
1960/61	1445	1439	243	232	1202	1196
1961/62	1498	1494	228	242	1270	1266
1962/63	1685	1698	269	276	1416	1429
1963/64	1851	1833	283	303	1568	1550
1964/65	2030	2020	331	335	1699	1689
1965/66	2125	2103	344	349	1781	1759
1966/67	2122	2149	366	348	1756	1783



A comparison of the actual and model estimated values of the endogenous variables and their aggregates points clearly to the model's ability to simulate the performance of the actual economy with a high degree of accuracy, and without any systematic bias. We can therefore proceed, and use it in our analysis of past and future growth.

#### Anatomy of Ex Ante Savings and Trade Gaps

The decisions to invest, save, import, or export--i. e., the four aggregates determining the size of the savings and trade gaps--are often undertaken by different groups, and have different functional relations. Therefore, there is no a priori reason for their being ex ante mutually consistent; and consequently there is no reason for the two gaps to be ex ante equal. As for the observed ex post equality, it is achieved through short-run adjustments to actual foreign resource inflows.

In the case of Egypt, government influence on the behavior of the determinants of the two gaps has been pervasive. Investment is virtually a government monopoly, and so is foreign trade. Furthermore, the industrial sector, whose surplus is the main source of private savings, is almost totally publicly owned and controlled. As for household savings, aside from the fact that its contribution to total savings is rather small, the bulk of it is greatly influenced by the government through para-fiscal policies such as social security and pension schemes which cover those employed in both the government and business sectors. Nevertheless, the government's decision-making body is represented by a myriad of organizations, committees, and individuals

whose policies are not always consistent. As a result, more often than not, the actual realized values of the four variables significantly deviate from the desired ones.

The estimation and analysis of ex ante (as distinguished from ex post) gaps, and their interrelations, is an important prerequisite for policy design. It allows us to identify the dominant gap (i. e., the larger of the two gaps), and thus enables us to channel policies aiming at restoring the balance of payments equilibrium in the direction of the binding causal factors underlying the prevailing disequilibrium. Furthermore, any attempt to interpret the mechanisms through which the smaller ex ante gap comes to ex post equality with the larger one sheds some light on the interrelations among the four strategic variables.

Two main issues related to Egypt's two gaps will be discussed below: One, projection of the ex ante gaps, analysis of their structure, and their ex post equalization mechanism; and two, the interdependence between the savings and export parameters in two-gap models, and its consequences for policies aiming at restoring equilibrium in the external balance.

#### Structural Analysis of the Two Gaps

To project the ex ante gaps for the sample period, we used the following methodology. First, we assumed three alternative compound rates of growth of real GNP for the period 1953/54 - 1965/66: 4.5 per cent per annum, 5.5 per cent per annum, and 6.5 per cent per annum. In fact, the middle rate approximates the historical one of 5 per cent. Secondly, we estimated sectoral

capital stocks needed to achieve these alternative growth targets from the model's equations (1) to (5). In doing that, we assumed a pattern of investment allocation similar to the historical one, and assumed no changes in the historical values of the other explanatory variables in sectoral production functions, namely, land, labor, and fertilizers. This is a reasonable assumption since any increase in land above the observed historical rate would have required investments with a long gestation period in water control (e. g., High Dam) and could not have materialized over the sample period. As for labor, all sectors were characterized by excess labor capacity, and accordingly could have increased their output (within the assumed growth rates) without any additional demand for labor.

Thirdly, taking the observed rate of indirect taxes (as percentage of GDP) and the balance of factor payments abroad, we were able to solve for GNP (equation 37). Given the projected values of GNP, we were able to derive government income and private disposable income (equations 16, 37). Fourthly, given the projected values of industrial value-added, the industrial surplus was projected (equation 15) using the observed average ratio of  $S^i/V^i$  during the sample period. Of course, the above-described procedures were undertaken for each of the three alternative rates of real GNP growth ( $\bar{r}$ ).

Finally, we inserted the projected values of these predetermined variables (other parameters are left at their historical values) in the model reduced form equations for imports, exports, and saving, and projected their values. As for investment, it was estimated from equations (27-30) given the

projected capital stocks. Then using equations 43, 44, we were able to project the ex ante savings and trade gaps under the assumed alternative growth rates. The results of this operation are presented in Figure 2.2.

As in seen from Figure 2.2, our projections indicate that the savings gap was the dominant one over the whole sample period, and at all assumed rates of real GNP growth. A closer look at each of the two gaps would reveal the following.

While the savings gap ( $F^S$ ) rose steadily, it increased at a decelerated rate. This is a reflection of the accelerating rate of growth of private savings which is, in turn, a function of the rising share of industry in GNP. The industrial surplus is the main source of savings, and a rise in the share of industry in GNP coupled with no decline in the share of industrial surplus in total industrial value-added would, ceteris paribus, lead to a rising marginal propensity to save. This points to an important built-in stabilization mechanism in the system which should be more fully utilized.<sup>6</sup>

The deceleration of the rate of growth of the savings gap would have been faster at higher rates of growth if we had linked the industrial capacity utilization to the rate of growth. Empirical observation generally points to a negative correlation between the rate of growth of GNP and the capital-output ratio. Nevertheless, in Egypt's cases we thought it more fit to tie the industrial excess capacity to industrial exports.

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<sup>6</sup>See Part I for a discussion of the government's industrial wage policies and their implications for the industrial after-wage surplus.

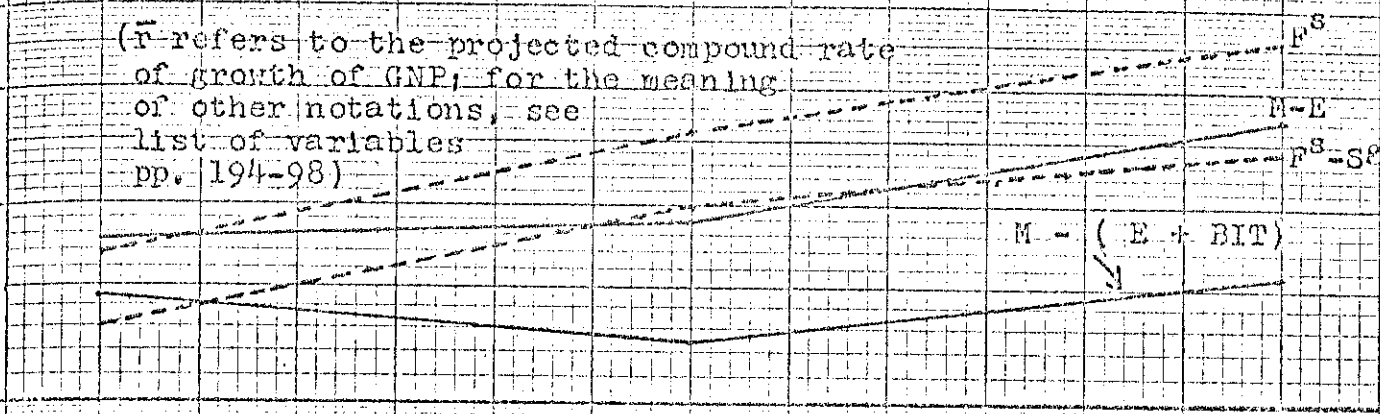
FIGURE 2.2

PROJECTIONS OF SAVING AND TRADE GAPS AND THEIR MAJOR COMPONENTS  
(1953-66)

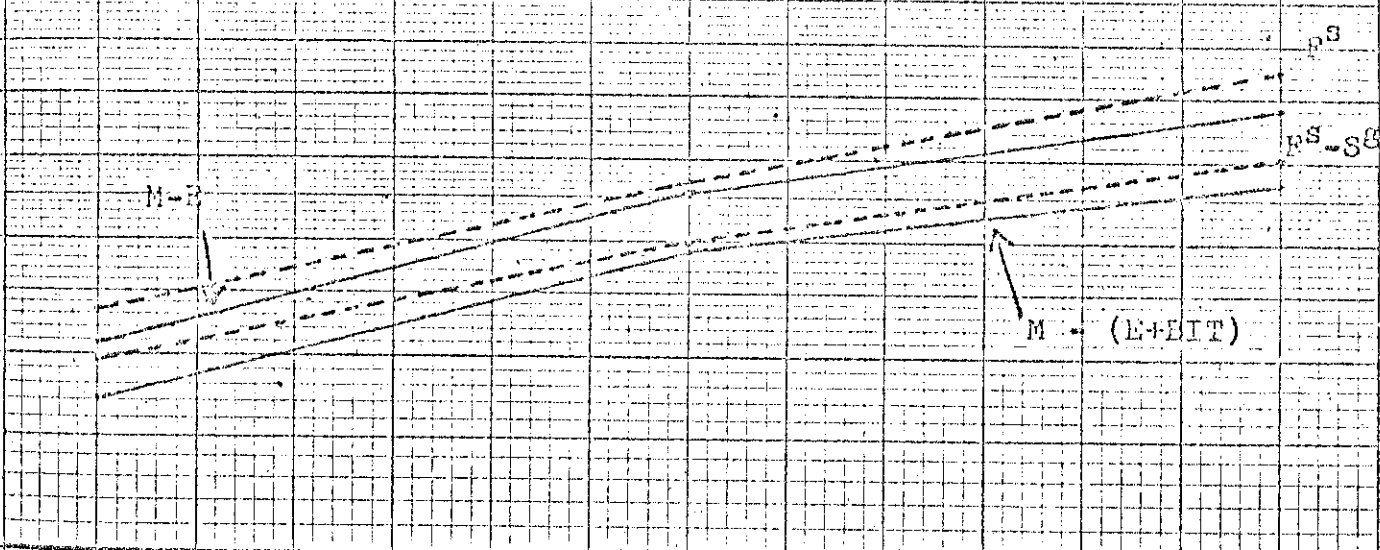
L.E.  
(m.)  
+150  
+100  
+50  
0.0  
-25  
+200  
+150  
+100  
+50  
0.0  
-25  
+300  
+250  
+200  
+150  
+100  
+50  
0.0  
-25

$\bar{r} = 0.045$  p.a.

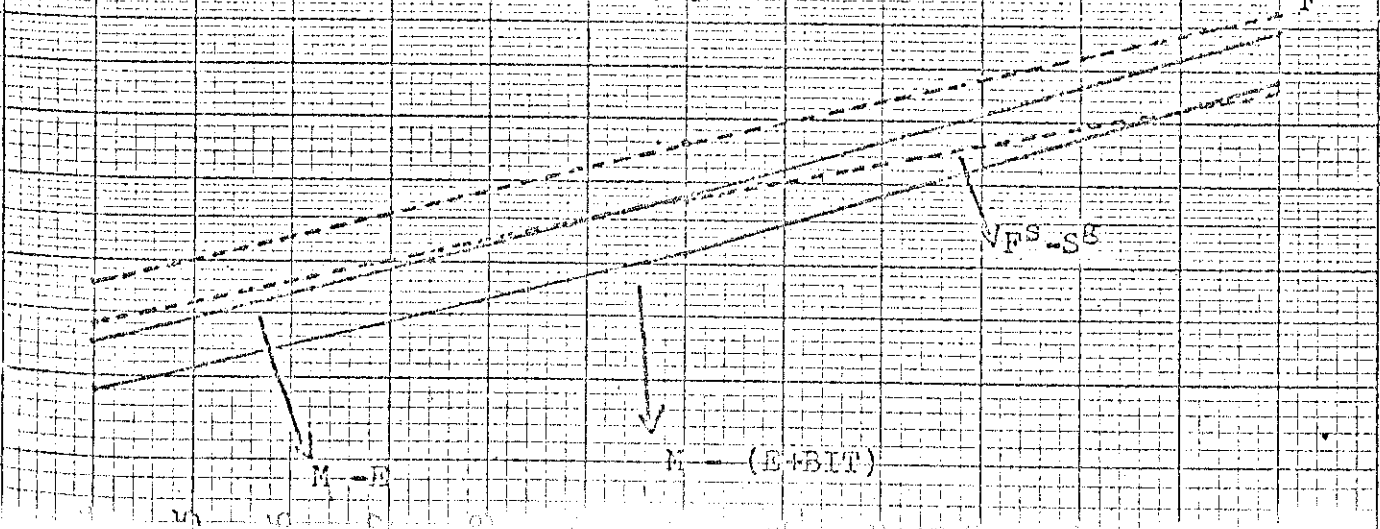
( $\bar{r}$  refers to the projected compound rate of growth of GNP; for the meaning of other notations, see list of variables pp. 194-98)

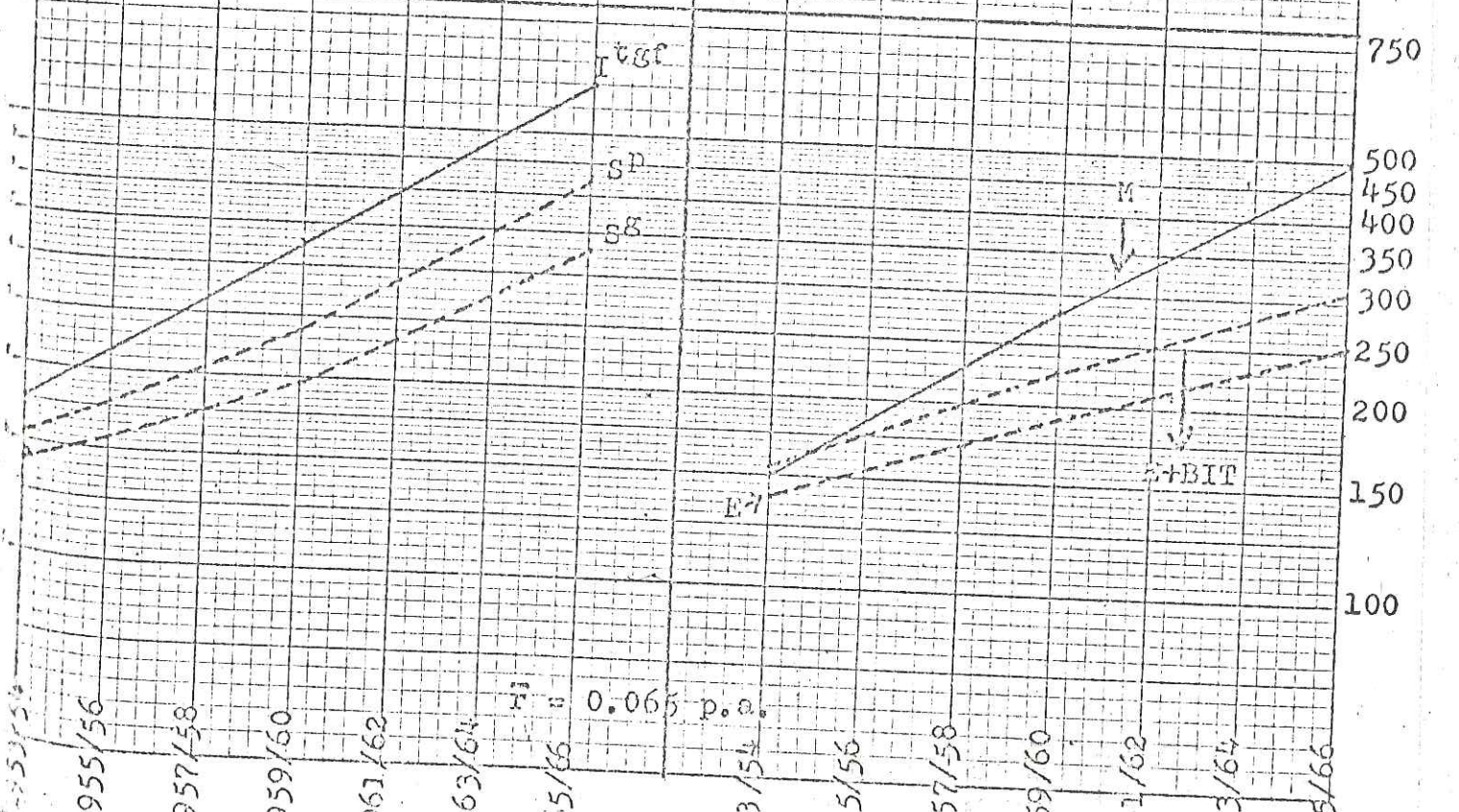
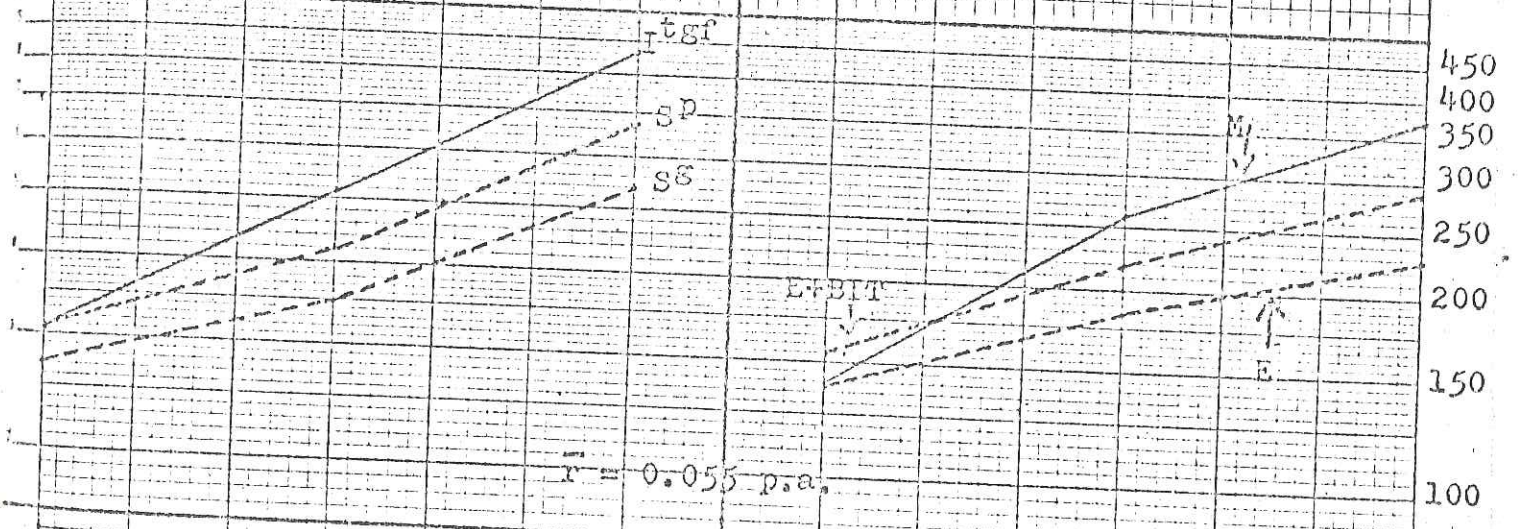
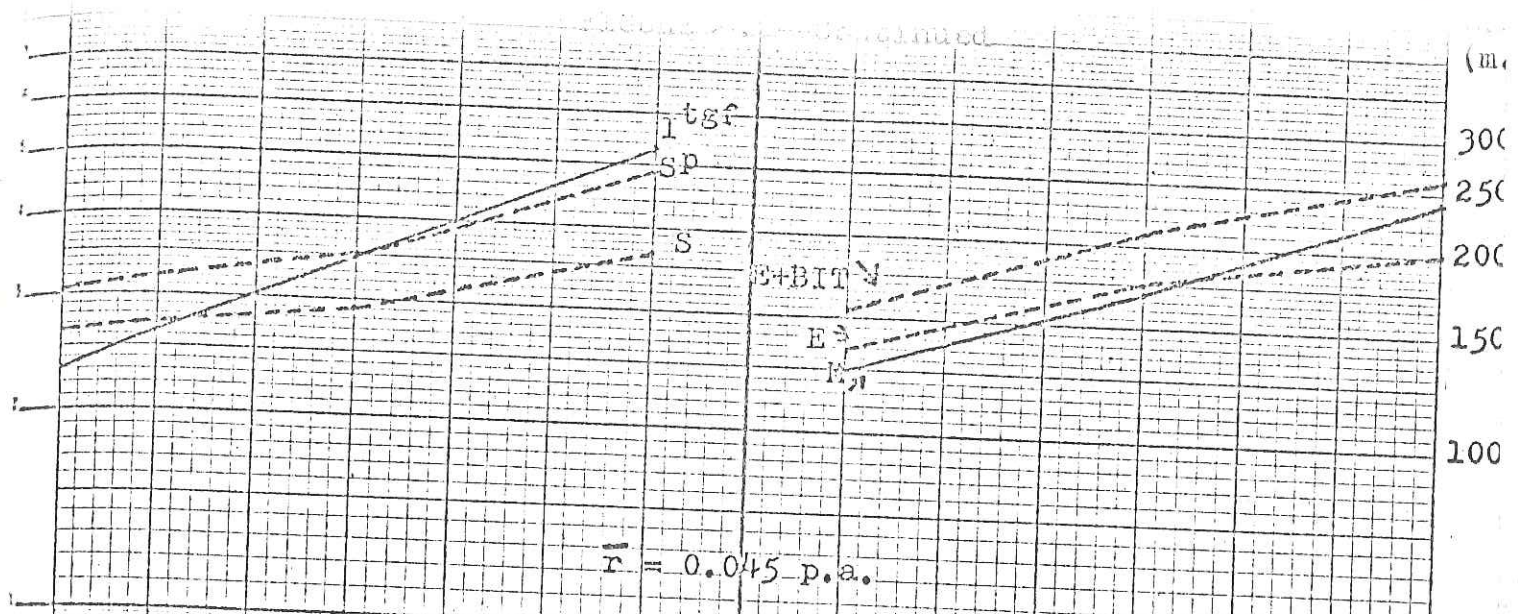


$\bar{r} = 0.055$  p.a.



$\bar{r} = 0.065$  p.a.





In the case of the trade gap ( $F^t$ ), both commodity exports and imports increased at a decelerated rate (except for imports at  $\bar{r} = 4.5$  per cent), with the rate of deceleration varying with the rate of growth. In the case of imports, the reason is mainly import substitution which was partially built in the system. In the case of exports, the deceleration is an outcome of the change in commodity composition of both domestic demand, including intermediate demand, and domestic supply; to wit: the decline in the share of agriculture, the main exporter, and the increasing domestic use of raw cotton.

The impact of the interaction of the rates of growth of imports and exports on the trade gap at the alternative GNP growth rates was not uniform. At both low and high GNP growth rates, the trade gap widened at an accelerating rate. At the same time, at the medium rate of growth, the trade gap increased at a decelerating rate. This fact has a strong bearing on the relationship between the two gaps over time, and accordingly on Chenery and Strout's two-gap "stages" hypothesis. This case study actually shows that the stage hypothesis, if it actually took place, represents a rather special case.

Next a few words need to be added about the structure of Egypt's two gaps, and their relationship to economic policies. The savings gap was a direct outcome of two major factors: (a) the budget deficit on current account (i. e., budget gap) and (b) the growth of investment above what is referred to by the two-gap theory as the "minimum required level."

The first of these two factors has been discussed earlier. Suffice it

to add here that if we deduct the budget gap from the savings gap, the latter would be close to halved, and in the case of the low GNP growth rate, it would be transformed to a surplus over most of the period.

As for the growth of investment, a major cause of its accelerated growth was the sharp rise in investments in the Aswan High Dam and related electricity projects. The share of the High Dam investments in total gross fixed investment increased from nil in the mid-1950's to 10 per cent in 1963/64, and for the whole of the 1960's section of the sample period, it averaged over 5 per cent.

Now, this raises a conceptual problem. Two-gap theory is based on minimum required investment given the GNP target rate of growth. It might be objected that since the High Dam investment did not contribute to output during this period, it should not be considered as constituting a part of the minimum investment required to sustain GNP growth. However, if we abide by the spirit rather than by the letter of the two-gap theory, we find that such an investment was an essential one, and should thus be considered as part of the minimum required investment, particularly in light of the country's poor resource endowment and its need to substitute capital for scarce land.

But even if the above logic is acceptable, it must be pointed out that the import substitution strategy erred in that it overstretched the demand for the country's meagre resources. Thus we find that the large investments allocated to the commodity sectors coincided with investments in projects with a long gestation period such as the High Dam as well as with a rising



budget deficit.

As for the foreign trade gap, around half of it was a direct product of the food gap. If we deduct the food gap from the trade gap, the former would have a positive sign for most of the sample period, at both low and medium rates of GNP growth.

A major source contributing substantially to the country's foreign-exchange receipts--thus boosting export earnings--was the positive net balance of invisible trade. It increased steadily from £. E. 18 million in 1953/54 to £. E. 59 million in 1965/66. The main source of the rise of invisible receipts was the nationalization of the Suez Canal in 1956, and the rapid growth of its foreign-exchange earnings. This factor (supplemented to a lesser degree by a rise in receipts from tourism) allowed for a rapid growth in invisible receipts, and helped reduce the trade gap.

Finally, it must be noted that during the 1960's the internal terms of trade (i. e.,  $P_e/P_m$ ) showed a declining trend (see Figure 2.3). This means that the foreign-exchange gap was larger than is indicated by the trade gap. An estimate of the foreign-exchange gap could be derived from the foreign trade gap by multiplying exports (E) by the terms of trade ( $P_e/P_m$ ), that is:

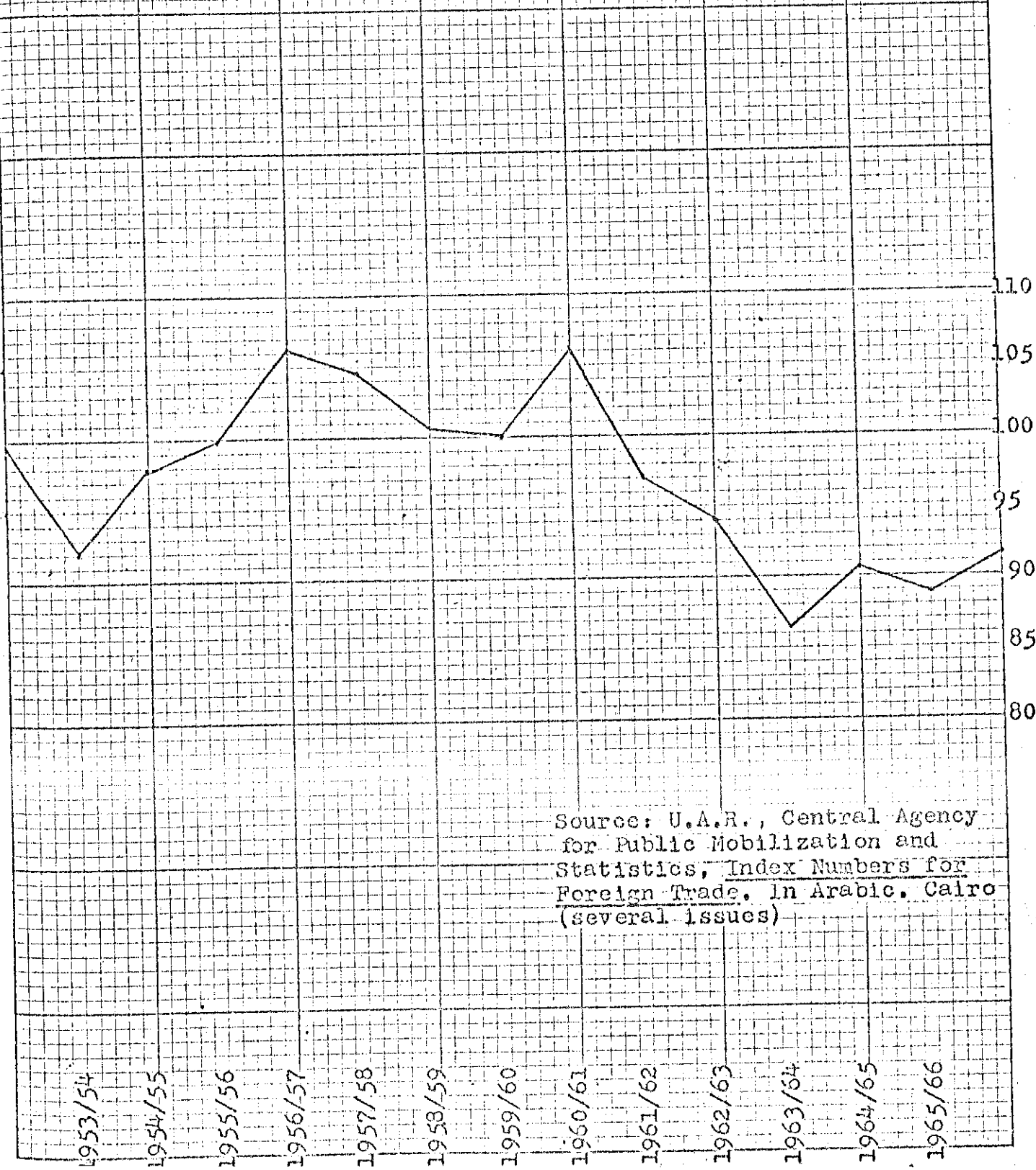
$$F_t^{f.e.} = (E + BIT) (P_e/P_m) - M$$

where  $F_t^{f.e.}$  = foreign-exchange gap, and BIT = balance of invisible trade.

Before concluding our discussion in this section, a word about the adjustment mechanism which brings the two gaps to equality is in order. In the case of Egypt, this mechanism was rather simple. As pointed out earlier,

FIGURE 2.3

## EXTERNAL TERMS OF TRADE (1952/53-66/67)



Source: U.A.R., Central Agency for Public Mobilization and Statistics, Index Numbers for Foreign Trade. In Arabic. Cairo (several issues)

the government controls the decisions as to investment, savings, import, and export. This reduces the problem to one of government targets, policies, and priorities. Of course the degrees of freedom allowed to government decision-makers are limited by internal, technical, institutional, and political factors as well as by external constraints (especially in the case of available foreign aid).

With regard to the actual channels (instruments) through which the trade gap catches up with the dominant savings gap, one can point to the following: (a) a rise in food imports, and a decline in food exports, particularly the former; (b) a rise in intermediate imports, and a decline in its exports (particularly ginned cotton); (c) since there has been an unsatiated demand for capital goods imports, this latter import item can always expand whenever foreign exchange is available.

#### Interdependence Between the Savings and Export Parameters: A Sensitivity Test

Three basic issues related to the empirical estimation of ex ante savings through the use of oversimplified aggregate models have been discussed in the recent two-gap literature. One, if the trade gap is the dominant one, any attempt to estimate the savings gap from historical data would provide biased results. With the two gaps being ex ante unequal, and the foreign resource inflow presumably filling the larger of them, the historical data pertaining to the smaller gap necessarily reflect ex post adjustment, and accordingly provide a downward biased estimate of savings and/or an upward

biased estimate of investment. Using the estimated savings and investment parameters for extrapolating the savings gap would naturally, in such a case, produce an overestimate.<sup>7</sup>

Two, implicit in the national income identity  $I_t = S_t + F_t$  is the assumption that domestic (S) and foreign (F) savings are additive. In other words, foreign resource inflows represent a pure addition to the domestic resources available for financing investment, and are neutral vis à vis the domestic propensity to save. This assumption has also been challenged on the grounds that, to the extent that the inflowing foreign resources are used to augment current consumption (private or public), observed domestic savings must be below the intended ones.<sup>8</sup> In other words, even if the savings gap is the dominant one, easy accessibility to foreign aid might lead to less than full potential domestic savings.

Three, two-gap theory in its initial formulation<sup>9</sup> assumed independence of the savings and trade gaps. This assumption would hold in one of two cases: (a) if the investment, savings, import, and export parameters are independent,

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<sup>7</sup>This point was first raised by J. C. H. Fei and G. Ranis, "Foreign Assistance and Economic Development: Comment," The American Economic Review, LVIII, No. 4 (September 1968), 897-912.

<sup>8</sup>See Thomas E. Weisskopf, "The Impact of Foreign Capital Inflow on Domestic Savings in Underdeveloped Countries," Journal of International Economics, II (1972), p. 25; also see "An Econometric Test of Alternative Constraints on the Growth of Underdeveloped Countries," The Review of Economics and Statistics, LIV, No. 1 (February 1972), 67-78.

<sup>9</sup>See Chenery and Strout, op. cit., "Foreign Assistance and Economic Development," The American Economic Review, LVI, No. 4, Pt. I (September 1966), 679-733.

or (b) they are interdependent but at the same time seem to shift equally and simultaneously. Once again, this assumption has been challenged on both theoretical and empirical grounds.<sup>10</sup> Some of the implications of the interdependence between the savings and export coefficients have been summed up by A. Maizels as follows:

Where . . . a relationship [between exports and savings] does exist, then a rise in the projected rate of export growth would reduce the ex ante savings gap as well as reducing the ex ante trade gap. While, however, the trade gap would be reduced by an amount equal to the increase in exports, the savings gap would decline by an amount dependent not only on the increase in the net income of the export sector but also on that sector's marginal propensity to save. In any event, it would seem that the Chenery-Strout model would overstate the ex ante savings gap for countries having a significant response to export changes.<sup>11</sup>

If one or more of the above-mentioned cases prevails in any economy over a certain period, historical data would produce a biased estimate of the savings gap. In the case of Egypt, the first issue does not arise since the savings gap was, as we have seen, dominant throughout the sample period. As for the second issue, aside from its being related to the first, one can add that external resource inflows were instigated by internal demand, and were by no means readily available. Accordingly, it could be deduced that the

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<sup>10</sup> See A. Maizels, Exports and Economic Growth of Developing Countries (Cambridge: The Cambridge University Press, 1968); also see J. K. Lee, "Exports and the Propensity to save in L. D. C. s," The Economic Journal, 81, No. 322 (June 1971), 341; Hollis B. Chenery and P. Eckstein, Development Alternatives for Latin America, Economic Development Report No. 29 (Harvard University: The Center for International Affairs, April 1967); Harry G. Johnson, Economic Policies Towards Less Developed Countries (New York: Brookings Institution, 1967).

<sup>11</sup> Maizels, op. cit., p. 58.

observed savings behavior largely reflected the desired one given the economic system's constraints.

It is the third issue, however, which assumes greater importance in Egypt's case. As the model system we have designed indicates, the savings, investment, import, and export parameters are by no means independent. Particularly pronounced, and worthy of note, is the pattern of interdependence of the savings and export coefficients. Below we will delineate this relationship and estimate its impact through a sensitivity test.

Ordinarily exports affect savings via the medium of income. A rise in the share of exports in GNP leads to a rise in income above what would have been anticipated with a constant export coefficient. The extra rise in income stems from the gains from trade associated with better allocation of resources (classical trade theory) or the foreign trade multiplier (modern trade theory). In the case of a foreign-exchange constrained economy, the increase in income is even greater as a result of the high marginal productivity of the foreign-exchange factor of production (two-gap theory).

However, a rise in the export coefficient can affect the savings propensity directly as well. This can come about through its effect on income distribution which would raise the share of those groups with a higher saving propensity such as the exporters. Or it can cause a shift in the saving schedule of other groups such as government (for example in cases where export taxes represent a major source of tax revenue) or household.

In the case of Egypt, the slow growth of exports had a negative effect

on savings through all of the above-described channels. First, the slow growth of industrial exports had a detrimental effect on the industrial surplus --the main source of national saving--mainly through its impact on capacity utilization. Second, even the modest rate of export growth was achieved at the cost of increasing government export subsidies (a negative export tax) which contributed to government dissaving.<sup>12</sup> Thirdly, the consumption liberalization policies that were necessary as a result of the failure to expand industrial exports had a downward influence on household savings.<sup>13</sup>

#### Sensitivity Test

In our earlier projection of the ex ante gaps we used "Model I." However, in our coming assessment of the impact multipliers of changes in the industrial export coefficient on the relative sizes of the two gaps, we will use "Model II." The reason, obviously, is that the consumption specification in "Model II" brings out explicitly some of the structural factors which led to a direct interdependence of the savings and export coefficients, and accordingly between the savings and trade gaps.

The following two equations represent a solution of the model for the year 1965/66 assuming an average compound rate of GNP growth of 5.5 per cent per annum (which approximates the historical rate of growth), and no change in investment allocation. However, in our solution we treated

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<sup>12</sup> Unfortunately this aspect is not incorporated in our model (with all its alternatives). However, it represents a topic worthy of future investigation.

<sup>13</sup> This will be tested next through the use of "Model II."

industrial exports as exogenously determined so that we could readily vary it as part of our test. The other letter variables and parameters are either target variables or policy instruments which will be used later as part of our policy design experiments.

$$(1) \quad F_t^s = 1692.274 - 0.869 (GNP_t) - 0.131 (Y_t^g) - 1.525 (Ex_t^i) \\ - 0.706 (I_t^{t.g.f.}) + 0.6 (Ex_t^i) (\beta mk_t) - 345.013 (\beta mk_t) \\ + 148 (N_t^{os}) + I_t - E_t^i$$

$$(2) \quad F_t^t = -184.459 + 0.131 (GNP_t) - 0.131 (Y_t^g) + Ex_t^i (\beta mk_t) \\ - 575.022 (\beta mk_t) - 0.391 (Ex_t^i) - 21.247 (\alpha L_t) \\ + 0.49 (I_t^{t.g.f.}) - E_t^i$$

As is seen from the above equations, there are various direct channels through which changes in industrial exports would influence savings, investment, imports, and  $GNP_t$ . First, an increase in  $E_t^i$  would lead to an equal decrease in both  $F_t^s$  and  $F_t^t$ . Second, it is reasonable to assume that a significant increase in  $E_t^i$  would lead to a better capacity utilization in the industrial sector, that is, a decline in  $Ex_t^i$ . This in turn would lead to a rise in both GNP and imports at the given installed capacity. Furthermore, the above changes would be expected to lead to a decline in undesired investment in inventories, and accordingly to a decline in total required investment.

The outcome of these various changes, and their impact on the sizes of the savings and trade gaps can only be ascertained through an actual experiment. Therefore, we have made alternative assumptions about the industrial



export coefficient, and its relationship to industrial capacity utilization, and then solved the above two equations for the values of  $F^s$ ,  $F^t$ . The results of this experiment are given in Table 2.2.

TABLE 2.2

A SENSITIVITY TEST OF THE RESPONSE OF THE SAVINGS AND  
TRADE GAPS TO VARIATIONS IN INDUSTRIAL EXPORTS

(For the Year 1965/66)												
	$E^i$	$V^i$	$Ex^i$	$I^v$	GNP	$Y^g$	M	$E^*$	$F^t$	I	S	$F^s$
(1)	0.28	96	49	2059	336	375	343	+32	487	443	+44	
(2)	0.31	0	29	2155	352	414	384	+30	467	458	+9	
(3)	0.36	0	0	2155	352	414	419	-5	438	493	-55	

\* Including the net balance of invisible trade.

It is clear from the figures in Table 2.2 that, given the limited structural flexibility of the economic system, a rise in the industrial export coefficient leads not only to a shift in the savings schedule but also to an increase in its inclination. This, reinforced by other changes, leads to the savings gap declining at a faster rate than the trade gap. In other words, the export elasticity of the savings gap would be greater than that of the trade gap.

### Economic Policy Design

The conclusions derived from the last section's sensitivity experiment have a substantial bearing on the design of economic policy. As we have seen, in Egypt's case general excess aggregate demand, as evidenced by a dominant ex ante savings gap, coexisted with deficient demand for industrial goods, as evidenced by the prevalence of substantial excess capacity and undesired inventory accumulations. In a case such as this, a simple policy prescription based mainly on curtailing consumption could bring about a recession without achieving its objectives.

Any policy mix capable of coping with a situation where policy objectives are conflicting must include policy instruments equal in number to the policy targets. In fact, this is the essence of the Tinbergen approach to economic policy design.<sup>14</sup> In this last part of our study, we will utilize this approach in order to experiment with alternative policy mixes aiming at restoring external equilibrium.

According to Tinbergen's theory of economic policy, the endogenous variables of a model are divided into two categories: (a) target variables, and (b) irrelevant variables. On the other hand, the predetermined variables are divided into: (a) policy instruments, and (b) data. After converting the model to its reduced form, the equations pertaining to the irrelevant endog-

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<sup>14</sup> See J. Tinbergen, Economic Policy: Principles and Design (Amsterdam: North-Holland Publishing Company, 1956); for an outline and general assessment of the approach, see K.A. Fox, T. K. Sengupta, and E. Thorbecke, The Theory of Quantitative Economic Policy (Amsterdam: North-Holland Publishing Company, 1966), Chapter II, and Bent Hansen, Lectures in Economic Theory.

enous variables are eliminated, and we would be left only with those equations specifying the (policy) target variables as functions of policy instruments and data.

Ordinarily, one would assign values to the policy instrument variables, and solve for the values of the target variables (given the system's data). Tinbergen's approach reverses this order, thus assigning values for the target variables and solving for the values of the policy instrument variables. Further, an essential condition for the application of this approach is that the number of policy targets (knowns) and instrument (unknowns) variables would be equal, that is, the reduced policy model's degrees of freedom would be zero.

In brief, the above outline constitutes the fundamentals of Tinbergen's approach. However, in applying it to our model for Egypt, a few issues pertaining to the choice of target and instrument variables must be made clear. First, as has been pointed out by H. Theil, values of the target variables need not be absolute but could instead be related to one another in a target-performance function (i. e., a social welfare function).<sup>15</sup> In fact, since economic decision-makers are rarely indifferent to the choice of policy instruments, they could also be included in the general welfare function. In this case the task of the economic policy designer would be to maximize this

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<sup>15</sup> See Henri Theil, "Linear Decision Rules for Macrodynamic Policy Problems," in Quantitative Planning of Economic Policy, ed. by B.G. Hickman (Washington, D. C. : Brookings Institution, 1965), pp. 18-42; also see Economic Forecasts and Policy (Amsterdam: North-Holland Publishing Company, 1958), Chapters VII, VIII.

function.

But in the absence of any operational welfare function, and to loosen a little Tinbergen's absolute target alternative, we will use a second best approach. According to this approach, several alternative values (within socially and technically acceptable limits) will be assigned to a combination of target and instrument variables, and then solved for the remaining unknowns. In this way we would have more policy degrees of freedom, and would be able to present a range of alternative policy mixes.

Secondly, the theory of economic policy in general assumes the structural parameters of the model to be fixed and not part of the tools of policy design. However, this need not be necessarily so. For example, in Egypt's case some of the parameters are themselves the product of economic policies, and are subject to policy manipulation. Therefore, in our attempt to experiment with policy mixes for Egypt, we included some strategic structural parameters as policy instruments.

The last issue related to the choice of policy targets and instruments is to explain the effect of the model's complete recursiveness on the process of selection. In a completely interdependent system, any policy instrument can influence any policy target (theoretically speaking). But in a completely recursive system like ours, this ceases to be the case. Policy instruments of a certain order (see Table 2.1) can influence only target variables of the same order or those of a higher order. This restriction coupled with the social and technical constraints imposed on the values of certain policy

instruments reduces the automaticity of choosing effective instruments to achieve our policy objectives. Therefore, our choice of appropriate policy instruments was a matter of personal judgment in the light of our diagnosis of the case under study.

The above-mentioned approach is ordinarily used to design future policies. However, the outbreak of the Arab-Israeli War in 1967, and the change it brought about in the course of events, makes such an undertaking quite hazardous. It brought major distortions in the behavior of most of the system's variables, and the future course of these variables is by no means certain. Under these circumstances we have instead opted to conduct our policy experiment for the year 1965/66. The main policy conclusions that may be derived from such an experiment would be basically applicable for the post-sample period.

Equations (3) and (4) below provide us with the necessary relationship between the chosen policy targets and instruments. They represent the two demand-supply balance equations for capital and foreign exchange. The only alteration is that investment is treated in its capacity-creating role rather than in its Keynesian aggregate demand role. This means that the investment term in the capital balance equation was replaced by  $[\sigma(\Delta\text{GNP}_t)]$  where  $\sigma$  is the model estimated incremental capital-output ratio, and  $\text{GNP}_t$  represents capacity output. This step is necessary if we are to get a positive functional relation between foreign resource inflows ( $F^s$ ) and GNP.

$$\begin{aligned}
 (3) \quad \text{GNP}_t &= -643.596 + 0.049 (Y_t^g) + 0.58 (Ex_t^i) \\
 &+ 0.268 (I_t^{t.g.f.}) - 0.228 (Ex_t^i) (\beta mk_t) \\
 &- 131.179 (\beta mk_t) - 56.274 (N_t^{os}) + 0.38 (E_t^i) \\
 &+ 0.38 (F_t^s) + 1.331 (\text{GNP}_{t-1})
 \end{aligned}$$

$$\begin{aligned}
 (4) \quad \text{GNP}_t &= 957.702 + Y_t^g - 7.634 (Ex_t^i) (\beta mk_t) \\
 &+ 4389.481 (\beta mk_t) + 2.985 (Ex_t^i) + 162.191 (\alpha L_t) \\
 &- 3.664 (I_t^{t.g.f.}) + 7.634 (E_t^i) + 7.634 (\text{BIT}) \\
 &+ 7.634 (F_t^t)
 \end{aligned}$$

A few comments on the above equations are now in order. First, two structural parameters are chosen among the policy variables, namely,  $(\beta mk)$  and  $(\alpha L)$ . The former refers to the ratio of gross capital goods production to total industrial value-added while the latter refers to the ratio of cotton area to the total cropped area. Both parameters are a function of government policies: The value of  $(\beta mk)$  is determined by investment allocation within the industrial sector among the consumer, intermediate, and capital goods sectors, and the value of  $(\alpha L)$  is determined by land allocation among the cotton and cereal crops. Second, the meaning of the coefficient of the  $(\alpha L)$  parameter is that if, hypothetically speaking, the whole of the country's crop area was allocated to cotton production, the net addition to the national product would amount to £.E. 162 million. Third, the two provide us with two estimates of the marginal value productivity of foreign aid. According to the two-gap theory, if the trade gap were dominant in Egypt, the marginal pro-

ductivity of  $F^t$  would have been 7.634, i. e. ,

$$\frac{\partial \text{GNP}_t}{\partial F_t^t} = 7.634 .$$

However, we have shown earlier that the savings gap was the binding one.

On the other hand, we have also shown that the two gaps were not independent and that underlying the larger savings gap was the smaller--but harder to close--trade gap. Given these findings, and given the fact that the two gaps are equated ex post, it would be warranted to assume that the actual marginal productivity of foreign aid falls between the coefficients of  $F^s$  and  $F^t$  in the above equations, and would perhaps be closer to the latter.

Finally, the results of using equations (3) and (4) to test the impact of alternative policy mixes on  $F^s$  and  $F^t$  are given in Table 2.3. Using our earlier projections of sectoral capital stocks and GNP (at an annual compound rate of 5.5 per cent per annum), and assuming alternative values for the different policy instruments (as shown in Table 2.3) we solved the system in each case for the values of  $F^s$  and  $F^t$ .

It must be pointed out that in our choice of alternative values for the controlled variables we have attempted to remain within a feasible range. Policy mix No. (1) represents the more lax one while policy mix No. (4) represents the more stringent one. As is indicated from the results of our projections, it is policy mix No. (3), nevertheless, which represents the equilibrating one. Given the values of the controlled variables corresponding to this policy package, it would lead approximately to both a closing and an

TABLE 2.3  
CONTROLLED MODEL SOLUTIONS  
(1965/66)

Policy mix No.	$\alpha L$ $(= \frac{L^c}{L})$	$\alpha m^k$ $(= \frac{O^k}{V^i})$	$e^i$ $(= \frac{E^i}{V^i})$	$Ex^i$	$I^v$	GNP	$Y^g$	$Y^g$	BIT	$N^{os}$
(1)	0.18	0.10	0.17	96	49	2059	336	0.16	59	2.142
(2)	0.20	0.15	0.20	76	35	2079	370	0.18	59	2.142
(3)	0.22	0.20	0.23	56	20	2099	403	0.19	59	2.142
(4)	0.24	0.25	0.28	16	0	2139	437	0.20	59	2.142

Projected values	$M^t$	$E^t$	$F^t$	$I^t$	$S^t$	$F^s$
(1)	375	230	86	487	388	99
(2)	362	257	46	473	415	58
(3)	346	285	2	458	444	14
(4)	334	333	-58	438	484	-46



equalization of the two gaps.

### The Saving Propensity and the Pattern of Commodity Growth

From our discussion, we have seen that at the center of Egypt's low (and declining) marginal propensity to save was a rapidly rising budget deficit on current account. Given the fact that the savings gap was the larger and, accordingly, the dominant one, the simplest policy recommendation would, of course, be that the country should save more and consume less. The means of achieving this goal would be to reduce government dissaving by either (a) raising budget revenues to the level of current expenditure through tax reforms, or (b) reducing government expenditure to the level of its revenue, or (c) by a combination of (a) and (b). If this is not feasible, an alternative would be to reduce private consumption to a level that would permit private savings to be sufficiently high to finance a simultaneous rise of both public consumption and capital formation.

Although policies aiming at raising aggregate savings are necessary if stability and external equilibrium are to be achieved, they are not sufficient. They must be accompanied by an appropriate pattern of commodity growth. Of particular importance for us here is the relation between the growth of exports, capital goods output, and the propensity to save. The following equation illustrates the relationship among these three variables and foreign aid:

$$(5) \quad \Delta \left\{ \frac{[E + \text{BIT} - \text{B.F.P.} + F] - [M^c + M^f + M^i] + O^k}{\text{GNP}} \right\} = \Delta \left\{ \frac{0.45 (S + F)}{\text{GNP}} \right\}$$

(For the meaning of the notations used, see the list of variables attached to the model. The only new addition is  $O^k$  which refers to gross output of manufactured capital goods.)

Through cancellation and algebraic manipulation, the above equation could be reduced to the following empirically observed identity

$$\frac{M^k + O^k}{S + F} = 0.45$$

which states that the share of capital goods (domestically produced and imported) in total investment ( $I = S + F$ ) equals 0.45.

If we assume a given production level (predetermined by previous investment allocation), any attempt at substituting domestic savings ( $S$ ) for foreign resources ( $F$ ) through appropriate financial measures must be accompanied by either (a) an increase in exports, or (b) a decrease in non-capital goods imports, or (c) an increase in domestic production of capital goods (i. e., import substitution in the capital goods sector), or (d) by a combination of (a), (b), and (c). If none of these required balancing changes materialize, the result would be deflation, inventory accumulation, and ultimately recession--mainly in the industrial sectors.

The use of equation (5) as a framework for assessing the policy course open for Egypt in the future would lead us to the following. The scope of any significant reduction in the non-capital goods' import coefficients is quite limited, even with more rigorous savings policies. Imports of consumer goods reached a minimum of less than £. E. 10 million and could thus be

ignored. The demand for food is, on the other hand, quite inelastic, and is mainly tied to population growth; accordingly, short of a tax policy designed mainly to curb food consumption, one is not to expect any substantial decline in food imports in the near future.<sup>16</sup> As for imports of intermediate goods, it is also unlikely that they would decline given Egypt's poor natural resource endowment in general, and the shift in commodity composition of industrial output from simple processing of domestic raw material to more complex products whose raw material must be imported.

From this brief assessment, one can thus safely conclude that if Egypt is to achieve both rapid growth and a rising marginal propensity to save, it must (a) increase its exports, particularly of industrial goods, such that it would be sufficient to raise the aggregate export coefficient in the face of a declining export coefficient of agricultural goods, and (b) increase the share of capital goods in total industrial production.

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<sup>16</sup>We have also shown in Part I that the income elasticity of demand for food for the low-income brackets (in urban areas) might shift upwards.