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# MACRO-ECONOMIC IMPACTS OF REMITTANCES IN EGYPT: AN EXPLORATORY ANALYSIS

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## PREFACE

This study of remittances in Egypt is an initial exploration of the impacts of migrant workers' earnings on the economy. There is, to date, no rigorous assessment of the effects of migration on the Egyptian economy and no quantitative estimate of the role of remittances.

The analytical framework utilized in this study was developed to represent the peculiar characteristic features of the Egyptian economy. As we note in the first section of this report, there has been a tendency in the past for analysts to adhere closely to neoclassical assumptions when formulating their specifications of the Egyptian economy. As with almost all other developing countries, the case of Egypt, in reality, departs substantially from the neoclassical framework. Recognizing the distortions imposed by this conventional view has led to the development of an alternative, structural specification of economic activity.

The detailed description of the structural model of the Egyptian economy appeared earlier in our analysis of short run energy/economy interactions in Egypt. It is presented here again to provide the reader with sufficient information regarding the basis for inferences and conclusions.

This study of the effects of remittances was undertaken in the context of the Migration and Development Research Program. A summary version appeared in the report presenting an overview and summary of the studies undertaken on migration processes in the Middle East. The report, entitled Migration in the Middle East: Transformations, Policies, and Processes (M.I.T.: Technology Adaptation Program, 1983), provides a more comprehensive picture of labor

migration in Egypt. The analysis of remittances is only a small part of the study. A list of studies in other aspects of migration in the Middle East is presented below in the Appendix to the present report.

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## 1. Introduction

The decade of the 1970s produced important political and economic changes in Egypt, many of which have their origins in the economic liberalization policy and the "open door" posture. In particular, five principal factors are responsible for increasing both the level of economic activity and foreign exchange earnings of the country. The factors may be enumerated as follows: (1) the large inflow of worker remittances due to increasing migration and apparent growth of confidence in the Egyptian economy; (2) the expansion of oil production and natural gas resources, in conjunction with the rapid increases in the world price of oil throughout the 1970s; (3) the liberalization policies designed to encourage inflows of foreign capital; (4) the reopening of the Suez canal; and (5) the increase in tourism. Together, these five factors evolved throughout the 1970s, shaping the country's economy and attendant social and political adjustments. By the end of the decade these factors had set in motion a set of economic interactions that substantially transformed the country's economy throughout the 1980s. They are leading to important structural changes in the economy in terms of changes in the structure of demand, role of foreign trade, and allocation of resources. These five sources of foreign earnings -- the favorable factors for the economy -- cannot continue indefinitely into the future.

Recent developments suggest that the Egyptian economy has entered a transitional phase in its growth process undergoing a period of transformation towards a new equilibrium. Processes of adjustment and adaptation are inevitable in being characteristic transitional phases as distinct from the steady



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state phenomenon which is consistent with and observed in long-run equilibrium. Therefore, it is important to understand the shortrun adjustment mechanism of the interdependent economic system which would provide reasonable guidelines for appropriate policy measures. There are many countervailing forces in the Egyptian economy, and these five factors differ in their impacts and their overall contribution to growth.

Clearly, a significant contribution to the recent economic upsurge has been provided by remittances of migrant workers whose contribution to the Egyptian economy is increasing strongly.

This paper examines the macro-economic effects of remittances in the Egyptian economy at both the aggregate level and with respect to sectoral impacts. In companion studies the impacts of the other sources of expanded foreign exchange are examined. Here we note only the remittance factor and its economy-wide effects.

As an introduction to the analysis, Table 1-1 presents the size of Egyptian remittances in absolute terms and relative to GDP and to Exports and imports. It serves to place the remittances in perspective: the government has announced expansion of remitted earnings for 1982 to LE 2.8 billion, a figure that is considerably higher than previously noted.[1]

## 2. Overview of The Model

Despite rapid changes in the Egytptian economy, several features continue to stand out. These include a dominant agricultural sector, a growing construction sector, an expanding industrial base, large flows of remittances, and a dramatic growth in the petroleum sector. Domestic economic policies -- inherited from the revolution of 1952 -- include extensive subsidies for industrial inputs, energy prices, and foodstuffs. In agriculture, imports

TABLE 1-1

Remittances to Egypt

| | Remittance in Million US Dollars | Compared to GDP (%) | Compared to Exports (%) | Compared to Imports (%) |
|---|---|---|---|---|
| 1974 | 268.2 | 2.5 | 16.0 | 9.2 |
| 1975 | 365.5 | 2.9 | 23.3 | 9.3 |
| 1976 | 755.0 | 4.7 | 46.9 | 19.7 |
| 1977 | 896.6 | 4.3 | 45.4 | 22.2 |
| 1978 | 1772.8 | 7.1 | 91.4 | 37.4 |
| 1979 | 2213.2 | 12.4 | 91.3 | 36.9 |
| 1980 | 2695.4 | 11.4 | 70.5 | 39.6 |
| 1981 | 2181.4 | 7.4 | 54.6 | 27.5 |
| 1982 | 3857.2 | * | * | * |

*Egypt's 1982 remittance figure comes from a statement by Prime Minister Fuad Mohieddin in which he said it was 2.7 billion Egyptian Pounds. It is unknown whether it can be compared to the other IMF figures because it is so much higher.

serve to clear the market. Only in construction are prices allowed to adjust. In all other sectors quantities adjust to demand. The traditional dualism in the economy -- agriculture vs. the rest of the economy -- may well be supplanted by a trilateral structure; agriculture, rest of the economy, and a strong energy sector. With these distinctive features in mind, we have a short-run, 10-sector, macro-economic model of the Egyptian economy to examine its critical adjustment problems.

## 2.1 Theoretical Structure

The theoretical structure of this model is specified in accordance with the computable general equilibrium models formulated by Taylor (1983)[2] and Taylor and Lysy (1980)[3], emphasizing the particular structural characteristics of developing countries. Such models are based around the identities of a social accounting matrix (SAM) and incorporate additional technical and behavioral relationships to make the model determinate and represent the distinctive aspects of the specific economy being analyzed. The closure rules behind these models are based on a combination of different schools of thought inspired by Keynes, Kalecki and the different adherents of the Cambridge school. The model focuses attention on the particular variables that need to adjust to bring about the overall macro balance i.e. saving equal to investment. Different models can be constructed around the different accommodating variables that would adjust to satisfy the basic macro identity in the economy. Aggregate demand determined markets of the Keynesian type are included where chronic excess capacities are the essential features of the sectors and price clearing markets are assumed where bottlenecks and shortages are present. Generalized models of development are not useful for analyzing particular

cases. Different structural characteristics are important in case of different countries and the appropriate adjusting variables need to be emphasized accordingly.

The Egyptian macro-economic model is built around a social accounting matrix (SAM) for the Egyptian economy in the national accounts year of 1977. The model incorporates a complex set of general equilibrium interactions in the price and quantity clearing sectors in the commodity market. The model, however, is of a short-run nature and does not incorporate the dynamics of the system. It is designed specifically around a base year to assist in understanding immediate responses to policy changes. Investment has been modelled merely as a component of aggregate demand and the capital accumulation process of investment has not been considered. It has been specifically designed to explore the short-run adjustment mechanism of the system.

The ten sectors along which the model is built are the following: (1) agriculture; (2) construction and housing; (3) heavy industry; (4) light industry; (5) transportation; (6) sectors in the rest of the economy; (7) Suez; (8) oil extraction; (9) oil refining; and (10) other energy, namely electricity and a nascent natural gas component.

The overall macro balance in this structural model is decomposed sectorally. The mechanisms through which excess demand in each sector adjust to zero are the following:

i) The agricultural sector is assumed to have an adjusting "competitive import" level. Both prices and supply are assumed to be fixed in the short-run.

ii) The construction sector's stability mechanism is built around an adjusting price. Prices are assumed to vary freely to bring about equilibrium because capacity in the construction sector is fully

utilized in the short-run.

iii) For all the other sectors in the economy adjusting outputs occur due to the prevalence of chronic excess capacities.

Prices in all the quantity clearing sectors are determined by fixed producers' mark-up over variable costs as opposed to the neoclassical cost function. The wage rates are assumed to have been determined institutionally (which correspond to the Keynesian assumption of short-run predetermined nominal wages) and the coeffecients of production are fixed. The model draws upon the well known linear expenditure system of demand equations to arrive at the sectoral consumption level. Given the different behavioral assumptions and the different identities built around the social accounting matrix, the solution is determined through several adjustment mechanisms, namely Keynesian output response in the quantity-clearing sectors, a "forced saving" mechanism via the rise in the prices of output relative to wage, adjustments in the trade deficit and the surplus available in the government current account.

## 2.2 Relevance for the Egyptian Case

Models of the above general equilibrium nature in a multisectoral framework may provide highly useful insights and guidelines for investigating macro policy issues. They are especially relevant in the Egyptian case, where the government is actively engaged in bringing about economic changes through direct policy measures. Such models are different from the earlier computable general equilibrium models, popularly known as GEM models, which were applied in the case of Pakistan by McCarthy and Taylor (1978)[4] and in the case of Egypt by Eckaus, McCarthy and Mohie-Eldin (1979).[5]

Earlier views of the Egyptian economy specified in the GEM models incorporated the general equilibrium links between production structure, income of different groups and patterns of demand through flexible prices. Thus, a market clearing mechanism provided the interaction between demand, production and factor use. These models are essentially neo-classical in spirit and follow the general equilibrium notion that goes back to Walras. The GEM models assume Cobb Douglas production functions which allow for smooth substitution, constant return to scale and constant factor shares. Moreover, perfect competition is usually assumed in the factor markets for arriving at the dual cost function. Thus the obvious disadvantage of the GEM models are the highly neo-classical nature of the models which are clearly suspect in the framework of developing countries like Egypt.

Clearly, the important assumption of price responsiveness, smooth substitutability between the different primary inputs, perfectly competetive nature of factor markets do not hold in developing economies where institutional features and structural rigidities result in behavior far removed from the neo-classical assumptions. This is especially the case in Egypt where institutional factors established since the 1952 Revolution have introduced large-scale rigidities which blatantly violate neo-classical assumptions. Such notions impose serious distortions in analysis and for identifying policy adjustments. In short, neo-classical, general equilibrium analytical structures are singularly inappropriate in the Egyptian case, where public policy -- social and economic programs -- is clearly in violation of the most cherished neo-classical assumptions. For this reason we formulated an alternative, structural model specification of the Egyptian economy that would be useful for analysis of the actual (rather than hypothetical) situation.

## 3. Social Accounting Matrix

The macro data framework for the structural model of Egypt is based upon a simple social accounting matix (SAM) for 1977, a year chosen specifically for its use as a "base" for analysis. The main sources of data for the 1977 SAM are the following:

- o a 1977 ten sector input-output table prepared at MIT which was aggregated from a 32 sector input-output table[6];
- o the 1977 eleven sector social accounting matrix prepared through collaborative efforts between MIT and Cairo University; and
- o the Egyptian National Accounts (U.N. Yearbook of 1979)

The purpose of the 1977 matrix is to produce a clear view of the economy without too much detail so that it could be easily read and understood by analysts for policy purposes. It is designed to highlight the salient features of the economy without overwhelming policy makers and analysts with suffocating detail.

The 22 x 20 Social Accounting Matrix for Egypt for the national year of 1977 is presented in Table 3-1. This is a snapshot matrix representation of the national income accounts which states that receipts must equal expenditure for all sectors of the economy. All matrix identities are represented in value terms (i.e. money flows) in 1977 domestic prices in Egypt (in units of million L.E.).

## 4. Structure of the Model

As noted earlier, the formulation of the structural equations for this model are closely related to the model formulation made by Taylor (1983) for India. In this model remittances explicitly enter the wage income and balance

TABLE 3-1

Social Accounting Matrix of Egypt, 1977

(in million LE)

| | | 1 Agriculture | 2 Construction | 3 Heavy Industry | 4 Light Industry |
|---|---|---|---|---|---|
| 1. | Agriculture | 474.22 | 0.0 | 3.39 | 039.70 |
| 2. | Construction | .60 | 13.21 | 1.63 | 4.36 |
| 3. | Heavy Industry | 14.34 | 96.20 | 157.83 | 91.59 |
| 4. | Light Industry | 7.31 | 134.21 | 19.74 | 592.39 |
| 5. | Transportation | 2.51 | 5.00 | 6.11 | 23.16 |
| 6. | Rest of Economy | 24.66 | 215.39 | 36.86 | 152.50 |
| 7. | Suez | 0.0 | 0.0 | 0.0 | 0.0 |
| 8. | Oil Extraction | .17 | 18.11 | 11.26 | 8.28 |
| 9. | Oil Refining | 9.72 | 9.66 | 39.32 | 20.95 |
| 10. | Other Energy | .16 | 2.07 | 20.65 | 16.39 |
| 11. | $\sum$(1-10) | 533.69 | 493.85 | 296.79 | 1949.32 |
| 12. | H.H. Wage Income | | 405.74 | 124.87 | 581.53 |
| 13. | H.H. Profit Income | | 295.89 | 32.76 | 259.03 |
| 14. | Agricultural Income | 1581.48 | | | |
| 15. | Total Private Income $\sum$(12-14) | 1581.48 | 701.63 | 157.63 | 840.56 |
| 16. | Government Income | 142.20 | 78.65 | 139.67 | 481.09 |
| 17. | Gross Savings | | | | |
| 18. | Imports | 83.25 | 91.66 | 114.42 | 427.69 |
| 19. | Producer/ Consumer Subsidy | -46.03 | | | -299.24 |
| 20. | Indirect Taxes | | | 77.18 | 257.28 |
| 21. | Direct Taxes | | | | |
| 22. | Total Gross Output | 2294.59 | 1365.79 | 785.69 | 3656.70 |

TABLE 3-1 continued

| | | 5 Transportation | 6 Rest of Economy | 7 Suez | 8 Oil Extraction |
|---|---|---|---|---|---|
| 1. | Agriculture | 8.71 | 86.72 | 0.0 | 0.0 |
| 2. | Construction | 10.39 | 13.32 | 0.0 | .54 |
| 3. | Heavy Industry | 1.61 | 86.38 | .64 | 5.27 |
| 4. | Light Industry | 20.26 | 214.35 | 4.06 | 6.36 |
| 5. | Transportation | 5.34 | 163.04 | .39 | .71 |
| 6. | Rest of Economy | 43.87 | 216.04 | 2.44 | 4.63 |
| 7. | Suez | 0.0 | 7.53 | 0.0 | 0.0 |
| 8. | Oil Extraction | 0.0 | .67 | 0.0 | .23 |
| 9. | Oil Refining | 22.0 | 69.48 | 1.68 | 4.55 |
| 10. | Other Energy | 5.67 | 20.27 | .36 | .68 |
| 11. | $\sum(1\text{-}10)$ | 117.85 | 877.80 | 9.57 | 22.97 |
| 12. | H.H. Wage Income | 123.24 | 1384.25 | 17.59 | 10.09 |
| 13. | H.H. Profit Income | 13.14 | 812.09 | 0.0 | 34.53 |
| 14. | Agricultural Income | | | | |
| 15. | Total Private Income $\sum(12\text{-}14)$ | 136.38 | 2196.34 | 17.59 | 44.62 |
| 16. | Government Income | 205.94 | 110.74 | 158.24 | 157.26 |
| 17. | Gross Savings | | | | |
| 18. | Imports | 49.51 | 327.04 | 0.0 | 7.24 |
| 19. | Producer/ Consumer Subsidy | -15.35 | -15.35 | | |
| 20. | Indirect Taxes | | 463.11 | | 34.30 |
| 21. | Direct Taxes | | | | |
| 22. | Total Gross Output | 494.33 | 3959.08 | 185.40 | 266.39 |

TABLE 3-1 continued

| | | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|
| | | Oil Refining | Other Energy | $\sum(1-10)$ | Private Consumption |
| 1. | Agriculture | 0.0 | 0.0 | 1612.74 | 933.89 |
| 2. | Construction | 2.06 | .35 | 46.46 | 156.77 |
| 3. | Heavy Industry | 2.86 | .14 | 456.86 | 128.84 |
| 4. | Light Industry | 2.22 | .73 | 1001.63 | 1874.08 |
| 5. | Transportation | .21 | 21.11 | 208.58 | 186.51 |
| 6. | Rest of Economy | 23.32 | 3.10 | 722.81 | 1133.01 |
| 7. | Suez | 0.0 | 0.0 | 7.53 | 0.0 |
| 8. | Oil Extraction | 102.94 | 0.0 | 141.66 | 0.0 |
| 9. | Oil Refining | 12.94 | 8.97 | 199.27 | 53.61 |
| 10. | Other Energy | 1.09 | 0.0 | 67.34 | 38.29 |
| 11. | $\sum(1-10)$ | 147.64 | 15.40 | 4464.88 | 4505.00 |
| 12. | H.H. Wage Income | 10.88 | 21.59 | 2679.78 | |
| 13. | H.H. Profit Income | 11.10 | 11.65 | 1470.19 | |
| 14. | Agricultural Income | | | 1581.48 | |
| 15. | Total Private Income $\sum(12-14)$ | 21.98 | 33.24 | 5731.45 | |
| 16. | Government Income | 50.53 | 49.77 | 1574.09 | |
| 17. | Gross Savings | | | | 1469.41 |
| 18. | Imports | 58.38 | 8.41 | 1167.60 | |
| 19. | Producer/ Consumer Subsidy | -7.67 | | -383.64 | -188.96 |
| 20. | Indirect Taxes | 17.15 | 8.58 | 857.60 | |
| 21. | Direct Taxes | | | | 246.00 |
| 22. | Total Gross Output | 288.01 | 115.40 | 13411.98 | 6031.45 |

TABLE 3-1 continued

| | | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|
| | | Government Expenditures | Gross Fixed Investment | Stock Changes | Total Exports |
| 1. | Agriculture | 58.63 | .18 | 18.97 | 238.88 |
| 2. | Construction | 75.80 | 1086.76 | 0.0 | 0.0 |
| 3. | Heavy Industry | 38.61 | 74.49 | 39.12 | 47.77 |
| 4. | Light Industry | 144.83 | 288.77 | 172.23 | 217.56 |
| 5. | Transportation | 28.53 | 0.0 | 0.0 | 70.71 |
| 6. | Rest of Economy | 1195.40 | 319.20 | 43.6 | 545.66 |
| 7. | Suez | 0.0 | 0.0 | 0.0 | 177.87 |
| 8. | Oil Extraction | 0.0 | 0.0 | 5.22 | 119.51 |
| 9. | Oil Refining | 24.43 | 0.0 | 1.46 | 52.04 |
| 10. | Other Energy | 9.77 | 0.0 | 0.0 | 0.0 |
| 11. | $\sum$(1-10) | 1576.00 | 1769.40 | 280.60 | 1470.00 |
| 12. | H.H. Wage Income | | | | 300.00 |
| 13. | H.H. Profit Income | | | | |
| 14. | Agricultural Income | | | | |
| 15. | Total Private Income $\sum$(12-14) | | | | |
| 16. | Government Income | | | | |
| 17. | Gross Savings | 529.09 | | | 490.00 |
| 18. | Imports | | 438.50 | | |
| 19. | Producer/ Consumer Subsidy | 572.60 | | | |
| 20. | Indirect Taxes | | | | |
| 21. | Direct Taxes | | | | |
| 22. | Total Gross Output | 2677.69 | 2207.90 | 280.60 | 2260.00 |
| | | | 2488.50 | | |

TABLE 3-1 continued

| | | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|
| | | Competitive Imports | Indirect Taxes | Direct Taxes | Total Gross Output |
| 1. | Agriculture | -568.70 | | | 2294.59 |
| 2. | Construction | 0.0 | | | 1365.79 |
| 3. | Heavy Industry | 0.0 | | | 785.69 |
| 4. | Light Industry | -42.4 | | | 3656.70 |
| 5. | Transportation | 0.0 | | | 494.33 |
| 6. | Rest of Economy | 0.0 | | | 3959.68 |
| 7. | Suez | 0.0 | | | 185.40 |
| 8. | Oil Extraction | 0.0 | | | 266.39 |
| 9. | Oil Refining | -42.8 | | | 288.01 |
| 10. | Other Energy | | | | 115.40 |
| 11. | $\sum(1\text{-}10)$ | -653.90 | | | 13411.98 |
| 12. | H.H. Wage Income | | | | 2979.78 |
| 13. | H.H. Profit Income | | | | 1470.19 |
| 14. | Agricultural Income | | | | 1581.48 |
| 15. | Total Private Income $\sum(12\text{-}14)$ | | | | 6031.45 |
| 16. | Government Income | | 857.60 | 246.00 | 2677.69 |
| 17. | Gross Savings | | | | 2488.50 |
| 18. | Imports | 653.90 | | | 2260.00 |
| 19. | Producer/ Consumer Subsidy | | | | 0.0 |
| 20. | Indirect Taxes | | | | 857.60 |
| 21. | Direct Taxes | | | | 246.00 |
| 22. | Total Gross Output | 0.0 | 857.60 | 246.00 | 27973.22 |

of payments equations and enable us to capture the macro-economic interactions.[7]

## 4.1 Model Equations[8]

Detailed symbolic representations of the equations of the model along with the definitions of endogenous and exogenous variables and parameters are presented in Tables 4-1 and 4-2.

In this section, we shall describe the model equations contained in Table 4-1, adopting a convention of sequential description.. Equations 4.1 to 4.10 represent the famous material balance equations which represent the basic demand-supply balance in the social accounting framework. The model is based on the notion that the agricultural sector is import-clearing, i.e. the levels of competetive imports will adjust to bring about the demand-supply balances. This sector has an administered system of prices and output is fixed in the short-run. The construction sector is price-clearing because of the fixed capacity assumption in the short-run. All of the other sectors in the economy are quantity clearing because of the presence of unutilized capacities.

Equation 4.1 represents the supply of gross output in sector 1 (X1). The available supply equals the amount of intermediate sales between sectors (for instance $a_{1j}X_1$ represents intermediate sales of agricultural products to the other sectors), the demand for consumption goods ($C_1$), demand for investment goods ($I_1$) and changes in stock ($S_1$), government expenditure on goods and services ($G_1$) minus the level of competetive imports ($M_1$). All of the other material balance equations can be interpreted in a similar fashion.

Equations 4.11 to 4.15 represent demand for investment goods in real terms. Demand for investment goods has been converted into real terms by deflating the quantity of nominal investment ($IN_i$) by an appropriate weighted



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Table 4-1: Equations for the Structural Macro-Economic Model of Egypt

I. Demand-Supply Balance by Sector

$$X_1 = \sum_{\substack{j=1 \\ j\neq 2}}^{6} a_{1j}X_j + C_1 + G_1 + I_1 + S_1 + E_1 - M_1 \tag{4.1}$$

$$X_2 = \sum_{\substack{j=1 \\ j\neq 7}}^{10} a_{2j}X_j + C_2 + G_2 + I_2 \tag{4.2}$$

$$X_3 = \sum_{j=1}^{10} a_{3j}X_j + C_3 + G_3 + I_3 + S_3 + E_3 \tag{4.3}$$

$$X_4 = \sum_{j=1}^{10} a_{4j}X_j + C_4 + G_4 + I_4 + S_4 + E_4 - M_4 \tag{4.4}$$

$$X_5 = \sum_{j=1}^{10} a_{5j}X_j + C_5 + G_5 + E_5 \tag{4.5}$$

$$X_6 = \sum_{j=1}^{10} a_{6j}X_j + C_6 + G_6 + I_6 + S_6 + E_6 \tag{4.6}$$

$$X_7 = a_{76} + E_7 \tag{4.7}$$

$$X_8 = \sum_{\substack{j=1 \\ j\neq 5,7}}^{9} a_{8j}X_j + S_8 + E_8 \tag{4.8}$$

$$X_9 = \sum_{j=1}^{10} a_{9j}X_j + C_9 + G_9 + S_9 + E_9 - M_9 \tag{4.9}$$

$$X_{10} = \sum_{j=1}^{9} a_{10j}X_j + C_{10} + G_{10} \tag{4.10}$$

II. Investment Demand

$$I_i = IN_i/PI \qquad i = 1 \text{ to } 4, 6, \tag{4.11 to 4.15}$$

$$PI = \sum_{i=1}^{6} ww_i P_i \tag{4.16}$$

III. Generation of Income in the Agricultural Sector

$$Y_1 = P_1X_1 - (\sum_{\substack{i=1 \\ i\neq 7}}^{10} a_{i1}P_i + a_{01}P_{01})X_1 + SUB1\ P_1\ X_1 \tag{4.17}$$

$$GA_1 = \rho_1 Y_1 \tag{4.18}$$

$$HYA = Y_1 - \rho_1 Y_1 \tag{4.19}$$

IV. Generation of Income in the Construction Sector

$$Y_2 = P_2X_2 - (\sum_{\substack{i=1 \\ i\neq 7}}^{10} a_{i2}P_i + a_{02}P_{02})X_2 - w_2X_2 \tag{4.20}$$

$$GC_2 = \rho_2 Y_2 \tag{4.21}$$

$$HPC = Y_2 - \rho_2 Y_2 \tag{4.22}$$

V. Price Equations for Quantity Clearing Sectors

$$tt_i = KS_i (X_i / k_i)^{\eta_i} \qquad \text{for } i = 3 \text{ to } 6, 8 \text{ and } 9 \tag{4.23 to 4.29}$$

$$P_i = \frac{(1 + t_i)(1 + tt_i)}{1 - (1 + t_i)(1 + tt_i) a_{ii} (1 - sub_i)} \left[ \sum_{\substack{j=1 \\ j \neq i}}^{10} a_{ji} P_j + w_i + a_{0i} P_{0i} \right]$$

$$\text{for } i = 3, \ldots, 10 \tag{4.30 to 4.37}$$

VI. Variable Cost Equations

$$VC_i = \sum_{j=1}^{10} a_{ji} P_j + w_i b_i + a_{0i} P_{0i} - sub_i P_i a_{ii} \tag{4.38 to 4.45}$$

$$\text{for } i = 3, \ldots, 10$$

VII. Government Share of Profits

$$GR_i = \rho_i tt_i VC_i X_i \tag{4.46 to 4.53}$$

VIII. Wage Income

$$Y_w = \sum_{1=2}^{10} w_i X_i + R \tag{4.54}$$

IX. Household Profit Income

$$YHP = \sum_{i=3}^{10} tt_i VC_i X_i - \sum_{i=3}^{10} GR_i + HPC \tag{4.55}$$

$$Y = YHP + Y_w + HYA \tag{4.56}$$

$$D_h = (1 - S_h)((1 - dt)Y_w + (1 - t_z)YHP + HYA + CSUB) \tag{4.57}$$

$$\hat{D}_h = \sum_{\substack{i=1 \\ i \neq 7,8}}^{10} \theta_i P_i \tag{4.58}$$

X. Sectoral Consumption Functions

$$C_i = \theta_i + \frac{MP_i}{P_i}(D_h - \hat{D}_h) \qquad i = 1 \text{ to } 6 \text{ and } 9 \text{ to } 10 \tag{4.59 to 4.66}$$

XI. Closure Rules

$$X_i - \bar{X}_i = 0 \qquad i = 1 \text{ and } 2 \tag{4.67 to 4.68}$$

XII. Government Revenue and Expenditures

$$T^{ind} = \sum_{\substack{i=3 \\ i \neq 5,7}}^{10} t_i(1 + tt_i)VC_i X_i \tag{4.69}$$

$$T^d = dt \cdot Y_w \tag{4.70}$$

$$GREV = tzYHP + T^{ind} + T^{d} + GA_1 + GC_2 + \sum_{i=2}^{10} GR_i + \sum_{\substack{i=1 \\ i \neq 2}}^{9} (PE_i - P_i)E_i \tag{4.71}$$

$$GEXP = \sum_{\substack{i=1 \\ i \neq 7,8}}^{10} P_i G_i + \sum_{\substack{i=1 \\ i \neq 2,3 \\ 7,8}}^{9} P_i SUB_i X_i \tag{4.72}$$

XIII. Trade Deficit

$$DEF = P_1 M_1 + P_4 M_4 + P_9 M_9 + P_{0i}\ IN_m + \sum_{\substack{i=1 \\ i \neq 7}}^{10} a_{0i} X_i - \sum_{\substack{i=1 \\ i \neq 2}}^{9} PE_i\ E_i \tag{4.73}$$

XIV. Saving-Investment Balance

$$DEF + (GREV - GEXP) + S_h((1 - dt)Y_w + (1 - t_z)\ YHP + HYA + CSUB) =$$

$$= \sum_{i=1}^{6} P_i I_i + P_{0i} IN_m + \sum_{\substack{i=1 \\ i \neq 2,5,7}}^{9} P_i S_i \tag{4.74}$$

Table 4-2: Symbol Definitions in the Structural Macro-Economic Model of Egypt

| Symbol | Definition |
|---|---|
| Endogenous | |
| $C_i$ | Consumption level in sector i, i = 1 to 6, 9 |
| DEF | Trade deficit |
| $D_h$ | Consumption spending from household income |
| $\hat{D}_h$ | Subsistence level of consumption |
| $GA_1$ | Government income from the agricultural sector (sector 1) |
| $GC_2$ | Government profit income from the construction sector (sector 2) |
| HPC | Households profit income from the construction sector |
| HYA | Households income from the agricultural sector (sector 1) |
| INV | Total investment demand in nominal terms |
| $I_i$ | Investment demand in real terms for sector i, i = 1 to 4, 6 |
| $M_1$ | Competitive level of imports in sector 1 |
| PI | Aggregate level of prices for investment goods |
| $P_i$ | Price level in sector i, i = 2 to 10 |
| SAV | Total savings in the economy |
| $T^d$ | Direct taxes paid from wage income |
| TIND | Total indirect taxes |
| $TT_i$ | Mark-up rate in sector i, i = 3 to 10 |
| $VC_i$ | Variable cost per unit of output in sector i, i = 3 to 10 |
| $X_i$ | Gross output level in sector i, i = 2 to 10 |
| $Y_w$ | Total wage income |
| $Y_1$ | Total income generated in the agricultural sector (sector 1) |
| $Y_2$ | Total income generated in the construction sector (sector 2) |

Exogenous

| | |
|---|---|
| $X_i$ | Fixed output level in sector i, i = 1, 2 |
| CSUB | Total consumer subsidies |
| dt | Rate of taxes on wages |
| $E_i$ | Level of exports in sector i, i = 1, 3 to 9 |
| $G_i$ | Government demand for commodities in sector i, i = 1 to 6, 9, 10 |
| $IN_m$ | Investment demand for imports |
| $IN_i$ | Investment demand in nominal terms in sector i, i = 1 to 4, 6 |
| $K_i$ | Capital stock in sector i, i = 3 to 6, 8 to 10 |
| $M_i$ | Level of competitive imports in sector i, i = 4, 9 |
| $PE_i$ | World price of exports in sector i, i = 1, 3 to 9 |
| $P_{0i}$ | World price of $IN_m$ |
| R | Remittances |
| $SUB_i$ | Rate of production subsidies in sector i, i = 1, 4, 5, 6, 9 |
| $S_i$ | Changes in stocks in sector i, i = 1, 3, 4, 5, 6, 8, 9 |
| $TT_7$ | Mark-up rate in sector 7 |
| $T_z$ | Rate of taxes on profit income |
| $w_i$ | Wage/output ratio in sector i, i = 2 to 10 |

Parameters

| | |
|---|---|
| $a_{ij}$ | Sectoral input-output coefficient, i,j = 1 to 10 |
| $a_{0i}$ | Import coefficient in sector i, i = 1 to 6, 8 to 10 |
| $kS_i$ | Constant used in supply response function, i = 3 to 6 and 8 to 10 |
| $MP_i$ | Marginal propensity to consume in sector i, i = 1 to 6, 8 to 10 |
| $\rho_i$ | Share of government in public sector enterprises in sector i, i = 1 to 10 |
| $S_h$ | Savings ratio |

$\eta_i$ Elasticity in the supply response function in sector i, i = 3 to 6, 8 to 10

$\theta_i$ Subsistence level of consumption in sector i, i = 1 to 6, 8 to 10

$ww_i$ Weights in the investment price index in sector i, i = 1 to 4, 6

price index PI. The investment price index is represented by PI in equation 16. Thus real investment falls if prices go up and helps to bring about equilibrium by reducing excess demand.

Equation 4.17 represents agricultural income $Y_1$ which consists of value-added in that sector plus a production subsidy on the amount of output produced in that sector. Profit income in the construction sector is denoted by $Y_2$ in equation 20 which consists of sectoral value-added minus wage income accruing in that sector. $GA_1$ and $GC_2$, represented by equations 4.18 and 4.21, give the shares of the government in the agricultural and construction sectors respectively.

The mark-up rate (which is the amount added to the "cost price" to determine the "selling price") is taken as a function of the output capital ratio in some of the quantity clearing sectors. The functions relating the mark-up rate to the output capital ratios are represented in equations 4.23 to 4.29. Alternative values of the elasticity of the mark-up with respect to the degree of capacity utilization determine the precise nature of the relationship between the level of output and the price level. For convenience the assumption of zero elasticity has been used in the base runs implying fixed mark-up rates in the different sectors.

Equations 4.30 to 4.37 give the price equations for all the quantity clearing sectors with prices being determined on the basis of mark-up and indirect taxes over variable costs per unit of output. Variable costs per unit of output are represented in terms of equations 4.38 to 4.45. They include costs of intermediate inputs, wage costs and import costs less production subsidies.



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Government share of profits are represented in equations 4.46 to 4.53. The fraction ($\rho_i$) gives the proportion of the government's share in public sector enterprises. Total wage income is defined by 4.54, which consists of wage earnings plus remittances.

Equation 4.55 (YHP) gives the aggregate level of private profit income which is the sum of mark-up over variable costs less the share of government profit income obtained from public sector enterprises. Y defined in equation 4.56 gives the total aggregate level of private profit income, wage income plus income generated in the agricultural sector.

Consumer behavior in the model has been formulated on the basis of the linear expenditure system of equations (LES) contained in equations 4.57 to 4.66 for determining the levels of sectoral consumption. $D_h$ in 4.5 gives the total private consumption spending which is obtained by deducting savings, profit taxes, wage taxes and adding consumption subsidies (which effectively increase consumer income). The two important sets of parameters in the LES are the subsistence level of consumption ( $\theta$ ) and the marginal propensity to consume ($MP_i$). These two sets of parameters have been obtained from the family budget data of Egypt (1973-74). The procedures for estimation of these parameters are illustrated in Taylor (1979)[7]. The price and income responsiveness of the sectoral levels of consumption are determined by the $MP_i$ parameters across the different sectors.

Equations 4.67 and 4.68 set the levels of output in the import and price clearing agricultural and construction sectors at predetermined levels ($X_1$ and $X_2$) which are needed to make the system determinate.

$T^{ind}$ in equation 4.69 represents the total indirect taxes obtained by the government. GREV in equation 4.71 gives the government revenue which consists of profit taxes, indirect taxes, direct taxes (i.e. $T^d$ computed in equation



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4.70) and the share of government profits from the public sector enterprises plus the revenues generated from the differential between domestic and foreign prices of exports.[8] The level of government expenditure is given by equation 4.72 which is determined by the predetermined levels of government demand for commodities G (across sectors) and the level of expenditure incurred on the production and consumption subsidies.

Equation 4.73 (DEF) represents trade deficit which consists of payments for competitive and noncompetitive imports less earnings from exports (valued at world prices) and remittances.

Finally the savings and investment equations are introduced. Total savings in the model are generated from three sources namely, the trade deficit, surplus in the government account, and savings generated in the household sector. Total investment in the system are determined by the level of capital formation and stock changes. Since the savings investment equality is a derived relationship in the model, it provides a good check for the numerical solution.

## 4.2 Parameterization

The input-output coefficients are obtained directly from the 1977 SAM by taking the ratio of intermediate purchases from different sectors to the level of gross output in the purchasing sector.

The parameters of the LES have been estimated by using the family budget survey data of Egypt for 1974-75. The values of the parameters are depicted in Table 4-3. The wage-output ratios ($b_i$), have been obtained by dividing the total wage income by the level of gross output. The mark-up rates, the unit variable costs, the indirect tax rate, the production subsidies have been

TABLE 4-3

Parameters of the Linear Expenditure System of Demand Equations

| Sector | Income Elasticity | Own Price Elasticity | Marginal Propensity to Consume (Ratio) | Subsistence Level of Consumption (in million LE) |
|---|---|---|---|---|
| Agriculture | .58 | -.38 | .12023 | 663.136 |
| Construction and Housing | .97 | -.50 | .03363 | 81.09 |
| Heavy Industry | 1.12 | -.57 | .03203 | 56.763 |
| Light Industry | .96 | -.69 | .40012 | 973.08 |
| Transportation | 1.9 | -.95 | .07866 | 9.4605 |
| Rest of the Economy | 1.26 | -.75 | .31689 | 418.965 |
| Oil Refining | .75 | -.38 | .00892 | 33.337 |
| Other Energy | 1.12 | -.56 | .00952 | 18.02 |

calculated directly from the SAM. All sectoral level of prices have been scaled to unity for the base solution. The savings ratio for the household and the initial values of all of the relevant variables are directly read from the SAM.

## 4.3 Solution

The models in Table 4-1 are of a highly non-linear nature and are currently being solved on the TROLL system (operating on the IBM VM/370) by making use of a Newton-Raphson non-linear equation algorithm. In general terms the solution algorithm follows the following procedure.

The entire system of equations can be substituted and rearranged to a set of sectoral excess demand equations. Then one starts with a set of initial values for the adjusting variables, namely competitive imports for sector 1, a price level for sector 2, and an initial set of quantities for all other sectors, and calculates the excess demands, and then revises the initial set of values for the adjusting variables till equilibrium is reached, i.e. excess demand in all sectors are approximately close to zero. Different algorithms use different methods for revising the values of the adjusting variables between iteratives.

Given the values of the different parameters and exogenous variables, a convergent solution of the model in the base run would generate the 1977 SAM for Egypt represented in Table 3-1.

## 4.4 Macro Responses in the Egyptian Economy with Respect to Remittances

The major macro-economic consequences of remitted earnings that may be evaluated through the model may be classified in the following categories:

i) effects on sectoral output: Since the industrial sectors are characterized by excess capacities, the short-run macro adjustment takes place in terms of changes in output (i.e. capacity utilization);

ii) effects on sectoral prices: The changes in relative prices play a key role in the short-run adjustment process and help us to evaluate the inflationary impacts of policy changes;

iii) impacts on income shares in terms of wages, profits and government income: Value added is disaggregated into four categories, namely agricultural income, wages, government profits and private sector profits. The assumption of fixed wages and mark-up pricing enables us to arrive at different functional distributions of income (i.e. through the "forced savings mechanism").

iv) impacts on balance of payments: The effects on balance of payments are evaluated in terms of changes in the level of competetive and non-competetive imports.

## 5. Empirical Results

An initial set of simulation runs due to worker remittances was performed to examine the major macro-economic adjustments:

- o increased remittances of migrant workers to Egypt
- o an increase in the level of aggregate investment demand (presuming that an increase in remittances leads to an increase in the demand for investment goods).

### 5.1 Effect of Increased Remittances

In this section we shall present and analyze the results of the macro-economic impacts of increased remittances of migrant workers on the Egyptian

economy.

The immediate impact of an increase in remittances from .3 billion to .6 billion for the year 1977 will lead to a proportional increase in income in the hands of the consumers. This will lead to an increase in the demand for commodities due to the positive income effect. The results are shown in column B of Table 5-1. The increase in the amount of consumption demand is directly related to the income elasticities of the goods in the different sectors that have been used in determining the parameters of the linear expenditure system of demand equations.

Now an increase in demand for commodities will lead to a real increase in output in the sector where there is excess capacity (i.e., the quantity clearing sectors). In terms of our Egyptian model, real output in all quantity clearing sectors will rise, as is evident from Table 5-1. The increase in real output is mainly concentrated in sectors 4 and 6, owing to the high income elasticity of demand in these sectors. This increase in output will also lead to an increase in the share of wage income. The wage income will increase from 2979.43 to 3355.8 owing to the expansionary impact of remittances on the economy.

We find that prices in the construction sector will rise by 1.6 percent. The rise in the price of the construction sector is brought about by a rise in demand where, output being fixed, price is the adjusting variable. This rise in price does not given incentive to costpush inflationary pressure in the economy owing to the poor linkage of the construction sector to the other sectors of the economy in terms of intermediate costs. The results are evident from the price figures in Table 5-1. However, this rise in price leads

TABLE 5-1

Empirical Results of Different Simulation Runs

| Sector | | A | B | C |
|---|---|---|---|---|
| | Prices | | | |
| Construction and Housing | P2 | 1.0 | 1.016 | 1.153 |
| Heavy Industry | P3 | 1.0 | 1.0 | 1.002 |
| Light Industry | P4 | 1.0 | 1.0 | 1.000 |
| Transportation | P5 | 1.0 | 1.0 | 1.006 |
| Rest of the Economy | P6 | 1.0 | 1.0 | 1.002 |
| Suez | P7 | 1.0 | 1.0 | 1.000 |
| Oil Extraction | P8 | 1.0 | 1.0 | 1.003 |
| Oil Refining | P9 | 1.0 | 1.0 | 1.003 |
| Other Energy | P10 | 1.0 | 1.0 | 1.002 |
| | Gross Output (in million LE) | | | |
| Heavy Industry | X3 | 785.619 | 805.486 | 794.737 |
| Light Industry | X4 | 3655.81 | 3810.95 | 3722.97 |
| Transportation | X5 | 494.243 | 524.872 | 505.975 |
| Rest of the Economy | X6 | 3958.58 | 4071.4 | 4007.50 |
| Suez | X7 | 185.40 | 185.614 | 185.492 |
| Oil Extraction | X8 | 266.333 | 270.16 | 267.936 |
| Oil Refining | X9 | 287.856 | 296.722 | 291.522 |
| Other Energy | X10 | 116.538 | 121.692 | 118.665 |
| | Competitive Imports | | | |
| Agriculture | M1 | 568.198 | 652.899 | 604.188 |
| | Consumption (in million LE) | | | |
| Agriculture | C1 | 933.667 | 971.164 | 949.244 |
| Construction and Housing | C2 | 156.763 | 165.912 | 150.514 |
| Heavy Industry | C3 | 128.834 | 138.811 | 132.871 |
| Light Industry | C4 | 1873.40 | 1998.13 | 1924.72 |

A = Base Case
B = Increased Remittances (100 Percent)
C = Increased Investment Demand (10 Percent)

TABLE 5-1 continued

| Sector | | A | B | C |
|---|---|---|---|---|
| | Consumption (in million LE) | | | |
| Transportation | C5 | 186.453 | 210.857 | 195.502 |
| Rest of the Economy | C6 | 1132.80 | 1230.7 | 1171.92 |
| Oil Refining | C9 | 53.4077 | 56.18 | 54.4938 |
| Other Energy | C10 | 39.4407 | 42.40 | 40.6239 |
| | Sources of Savings (in million LE) | | | |
| Government Savings | GSAV | 1574.54 | 1651.95 | 1653.44 |
| Household Savings | HHSAV | 1469.07 | 1571.27 | 1515.85 |
| Trade Deficit | DEF | -555.144 | -734.695 | -459.769 |
| | Sources of Income (in million LE) | | | |
| Agricultural Income of Households | HYA | 1581.48 | 1581.46 | 1581.48 |
| Profit Income of Household | YHP | 1469.05 | 1523.13 | 1649.45 |
| Wage Income of Household | YW | 2979.43 | 3355.80 | 3012.2 |
| Government Profit Income | | 1575.3 | 1626.16 | 1640.64 |
| Aggregate Price Index | | 1.00 | 1.0017 | 1.05 |
| Real Value Added (in million LE) | | 7605.22 | 8072.68 | 7754.724 |
| Nominal Value Added (in million LE) | | 7605.22 | 8086.54 | 7883.575 |

to a rise in profit income of the construction sector and adds to the expansionary impact of a rise in aggregate demand. Competitive imports in the agricultural sector also increases to close the gap between domestic demand and domestic supply. Prices and output have both been assumed constant for the sector.

The effect on the balance of payments will also be of a positive nature owing to increased remittances. This, however, is partly offset by the rise in non-competitive imports led by an increase in output in the different sectors of the economy.

The aggregate price level will increase by .17 percent. This would imply an increase in real value added in the economy of 6 percent. On the whole, it may be reasonable to sum up and say that the net effect of a rise in remittances in the Egyptian economy will be expansionary in real terms.

### 5.1.1 Effect of Remittances on Aggregate Price Level and Real Output

Given the assumptions of our model the total effects of increased remittances will include an increase in the real output of goods in almost all the sectors of the economy and a rise in the prices of goods in the construction sector alone. We find that prices of the construction sector increase by 1.6 percent. This, however, does not give incentive to costpush inflationary pressure in the economy owing to the limited linkage of the construction sector to the other sectors of the economy in terms of intermediate costs. The results are evident from the price figures in Table 5-1. As a result, the aggregate price level (which measures inflation) increases by .17 percent. Given the increase in real output in the different sectors, this implies an increase in real value added in the economy by 6 percent. Therefore, it may be reasonable to sum up and say that the net effect of a rise in remittances



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in the Egyptian economy will be expansionary.

The above conclusion might be contrary to the popular belief that the effects of increased remittances in Egypt are inflationary. This could be explained along the following lines: (i) the assumption of bottlenecks in supplies in certain sectors might not have been incorporated correctly, i.e. the assumption of excess capacity in the different sectors might need to be modified; and (ii) the absence of the specification of an investment function mechanism which would trace the effects of increased remittances in terms of an increase in final demand for investment goods in the short-run. An increase in the demand for investment goods is mainly geared to the construction sector because it primarily satisfies the demand for investment goods. Given the assumption of our model that the construction sector is primarily "price clearing," this would have added incentive to the inflationary pressures in the economy in the short-run. Over time, however, these investments would result in a larger physical stock of capital and counteract the inflationary tendencies by increasing the aggregate supply of goods.

The effect of remittances on portfolio shifts between domestic and foreign assets and hence their effect on inflation and growth have also not been considered in the model.

## 5.2 Effects of Increased Investment Demand

In the initial experiment the total aggregate level of investment demand (in nominal terms) is increased by 10 percent (i.e. LE 221.69 million). Our main interest is to examine the responses of the accommodating variables which would give us an improved understanding of the structure of the model.

It is evident from Table 3-1 that the largest component of investment demand is met by goods from the construction sector. As a result the variation in the demand for investment goods is mainly reflected in terms of a rise in the aggregate demand for construction sector products. Since the construction sector has fixed capacity in the short-run the increase in aggregate demand will lead to an increase in prices by 15 percent. This, however, will not lead to much of a costpush inflation in the other sectors of the economy owing to limited sales of intermediate inputs by the construction sector to the other sectors of the economy.

The aggregate level of prices in the economy will increase by 5 percent. The price index of investment goods will increase by a much larger extent (by 9 percent). This increase will result in a net increase of demand for investment goods in real terms by LE 53.135 million (as against a nominal increase of LE 221.69 million). An increase in prices in the construction sector will lead to a proportionate increase in income generated by the construction sector which will put upward pressure on demand for all commodities.

An increase in aggregate demand for investment goods (in real terms) will also result in an expansion of output and income in the other sectors of the economy. All this will lead to an increase in real value added by LE 149.504 million. The results of this experiment are summarized in column B of Table 5-1.

The familiar multiplier and centered arc elasticity measures with respect to shifts in real investment demand are shown in Table 5-2. The values of the elasticities show that all of the accommodating variables will respond positively to a change in the real aggregate demand for investment goods in the economy. The high elasticity measure of the construction sector prices (6.24) reveals the sensitive nature of this sector to a change in the economy's level

TABLE 5-2

Multiplier and Elasticity Measures of Accommodating Variables with Respect to Changes in Real Investment

| Sector | | Multiplier | Elasticity |
|---|---|---|---|
| | Gross Output | | |
| Heavy Industry | X3 | .17 | .48 |
| Light Industry | X4 | 1.26 | .77 |
| Transportation | X5 | .22 | .98 |
| Rest of the Economy | X6 | .92 | .62 |
| Suez | X7 | .0017 | .02 |
| Oil Extraction | X8 | .03 | .25 |
| Oil Refining | X9 | .07 | .54 |
| Other Energy | X10 | .04 | .76 |
| | Competitive Imports | | |
| Agriculture | M1 | .68 | 2.59 |
| | Prices | | |
| Construction and Housing | P2 | .003 | 6.24 |
| Real Value Added | | 2.81 | .82 |
| Total Value Added | | 5.24 | 1.51 |

of real investment demand. The sensitivity measure of the competitive level of imports in the agricultural sector is also high (2.59) because of the high demand pressures that are generated for the goods in this sector. The elasticity measure of the real value added of .82 reveals the limited expansionary impact in real terms of an increase in aggregate investment demand.

We observe a fall in the share of wage income and a rise in the share of profit income resulting from a change in prices brought about by the construction sector. The saving shares also adjust to bring about the new investment saving equality. The government's share in savings falls from .6327 to .6102 and that of the households from .5904 to .5595.

The main burden of adjustment falls in the trade sector (from -.2231 to -.1696) because of the rise in the level of competitive imports in the agricultural sector and non-competitive imports in the other sectors resulting from an expansion in output.

## 5.3 Future Extensions

The above model may be modified along the following lines to analyze the issues of migration and remittances more effectively.

An introduction of the labor market may help to assess the impacts of migration on the availability of manpower at different occupational levels and dits effect on output in the different sectors. For example, we could assess whether migration is creating bottlenecks in the labor supply of highly skilled workers or if it is alleviating pressures on the limited absorptive capacity of the agricultural sector.

We could also make more realistic assumptions regarding saving propensities for the recipient of remittances. The savings ratio from income



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generated from remittances is usually higher than that of wage earners. It would also be interesting to specify an investment function mechanism which would trace the short-run effects of increased remittances in terms of an increase in final demand for investment goods and over time these investments would result in a larger physical stock of capital which would increase the aggregate supply of goods as well.

It might also be of interest to model the effects of remittances on balance of trade and financial issues for developing countries.

## NOTES

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6. For the composition of the 10 sectors from the 32 sector classification see Table 3-1 in Nazli Choucri and Zaki Shafei, "Resource Development and Policy in Egypt: Petroleum and Natural Gas: Summary and Conclusion," TAP Report 83-3 (January 1983).
7. See Appendix B in Lance Taylor, Macro Models for Developing Countries (New York: McGraw-Hill Book Company, 1979).
8. The model specification, underlying rationale and logic, and initial results have been presented in Nazli Choucri and Supriya Lahiri, Short-Run Energy-Economy Interactions in Egypt (M.I.T.: Technology Adaptation Program, No. 83-7, 1983).

9. The world prices of agricultural goods, crude oil, and petroleum products have been taken to be three times, four times, and five times as much as the domestic prices of the respective products.



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## APPENDIX

### List of Research Reports:

### Migration and Development Research Program


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