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MACRO AND MICRO EFFECTS OF SUBSIDY CUTS: A SHORT-RUN CGE ANALYSIS FOR EGYPT

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ABSTRACT

Using a Computable General Equilibrium model for Egypt based on data for 1991/92, this paper analyzes the short-run impact of removing price-distorting subsidies for oil products sold domestically and for commodities covered by the consumer subsidy program. The model merges neoclassical and structuralist features. Two sets of simulations are conducted. The first involves raising the price of domestic oil products to international levels; the second simulates the impact of removing consumer subsidies. Each policy gives rise to an increase in government savings. The analysis is focused on imposing alternative macro closures in order to explore trade-offs between alternative uses for these savings: foreign debt repayment (adding to Egypt's net foreign assets), domestic investment, and government transfers to the households. The results indicate that both policies are contractionary, across all macro closures. The strongest fall in real GDP and other indicators resulted from paying back foreign debt. For the other two cases, the savings were used in a manner which simulated the domestic economy, with a trade-off between investing and improving current household conditions. On the micro level, the oil policy simulations showed a decline in domestic oil use by 6-8 percent (with an accompanying reduction in air pollution) and larger exports. For the consumer subsidy cut, the household consumption fall was relatively limited for food due to low income and price elasticities; most of the consumption cut affected other industrial goods and services. Sensitivity analysis suggested that one structuralist feature--mark-up pricing and excess capacity in much of the economy--had a strong impact on the results; when profit maximization and no excess capacity was assumed for most sectors, the changes in real GDP and other variables were much smaller.

1. INTRODUCTION*

In 1991, after a sustained period of declining living standards, slow growth and growing foreign indebtedness, Egypt embarked on a reform program supported by the IMF and the World Bank. The purpose of this paper is to analyze some short-run aspects of this program, especially the policy of removing price-distorting subsidies. The analysis is based on a nine-sector, real-economy, Computable General Equilibrium (CGE) model for Egypt, with most of the data provided by a 1991/92 Social Accounting Matrix (SAM). Theoretically, the model merges neoclassical and structuralist features in an attempt to capture key aspects of the Egyptian economy. The simulations focus on two areas, the alignment of domestic oil prices with international levels and the elimination of consumer subsidies. Both are motivated by the government policy agenda. The discussion covers both macro and micro effects and highlights policy trade-offs by imposing alternative macro closures. The sensitivity of the results to alternative assumptions for trade elasticities and producer behavior is also tested.

We proceed as follows: Section 2 provides some background on Egypt's economy. Section 3 presents the CGE model and its data base. In Section 4, a set of simulation experiments are reported Section 5 summarizes and expands on the conclusions. An Appendix includes the disaggregated SAM and additional non-SAM data used in the model.[1]

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[1]A mathematical statement of the model is available on request from the author.

2. EGYPT'S ECONOMY: BACKGROUND AND CURRENT POLICIES

In the second half of the 1980s, Egypt's economy suffered from slow GDP growth, severe macro imbalances, increasing unemployment, and declining average real income. The crisis was triggered by unfavorable external conditions, especially the fall in world oil prices in 1985-87. However, the economy also suffered from structural weaknesses; the major culprits include a large and inefficient public sector, large price distortions (compared to international price benchmarks), and widespread governments controls.

Against this background, Egypt in 1991 initiated a reform program aimed at macro stabilization and structural transformation toward increased reliance on the private sector and market forces, including reduced price distortions and the liberalization of international trade and capital flows. In the same year, the country reached agreements on a standby arrangement with the IMF, a Structural Adjustment Loan from the World Bank, and a deal with the Paris Club on phased cancellation of $10bn of the country's foreign debt. Selected data on the Egyptian economy of 1991/92, the first full reform year, are presented in Table 1. Its GDP per capita positions the country between the groups of low- and middle-income countries according to the World Bank classification. Compared to the preceding year, the reform program led to a rapid cut in the budget deficit (from 15.2 percent of GDP to 4.4 percent), lower flation (falling from 19.8 percent to 13.6 percent), a smaller (goods) trade deficit (decline from 19.7% to 15.5% of GDP), a larger current account

Table 1. Selected data on Egypt's economy in 1991/92

AGGREGATE DATA				
GDP/capita ($) (1)		757		
Government budget deficit (% of GDP)		4.4		
Investment (% of GDP)		20.2		
Inflation (CPI, %/year)		13.6		
Unemployment rate (%)		17.5		
Foreign debt ($bn)		40.4		
Foreign reserves ($bn)		10.8		
Current Account Surplus (% of GDP)		8.7		
Petroleum subsidy (% of GDP)		2.9		
Consumer subsidies (% of GDP)		2.9		
Producer subsidies (% of GDP)		0.3		
Electricity subsidy (% of GDP)		1.1		
CURRENT ACCOUNT OF BALANCE OF PAYMENTS				
Revenues				
Non-oil goods exports		10.2		
Oil exports		14.7		
Non-factor service exports		40.9		
Net factor services & Transfers		34.1		
Total	($18.1bn)	100.0		
Expenditures				
Goods imports		89.6		
Non-factor service imports		10.4		
Total	($14.5bn)	100.0		
SECTORAL STRUCTURE			% of GDP	% of Employment
Agriculture		16.2		33.0
Oil		9.5		0.3
Electricity		1.6		0.7
Construction		5.0		6.6
Industry		16.8		13.7
Transportation		10.5		4.5
Other Services (2)		40.4		41.3
Total		100.0		100.0

Sources: 1991/92 SAM (see Appendix & Section 3 below); Fergany 1993:7; EIU Country Report 2/1991:11 & 2/1994:3; world Bank 1993:156; Central Bank Annual Report 1992/93:157

Notes: 1. Computed as the ratio between 1991/92 GDP (LE139.1bn) & exchange rate (LE3.33/$) times population (55.2 mill.)

2. Other services includes wages of government labor.

surplus (increase from 3.1 percent of GDP to 8.7 percent),[2] and rapid accumulation of foreign reserves (from $5.3bn to $10.8bn). However, the fall in investment, already underway, continued (from 25 percent of GDP to 20.2 percent). Real GDP growth remained at a low but certain level.[3] The structural peculiarities of Egypt's economy include heavy reliance on foreign earnings other than non-oil exports (the latter representing only 11 percent of earnings), including various "rents" (the Suez Canal, tourism, foreign aid and oil) and worker remittances. This lopsided nature of the economy is also reflected in sectoral GDP shares.

The focus of the CGE-based analyses of this paper is on the macro and micro effects of removing price-distorting subsidies in two areas, petroleum products and the different commodities covered by consumption subsidies.[4] (In addition, there are other smaller electricity and producer subsidies.) Both types of distortions have been pervasive since the 1970s when international commodity prices rose without matching domestic price hikes.[5] Although still substantial, subsidy rates have recently declined,

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[2] The primary cause was that high domestic interest rates and a stable nominal exchange rate vis-a-vis the dollar encouraged a large increase in private remittances from abroad. Between 1974 and 1989/90, Egypt's current account was in a constant deficit.

[3] Data on real GDP and its growth are shaky and frequently revised. For 1991/92, the Government of Egypt has reported growth rates at 2.8 percent and 4.4 percent (IMF April and august 1991) whereas the World Bank uses the figure of 0.3 percent (1994:16).

[4] The term "distortion" refers to deviations from international price equivalents. Recently, administered electricity prices have been raised toward the long-run marginal cost. This area is not covered in this paper.

[5] In 1978, the price of crude oil for domestic use was 12 percent of the export price (Ikram 1980:282). Richards (1991:1722-1726) analyzes macro and micro aspects

especially for petroleum products: domestic prices rose from 33 percent of the international level in April 1991 to 64 percent in January 1992 (EIU Country Report 2/1991:11; World Bank 1993:156). Subsidy rates for consumption goods, including foodstuffs, were lowered in 1989-1992 (EIU Country Profile 1993/94:19, 36-37). In 1991/92, both the implicit petroleum subsidy and explicit consumer subsidies were at around 2.9 percent of GDP. The government aims at raising petroleum prices to international levels in 1995 and further reducing and targeting consumer subsidies (EIU Country Profile 1993/94:19, 26; EIU Country Report 1/1994:7-8).

The case for bringing domestic prices up to international levels is familiar and may amount to "little more than common sense" (Shapiro and Taylor 1990:876): efficient use of commodities is encouraged if the agents face marginal opportunity costs defined on the basis of international prices.[6] However, although untargeted, consumer subsidies have significantly raised the purchasing power of many poor. This means that consumer subsidy reduction raises demands for alternative methods of protecting the living standards of vulnerable groups. In addition, any significant price hike gives rise to transitional problems, especially given that most benefits of price rationalization may only make themselves felt after some time.

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of price distortions in Egypt with a focus on the 1980s.

[6] In Egypt, petroleum price distortions have encouraged capital-intensive techniques and air pollution while reducing oil exports. Reports of Egyptian water buffaloes eating bread reflect a misallocation due to a consumer subsidy.

Oil pricing and consumer subsidies have been analyzed in some earlier CGE models for Egypt.[7] The simulated impact is invariably higher government savings. In addition, subsidy cuts tend to reduce the trade deficit, real household incomes, and real GDP.[8] Apart from the fact that it is based on relatively up-to-date information, the current study is distinguished by the micro-structuralist character of the CGE model and its systematic exploration of the impact of alternative ways of disposing the increase in government savings (addressed by means of alternative macro closures).

3. MODEL STRUCTURE AND DATA BASE

This section presents the CGE model and its data base. The model is adapted to the structure and state of the Egyptian economy in the early 1990s. Theoretically, it may be labeled structuralist since it assumes mark-up pricing for most sectors and rigid wages. However, its structuralism is of the "micro" type: the model remains homogeneous of degree zero in all prices.[9] In the tradition of CGEs for Egypt, it occupies a relatively unexplored middle ground between the macro structuralist and

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[7] Oil pricing is analyzed by Choucri and Lahiri (1983) and consumer subsidies by Taylor (1979), Dethier and Esfahani (1981), Hansen and Radwan (1982), Eckaus and Mohie-Eldin (1984) and Dethier (1985). See Löfgren (1994b) for a review of CGE models for Egypt.

[8] Increases in output and household incomes are only reported by Eckaus and Mohie-Eldin (1984:486) for a special case where the supply of a subsidized consumer import is eliminated while household demand is assumed to be reallocated to domestic output of the same category. The result is an expansion in household demand for domestic output, with a positive multiplier effect.

[9] For a classification of CGE models along these lines, see Robinson (1989:907-923). Bandara (1991) provides a recent survey of CGE modeling for LDCs.

neoclassical traditions, due to Taylor and Dervis; de Melo; Robinson, respectively.[10] For this paper, it was decided not to extend the model to include nominal rigidities and financial assets considering the uncertain payoffs--the knowledge of how to treat these aspects in a CGE model for Egypt (or, indeed, for other LDCs) is limited.[11] Given the current model structure, it should be made clear that the purpose of the analysis is to provide insight about the short-run equilibrium effects of selected policies, not to forecast or trace the dynamic responses to these policies.[12] Moreover, since the validity of the model is not tested statistically, its results may be viewed as "null hypotheses" in need of support from other studies.[13] Data considerations also call for caution. Although a serious effort was made to make the best possible use of available data, even basic data on Egypt's economy are subject to a high degree of uncertainty.

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[10] Taylor (1979:58-66), and Choucri and Lahiri (1990:177-196) present macro structuralist models for Egypt while more neoclassical treatments are found in Ahmed et al. (1985) and Dethier (1985).

[11] Not only are functional forms and elasticity values unknown, it is not even clear where the sources of money non-neutrality are. For example, in one of the best real-financial CGEs, non-neutrality is present in relationships determining capital flight, investment, and wages (Fargeix and Sadoulet 1994:150). To what extent a similar treatment would be valid for Egypt is an important question. Research in this area should, of course, be encouraged For an exploratory model formulation for Egypt, see Löfgren (1994a).

[12] The analysis is short-run since the model applies to one time period and the capital stock is fixed.

[13] In case this sounds discouraging, it should also be said that there is no clearly superior alternative methodology if the aim is to understand macro and micro effects of policies and shocks in a unified framework. For such arguments, see Shoven and Whalley (1992:4-5) and Srinivasan (1990:69).

The model overview starts with a discussion of production sectors and closure rules for factor and commodity markets (micro closures), followed by the treatment of institutions, macro closures, the price normalization rule, and the data base.

Production Sectors, Factors, and Micro System Constraints

Table 2 presents the model's disaggregation for production sectors, factors, and institutions. Except for the outputs of two non-tradable sectors, electricity and construction, all outputs enter foreign trade in both directions. All sectors use capital and labor whereas land is only demanded by crop agriculture. The "household" is an aggregate domestic non-government institution (covering both households and enterprises).

Table 3 shows key assumptions relevant to the producing sectors. The treatment of the two agricultural sectors is quite neoclassical. The assumption of full capacity utilization (with little room for short-run increases in aggregate supply) is supported by much research on agriculture in Egypt (Esfahani 1987) and other LDCs (Chhibber 1989). Like other employers (producing sectors and government), the agricultural sectors face an infinitely elastic labor supply at CPI-linked employer- specific wages. The latter are determined so as to reproduce observed base-year wage gaps. These assumptions are chosen in light of the high unemployment rates of recent years and persistent wage differences across employers.[14] Flexible domestic prices clear the

[14] Wage differences may be derived from CAPMAS (1993:308, 310).

Table 2. Disaggregation of sectors, factors and institutions

	Elements	
Set	No.	List
Sectors	9	Agriculture: Crop, Livestock Industry: Food, Oil, Electricity Construction, Other Services: Transportation, Other
Factors	3	Labor, Capital, Land
Institutions	3	Government, Household, Rest of World

market for domestic output, with both supply and demands (domestic and export) being price-sensitive.

A majority of the sectors belongs to the group "other non-agriculture" characterized by a more structuralist treatment. The view taken is that these sectors operate in fragmented markets with price-setting power for individual producers. There is little technological flexibility, because of limited competitive pressure and the short-run character of the analysis. The depressed state of the Egyptian economy in the early 1990s after several years of slow growth supports the excess capacity assumption. Producer prices are determined as variable unit cost, adjusted to account for a fixed capital mark-up factor, indirect taxes and subsidies. Variations in output quantity clear the market: whatever is demanded at the mark-up price is supplied. Domestic demands and, for most sectors, export demands are price-sensitive. The treatment of transportation exports reflects the predominant role of the Suez Canal for which foreign

Table 3. Model assumptions by sector

Sector Area	Crop & Livestock Agriculture	Other non-agriculture (2)	Oil	Electricity
Producer Behavior	Profit maximation (perf comp); (endogenous output quantity)	Mark-up pricing demand-driven output quantity	Fixed output price (3) fixed output quantity	WPI-indexed output price; demand-driven output quantity
Technology	CES (value added); Leontief (inter-mediates)	Leontief (labor & inter-mediates)	Leontief (labor & inter-mediates)	Leontief (labor & inter-mediates
Capital (1)	Full utilization; flexible price	Excess capacity; paid cost mark-up	Full utilization; residual value-added to capital	Excess capacity; residual value-added to capital
Output Market (clearing variable)	Price	Output quantity	Export quantity	Output quantity
Export Market	Constant elasticity demand function	Constant elasticity demand function except transportation (fixed $ price & quantity) & construc-tion (nontraded)	Fixed $ price; flexible quantity	Not traded

Notes: 1. Capital is sector-specific. The other factors are labor and land. For labor, there is unemployment at sector-specific wages linked to the CPI. For land (only used by crop agriculture), the model assumes full utilization with a flexible price.
2. The sectors belonging to "other nonagriculture" are food, construction, other industry, transportation and other services.
3. Producer receives world price for exports and fixed share of world price for domestic sales.

currency earnings should be viewed as exogenous from the perspective of Egypt's economy.

The final two sectors, oil (petroleum and petroleum products) and electricity are singled out for special treatment because of the nature of government policies, capacity use, and demand conditions. The oil sector has a fixed output level (determined by

available capacity and other extraneous considerations).[15] After satisfying domestic demand, it exports the surplus. Being a small exporter, Egypt faces an infinitely-elastic export demand for oil at the given world price. The domestic producer price is set (by government policy) at 64 percent of the Egyptian pound export price (on the basis of data for 1991/92 (World Bank 1993:156).[16] The non-tradable electricity sector is similar except that the producer price is indexed to the wholesales price index (WPI) and that, agiven the excess-capacity assumption, output is demand-driven at the fixed price.[17]

Institutions

The institutions receive all factor incomes. Labor and land incomes accrue in their entirety to the household while capital income is split between household and government in fixed shares after deducting a payment to the rest of the world (RoW), exogenous in foreign currency.

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[15] Since 1987, Egypt's oil production has been quite constant, averaging around 870,000 barrels per day. The government intends to keep it at this level at least until 1997 (EIU 1993/94:26-27).

[16] The Egyptian pound export price is endogenous since the exchange rate is flexible.

[17] In the early 1990s, Egypt had some excess capacity in the electricity sector (EIU Country Profile 1990/91:35). In 1991/92, the government-fixed producer price was at 59 percent of an estimated long-run marginal cost (World Bank 1993:156). However, the results are invariant to the producer price used for model calibration since the electricity quantity unit is adjusted proportionally.

For the household, disposable income consists of factor incomes (net of a fixed share direct tax) as well as transfers from the government (typically CPI-indexed)[18] and the RoW (fixed in foreign currency). After subtraction of a transfer to the RoW (fixed in foreign currency), the remainder is allocated in fixed shares to household consumption, savings, and transfers to the government. Like other domestic demanders (the government, investors and producing sectors), the household demands a composite commodity made up of domestic goods and imports. At the composite commodity level, demands are determined by LES (linear expenditure system) functions. The composite demands are allocated between domestic output and imports on the basis of relative prices and initial shares according to the Armington specification (which assumes that domestic and imported commodities are imperfect substitutes).[19] For households and other demanders, import supplies are infinitely elastic at exogenous world prices. World prices are transformed into domestic market prices after accounting for the exchange rate, import tariffs and the sales tax.

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[18] More specifically, these transfers are CPI-indexed for two of the three macro closures. For the third case, they are a flexible residual. See below.

[19] Many CGE models assume that all demanders buy domestic and imported commodities in the same proportion. The current model deviates by assuming demander-specific shares by commodities and origin. An advantage of this treatment is that the impact of relative domestic-import price changes will vary across different demanders depending on the relative importance of imports and domestic goods in their composite commodity bundles. Many CGE models assume that each demander buys domestic and imported commodities in the same proportion. The current model deviates by assuming demander-specific shares by commodities and origin. An advantage of this treatment is that the impact of relative domestic-import price changes will vary across different demanders depending on the relative importance of imports and domestic goods in their composite commodity bundles.

Government current revenues include capital income, transfers from abroad (fixed in foreign currency), and direct and indirect taxes. Current expenditures cover the salaries of an exogenous quantity of government labor (at a government-specific wage), transfers to the household, consumption (exogenous quantities at composite commodity level; Armington treatment for imports versus domestic output), transfers to the rest-of-the world (fixed in foreign currency), consumption subsidies (constant commodity-specific market-price shares), and producer subsidies (fixed shares of gross producer price).

The RoW receives capital income, transfers from household and government, as well as payments for Egypt's imports. Egypt's receipts from the RoW belong to the same categories, with exports substituted for imports. Except for most exports and all imports, payments to and from the RoW are exogenous in foreign currency. Given that all nontrade current-account transactions are exogenous, there is a one-to-one positive relationship between changes in the current account surplus and the trade surplus. When "foreign investment" (the current account surplus) is added to Egypt's spending, the RoW account is by definition in balance.[20]

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[20] Recall that the following holds by definition: foreign investment = - foreign savings = current account surplus = capital account deficit = increase in foreign reserves + net increase in other foreign assets.

Macro System Constraints and Price Normalization

The macro constraints determine the manner in which the accounts for the government, the RoW, and savings-investments are brought into balance. Table 4 shows three alternative sets of closure rules used for the simulations. The use of different alternatives is supported by the fact that, while the choice of closure rule often has a strong impact on the results, it is typically difficult to make a strong case for any single alternative. The analysis of the results from different closures can provide insight about the trade-offs under which real-world economies operate.

The policy changes simulated in this paper invariably raise government savings (due to the removal of consumer subsidies and/or the imposition of a special oil tax). Each macro closure imposes one way of using these savings. For closure 1, they are used to repay foreign debt (or, more generally, to add to the nation's net foreign assets); for closure 2, to finance domestic investment; and for closure 3, to finance transfers from the government to the household achieving fiscal neutrality (defined as an unchanged ratio between government savings and GDP).

As shown in Table 4, these effects are achieved via variations in the way in which the government and savings-investment constraints are satisfied. For the government constraint, savings are either a residual while household transfers are indexed vis-a-vis the CPI (closures 1 and 2), or government savings are fixed at the base-year level share of GDP while government-household transfers are the residual

Table 4. Alternative macro closures

Closure #	1	2	3
Constraint			
Government Current Account	Flexible Government Savings	Flexible Government Savings	Fixed Gov Savings - GDP ratio
	CPI-indexed Gov-Hhd Transfers	CPI-indexed Gov-Hhd Transfers	Flexible Gov-Hhd Transfers
Savings-Investment	Flexible Foreign Investment	Fixed Foreign Investment (in $)	Flexible Foreign Investment
	Fixed Real Domestic Investment	Flexible Real Domestic Investment	Fixed Real Domestic Investment
BoP Current Account	Flexible Exchange Rate	Flexible Exchange Rate	Flexible Exchange Rate

(closure 3). The savings-investment constraint may be expressed as

$$\begin{bmatrix} domestic \\ investment \end{bmatrix} + \begin{bmatrix} foreign \\ investment \end{bmatrix} = \begin{bmatrix} domestic\ (household\ \& \\ govenment)\ savings \end{bmatrix}$$

Domestic investment (in real terms) is either fixed with flexible foreign currency; closure 2).[21] The former case may reflect government policy or the exogenous nature of investment decisions. For the latter case, domestic investment is

[21] Note that neither component of domestic savings is free to vary to assure that the savings-investment constraint is satisfied.

determined by available domestic savings, net of foreign investment.[22] Variations in the real exchange rate--the relative price of traded goods versus domestically produced goods sold on the domestic market)--generates a Current Account surplus equal to the level of foreign investment in the savings-investment balance.

Finally, the model is homogeneous of degree zero in prices, i.e. it only solves for relative prices. A price normalization equation fixes the aggregate level of producer prices for domestic output sold domestically--a wholesale price index. The selection of this index makes it possible to interpret the nominal exchange rate which appears explicitly in the model as the real exchange rate. [See de Melo and Tarr (1992:29-31, 62-63) for details.]

Data Base

The primary data source is a SAM for 1991/92, constructed by the author (see Appendix). Initially, a one-sector version of this SAM (see Table 5) was put together on the basis of national income data, the government budget, and the Balance of Payments. The first version of the multi-sector SAM was built by disaggregating the one-sector SAM, drawing on Ministry of Planning demand- supply balances and input-output tables. In areas where 1991/92 data were not available, data from other

[22] This kind of reasoning is used to explain investment in the 1980s in the recent Human Development Report of the Institute of National Planning (1994:57)--the fall in investment during this decade is linked to declining availability of foreign savings without any increase in domestic savings.

Table 5. Macro SAM for Egypt, 1991/92 (billion 1991/92 £E)

	Labor	Capital	Land	Household	Government
Labor					8.0
Capital					
Land					
Household	35.0	81.1	2.2		13.1
Government		8.8		4.4	
Rest of World		4.6		1.2	3.1
Activity					
Dom. Com'y				93.9	3.7
Imp. Com'y				10.4	2.7
Tax				10.1	
Tariffs					
Subsidy					4.5
Sav.-Inv.				34.1	6.1
TOTAL	35.0	94.5	2.2	154.1	41.2

	Rest of World	Activity	Dom. Com'y	Imp. Com'y	Taxes
Labor		27.0			
Capital	2.4	92.1			
Land		2.2			
Household	18.7				
Government	3.7				19.7
Rest of World				43.5	
Activity	39.7		165.1		
Dom. Com'y		54.2			
Imp. Com'y		26.3			
Taxes		3.4	4.3	1.9	
Tariffs				4.6	
Subsidy		-0.4			
Sav.-Inv.	-12.1				
TOTAL	52.4	204.8	169.4	50.0	19.7

	Tariffs	Subsidy	Sav.-Inv.	TOTAL
Labor				35.0
Capital				94.6
Land				2.2
Household		4.0		154.1
Government	4.6			41.2
Rest of World				52.4
Activity				204.8
Dom. Com'y			17.6	169.4
Imp. Com'y			10.5	50.0
Taxes				19.7
Tariffs				4.6
Subsidy				4.0
Sav.-Inv.				28.1
TOTAL	4.6	4.0	28.1	

Abbreviations: Dom. = Domestic; Imp. = Imported; Com'y = Commodity; Sav.-Inv. = Savings-Investment.

sources were used, including the most recent CAPMAS SAM, for 1986/87.[23] As expected, the resulting SAM was unbalanced (due to a combination of data errors and conceptual differences between data from different sources). A RAS procedure was used to generate a balanced SAM.[24] Subsequently, the model was calibrated, i.e., its parameters estimated through a procedure which assures that, when solved, the model exactly replicates the initial SAM, which is assumed to reflect a state of base-year general economic equilibrium. This means that most parameters were estimated from the base-year SAM. A survey of other CGE models provided elasticities for domestic supply (Armington) aggregation functions, production functions, as well as household and export demand functions. The Appendix includes elasticities and other non-SAM data used in the model.

4. MODEL SIMULATIONS

The simulations address the impact of two policies, an increase in domestic oil prices to the international level and the elimination of all consumer subsidies. Two sets of simulations are reported in detail, one for each policy. For each set, three simulations are carried out, numbered according to macro closure (cf. Table 4). In the

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[23] The most important sources for the SAM are Central Bank (1992/93), CAPMAS (1991; 1993) and Ministry of Planning (1992; 1993). For a detailed documentation of the SAM, see Löfgren (1994d).

[24] Compared to the initial SAM, the maximum cell change for the final SAM was 18 percent, a level which seems acceptable given the uncertainty of Egypt's data. The GAMS software was used for the SAM construction, including the RAS procedure, as well as for the model. [See Brooke et al. (1988).] The starting point for the RAS procedure was a GAMS input file kindly provided by Sherman Robinson.

analysis of individual simulations, we will typically first identify the initial disequilibrating effects of the policy change on the micro and macro levels, and subsequently turn to the final results.

Raising the domestic price of oil products to the world level

The common denominator of these simulations is that the domestic purchaser price for domestic oil products is raised to the international level by means of a special tax without any direct change in the producer price for domestic sales.

Oil Simulation 1

At the micro level, the rise in domestic oil prices causes a rise in composite oil prices (facing the domestic demanders), the CPI, and CPI-indexed wages. The mark-up sectors ("other non- agriculture") respond by raising output prices, this leading to lower quantities demanded (both domestically and for exports) and produced. For the profit-maximizing (agricultural) sectors, the increases in the oil price and the wage lower the optimal level of labor demand and output. The initial response of the household is to shift its demand from oil to other commodities. The oil sector responds to lower domestic demand by shifting some of its output to exports.

Less output and employment in most sectors reduce household factor incomes, giving rise to less consumption demand and a multiplier process with further demand and output cuts. For the oil sector, given a fixed output level, the main impact is a decrease in domestic demand and increased exports.

Macro closure 1 is driven by domestic investment with flexible foreign investment and residual government savings. Government savings initially increase, although the economic contraction softens this effect and cuts household savings. The net result is nevertheless a domestic savings surplus, channeled abroad to foreign investment. In the balance of payments, the fall in the trade deficit (larger oil exports and less imports due to the contraction) is larger than the increase in foreign investment, bringing about a surplus and currency appreciation, thus adding to the contraction in economic activity.

The final results, shown in Table 6, include a significant contraction in real GDP (-3.2 percent),[25] accompanied by larger cuts in real household income (-5.0 percent), and employment (-4.8 percent). The reductions in sectoral output range between 2 percent and 6 percent for most sectors, with a lesser impact on sectors with full capacity utilization and/or low income elasticities (agriculture and food). For construction, the cut is minimal since the sector almost exclusively produces investment goods. Government savings increase from 4.4 percent to 5.9 percent of GDP. An increase in foreign investment (i.e. a larger current account surplus) is equivalent to a lower trade deficit, the outcome of a combination of less imports, higher oil exports, and less non-oil exports.

[25] Throughout the analysis, reference is made to real GDP at market prices; the results for GDP at factor cost follow the same pattern.

Table 6. Simulations: Domestic price raised to world level (1)

INDICATOR	BASE	1	2	3
Equilibrating Variables for Macro Constraints (2)				
Savings-Investment		For. Inv.	Dom. Inv.	For. Inv.
Government		Gov. Sav.	Gov. Sav.	Hhd trns.
Real Data (91/92 £Ebn)	Base value	Percentage change compared to base		
Macro:				
GDP (3)	139.2	-3.2	-1.7	-2.1
Household income	138.8	-5.0	-4.0	-2.4
Investment	28.1	0	9.8	0
Exports	39.7	-0.9	-1.4	-1.9
Imports	43.5	-2.0	1.3	-0.7
Employment	13.9	-4.8	-3.3	-3.4
Real exch. rate (£E/$)	1.0	-4.0	-4.4	-4.8
Cur. Acc, surplus ($)	12.1	13.0	0	5.8
Gross Sectoral Production:				
Crop Agriculture	22.1	-1.8	-1.6	-1.4
Animal Agriculture	8.4	-1.6	-1.4	-0.9
Food	17.5	-2.4	-2.0	-1.4
Other Industry	42.4	-5.8	-3.6	-4.0
Oil	20.2	0	0	0
Electricity	6.0	-5.7	-4.4	-3.0
Construction	14.9	-0.5	8.5	-0.3
Transport	17.8	-3.7	-2.9	-2.5
Other Services	61.8	-6.0	-4.9	-4.0
Nominal Macro Data (% of GDP)	Base value	Change compared to base		
Government Revenue	27.4	1.9	2.0	1.9
Government Spending	23.0	0.4	0.1	1.9
Household transfers	9.4	0.3	0.1	1.9
Government Savings	4.4	1.5	1.9	0
Household Savings	24.5	-0.5	-0.6	-0.2
Domestic Investment	20.2	0.1	1.7	-0.3
Foreign Investment	8.7	0.9	-0.4	0.1

Notes: 1. Units. As indicated, base scenario units are either 91/92 £Ebn or percentage of GDP. The exceptions are employment (in millions of workers), the current account surplus (in foreign currency with base exchange rate £E1 = $1), and the exchange rate (in £E/$).

2. Simulation numbers match macro closure numbers. See Table 4.

3. GDP is measured at market prices.

Oil Simulation 2

For macro closure 2, domestic investment is flexible, while foreign investment (and hence the balance of trade) is fixed (in foreign currency). This influences the macro effects of the oil price hike: the increase in government savings gives a strong boost to domestic investment. On the micro level, the initial contractionary impact is similar to the first simulation with the exception that construction output expands in proportion to the real change in investment demand--around 50 percent of investment spending is directed to the domestic construction sector which produces little but investment goods. As a result of larger oil exports, the balance of payments is in surplus also for this simulation, requiring appreciation to validate the exogenous levels for foreign investment (and the trade balance).

Compared to the first simulation, the outcome is more benign for key macro variables: the declines in GDP, household income, and employment are smaller, while real investment expands by almost 10 percent. On the sectoral level, output cuts are less severe across the board; for construction there is a large increase (by 8.5 percent). The drawback is that there is no increase in foreign investment.

Oil Simulation 3

Closure 3 differs from closure 1 in that household transfers clear the government balance subject to the constraint that government savings, as a share of nominal GDP, stay at the base level. Thus, once again, the initial macro effect is different: household incomes and consumption are boosted, not domestic or foreign investment. On the

micro level, demand for consumption goods is higher across-the-board. With additional government savings transformed into transfers instead of foreign investment, the tendency toward currency appreciation is stronger.

Compared to simulation 1, the final outcome is less contractionary: the cuts in GDP, household income and employment are smaller. The increase in foreign investment is less drastic. Compared to simulation 2, the distinguishing features are a much smaller cut in household income, the absence of an increase in domestic investment, and an increase in foreign investment. In sum, simulation 3 shows the potential for removing the oil price distortion with more moderate contractionary effects in the context of fiscal neutrality and unchanged domestic investment.

Impact on Oil Sector

Table 7 gives more detail on the impact of the different scenarios on the oil sector. The cuts in domestic use vary between 6 percent and 8 percent, while the range for the increase in export volume is 9-11 percent. With a fixed domestic output level, there is an inverse relationship between export expansion and domestic demand, the latter related positively to real GDP and household incomes, and negatively to currency appreciation (since it brings about a shift toward imported oil products). Given that oil accounts for around 60 percent of Egypt's goods exports, these changes in export volume are significant. In addition, less consumption of oil products means less pollution.

Table 7. Oil Simulations: Demand and supply for oil products (91/92 £Ebn / percentage change)

INDICATOR	BASE	1	2	3
Domestic sales	11.3	-9.0	-8.0	-7.2
Export demand	8.9	11.4	10.2	9.1
Import supply	1.0	1.9	3.5	3.0
Domestic use	12.3	-8.0	-7.0	-6.3
Household demand	6.5	-12.8	-11.9	-10.4
Intermediate demand	5.1	-2.8	-1.9	-1.8
Other demands	0.6	0	2.5	0

Note: Domestic output is allocated to domestic sales and exports. Supply to domestic market (= domestic use) is from domestic sales and import supply. Other demands are for government consumption and investment use. Base values are in billions of constant 1991/92 £E. The simulation values are percentage changes at constant 1991/92 prices.

Eliminating consumer subsidies

For this set of simulations, consumer subsidies, in 1991/92 corresponding to 2.9 percent of GDP, are eliminated in the context of each of the three macro closures (cf. Table 4). This is an extreme case, since it is not clear that the government intends to remove these subsidies fully. Moreover, the nominal wage is not adjusted in response to the CPI increase caused by the subsidy cut. This means that the impact on real household income and consumption may be exaggerated.

Consumer Subsidy Simulation 1

The initial micro effect of the subsidy cut is reduced household consumption demands for all commodities, with the relative sizes of the declines depending on the size of the subsidy cut affecting each commodity and its price elasticity. As a result,

imports and domestic output decline, both for mark-up sectors (a direct response to lower demand) and profit-maximizing sectors (due to a downward movement in producer prices, reducing labor hiring). The key initial macro impact is higher government savings, supporting an increase in foreign investment. This leads to currency depreciation (the appreciating impact of expanded oil exports is absent for this set of simulations) and expansion for the sectors producing tradables.

Table 8 shows the final outcome; it includes cuts in GDP (-2.0 percent), employment (-3.0 percent), and household income (-5.1 percent). Foreign investment increases (from 8.7 percent to 10.3 percent of GDP) along with an expansionary decrease in the trade deficit.

On the sectoral level, the non-traded electricity sector faces the largest contraction, in part because it does not benefit from currency depreciation. Details about the impact on household consumption are shown in Table 9. The lowest cuts are for commodities with low price and income elasticities and small initial subsidies (the agricultural sectors). For food, the demand fall is moderate (-3.9 percent), reflecting the combined impact of a large subsidy cut and low elasticities. Household consumption cuts for the other commodities are large and quite uniform at around 7-8 percent.

Table 8. Consumer subsidy simulations: Elimination of subsidy

INDICATOR	BASE	1	2	3
Equilibrating Variables for Macro Constraints (2)				
Savings-Investment Government		For. Inv. Gov. Sav.	Dom. Inv. Gov. Sav.	For. Inv. Hhd trns.
Real Data (91/92 £Ebn)	Base value	Percentage change compared to base		
Macro:				
GDP (3)	139.2	-2.0	-0.0	-0.3
Household income	138.8	-5.1	-3.9	-1.3
Investment	28.1	0	13.0	0
Exports	39.7	2.7	1.9	0.8
Imports	43.5	-3.0	1.2	-1.1
Employment	13.9	-3.0	-1.1	-0.9
Real exch. rate (£E/$)	1.0	2.0	1.4	0.7
Cur. Acc, surplus ($)	12.1	17.0	0	5.8
Gross Sectoral Production:				
Crop Agriculture	22.1	-1.0	-0.7	-0.3
Animal Agriculture	8.4	-1.5	-1.2	-0.5
Food	17.5	-3.0	-2.6	-1.7
Other Industry	42.4	-3.5	-0.5	-0.8
Oil	20.2	0	0	0
Electricity	6.0	-5.4	-3.7	-1.4
Construction	14.9	-0.3	11.5	-0.1
Transport	17.8	-2.8	-1.7	-0.9
Other Services	61.8	-3.9	-2.5	-1.0
Nominal Macro Data (% of GDP)	Base value	Change compared to base		
Government Revenue	27.4	-0.7	-0.5	-0.7
Government Spending	23.0	-3.0	-3.4	-0.7
Household transfers	9.4	0	-0.2	2.5
Government Savings	4.4	2.3	2.9	0
Household Savings	24.5	-0.5	-0.7	0
Domestic Investment	20.2	0.1	2.3	-0.4
Foreign Investment	8.7	1.6	-0.1	0.4

Notes: See Table 6.

Table 9. Consumer Subsidy Simulations: Household consumption

INDICATOR	BASE	1	2	3
Crop Agriculture	12.1	-1.6	-1.2	-0.4
Animal Agriculture	6.3	-1.6	-1.2	-0.4
Food	20.5	-3.9	-3.4	-2.2
Other Industry	19.6	-7.1	-5.4	-1.8
Oil	6.5	-7.3	-5.5	-1.9
Electricity	3.8	-6.9	-5.2	-1.7
Transport	5.0	-7.7	-6.1	-2.7
Other Services	32.5	-7.2	-5.5	-1.9

Note: Base values are in billions of 1991/92 £E. The simulation values are percentage changes at constant 1991/92 prices.

Consumer Subsidy Simulation 2

The main new feature on the micro level is more demand and output for capital commodities (especially construction and other industry) as higher government savings translate into more domestic investment.

The final results indicate that for this closure, the cuts in GDP, employment, and household income and consumption all are quite minor or absent; a strong increase in investment demand (+13.0 percent) is the driving force. The increase in investment leaves its mark on the pattern of sectoral output change. Construction is boosted considerably and there are smaller output declines for all other sectors. The results for this simulation illustrate how the contractionary effects of subsidy removal are absent or reduced if the resources that are freed up can be channeled to investment, echoing the lesson of oil simulation 2. However, there is a trade-off: the favorable changes in

foreign investment (further reducing Egypt's foreign debt) and the trade deficit are absent.

Consumer Subsidy Simulation 3

With macro closure 3 (excess government savings allocated to household transfers), the contraction (in GDP, household income, and employment) is much smaller than for closure 1 and quite similar to closure 2, once more reproducing the pattern of the oil simulations. Relatively speaking, all sectors do better. However, as usual, nothing comes for free: there are costs in the form of a smaller increase in foreign investment (by 5.7 percent instead of 16.8 percent) while the government savings - GDP share stays unchanged at 4.4 percent instead of climbing to 7.3 percent. Compared to closure 2, the main difference is that households are better off and foreign investment higher at the expense of domestic investment.

Comparing Oil and Consumer Subsidy Simulations

The macro effects of the oil and consumer subsidy simulations are compared in Table 10. Although both policies are contractionary, simulations 2 and 3 are less so than simulation 1 (since additional government savings are used in ways which stimulate the domestic economy), and the outcome for households less negative for simulation 3 (since they are the recipients of additional government transfers). The main difference between the two policies is that the oil price hike is more

Table 10. Oil and Consumer Subsidy Simulations: Comparison of Macro Effects (percentage change at 91/92 prices)

SIMULATION	1		2		3	
INDICATOR	Oil	Con-Sub	Oil	Con-Sub	Oil	Con-Sub
GDP	-3.2	-2.0	-1.7	0.0	-2.1	-0.3
Household income	-5.0	-5.1	-4.0	-3.9	-2.4	-1.3
Domestic Investment	0	0	9.8	13.0	0	0
Employment	-4.8	-3.0	-3.3	-1.1	-3.4	-0.9
Real exch. rate (£E/$)	-4.0	2.0	-4.4	1.4	-4.8	0.7
Cur. Acc. Surplus ($)	13.0	17.0	0	0	5.8	5.8

Note: Units are the same as in Tables 6 and 8.

contractionary. The reason is that this policy boosts oil exports, thereby causing exchange rate appreciation, less exports, and more imports.

Additional Simulations

Additional simulations were carried out to test the impact of combining the two policies and to check the sensitivity of the results to assumptions regarding trade elasticities and producer behavior. The simulated impact of the two policies combined--a simultaneous increase in domestic oil prices and a removal of consumer subsidies--was roughly additive and followed the same pattern as for the individual policies. The broad pattern remained unchanged when the values were doubled for the elasticities for export demand and substitutability between imports and domestic output--for most simulations, real GDP declined; closures 2 and 3 remained less contractionary; and the household did best for closure 3. However, increased sensitivity to exchange rate changes and opposite impacts of oil and consumer subsidy

cuts on the exchange rate widened the gap between the two sets of simulations; the oil simulations became more contractionary (real GDP fell by between 3.4 percent and 4.4 percent) while the consumer subsidy cuts had a milder negative effect (a maximum GDP decline of 1.7 percent) or a slightly positive impact (+0.3 percent for closure 2). The assumption that the producers in much of the economy follow a mark-up pricing rule and have excess capacity is crucial; when the model was simulated with all sectors except oil and electricity as profit maximizers with a fully utilized capital stock the maximum GDP change was merely 0.9 percent.

Limitations

The model simulations address short-run policy effects using a relatively aggregate model. Further disaggregation and the extension of the analysis to multiple time periods would throw additional light on the issues involved. The need for complementary medium- and/or long-run analyses is obvious given that, according to the current economic "consensus", positive effects should be expected over time as a result of the removal of price distortions. The primary candidates for disaggregation are the household and oil sectors; such an extension could yield considerable policy-relevant detail about distributional and sectoral issues. It would also be of interest to conduct identical simulations with a real-financial CGE model to check the robustness of the results with respect to model structure.

5. SUMMARY AND CONCLUSIONS

This paper has presented a CGE model for Egypt based on data for 1991/92. The model was applied to the analysis of the short-run equilibrium effects of two policies, raising domestic oil prices to the international level and removing consumer subsidies. The results suggest that, without any ambiguity, the impact of each policy is contractionary in terms of GDP, household income, consumption, and employment. These results sharply contrast with expected long-run benefits from these measures.

Each policy gives rise to an increase in government savings. The analysis was focused on exploring the trade-offs between three alternative uses for these savings: foreign investment (i.e. an increase in net foreign assets, for example debt repayment), domestic investment, and government transfers to the households. By far the most contractionary impact results for the first case. For the other two cases, the savings are used in a manner which stimulates the domestic economy, with a trade-off between investing in physical capital and improving current household conditions. However, little or no foreign debt is repaid in these scenarios.

In recent years, Egypt has experienced subsidy cuts, lower budget deficits, large current account surpluses, and declining domestic investment, suggesting that the first scenario has been the one followed. In early 1995, foreign debt repayment is no longer a high priority for Egypt's government--after large-scale cancellations, the debt burden is manageable. The second alternative requires that either the business sector (private or public) or the government[26] be willing and able to embark on domestic investment in

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[26]The "public sector" refers to state enterprises whereas "government" refers to the state activities that are financed via the state budget.

response to the increased availability of savings. In recent years (also before the inauguration of the 1991 economic reform program), this condition has not been satisfied. Government, private and public (state enterprise) investment have all declined (as shares of GDP). For the government, this is a response to fiscal constraints; for the private sector, it is a reaction to a relatively depressed economy, various constraints and uncertainty; for the public sector, it reflects financial difficulties and the fact that it is now in the beginning of a restructuring process possibly leading to large-scale privatization. Alternative three, increased household transfers, has so far also been subject to fiscal constraints. However, given that today's political instability often is ascribed to social factors, it may be an attractive option as subsidies are further cut if the transfers could be targeted to poor and/or politically volatile groups. The general implication is that subsidy cuts promise to be less painful in the short run in the absence of fiscal side targets and in a setting where other parts of the structural adjustment program have been completed successfully.

Micro impacts were also analyzed. For the oil simulations, one noteworthy effect is a reduction in domestic oil use by 6-8 percent, freeing up oil for exports and promising to reduce air pollution, a high priority, especially for Cairo. For consumer subsidy cuts, the food industry is, contrary to what one might expect, not very strongly affected--the reasons are relatively low price and income elasticities for household food demand. For simulations with a savings-driven increase in domestic investment, the main supplier of capital goods, the construction sector, expands strongly (by 9-12 percent).

The main conclusion is that the effects of these two policy actions should not be viewed in isolation from complementary measures and general economic conditions. Is it a high priority to pay back foreign debt? Are the producing sectors in a position to turn additional savings into new investment? Do fiscal conditions and government capacity permit the efficient channeling of additional government savings to investment or household transfers?

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APPENDIX

Table A.1. Micro SAM for 1991-92 (million LE)

	1. LABOR	2. CAPITAL	3. LAND	4. HHOLD	5. GOVT
1. LABOR					7994
2. CAPITAL					
3. LAND					
4. HHOLD	35014	81096	2191		13123
5. GOVT		8830		4443	
6. ROW		4624		1190	3087
7. AGRCR-A					
8. AGRAN-A					
9. FOOD-A					
10. OIL-A					
11. OIND-A					
12. TRN-A					
13. OSER-A					
14. ELE-A					
15. CON-A					
16. AGRCR-DC				10752	330
17. AGRAN-DC				6119	147
18. FOOD-DC				14037	382
19. OIL-DC				4338	158
20. OIND-DC				19115	1301
21. TRN-DC				4972	328
22. OSER-DC				32176	837
23. ELE-DC				2408	121
24. CON-DC					141
25. AGRCR-MC				1364	16
26. AGRAN-MC				175	
27. FOOD-MC				6506	538
28. OIL-MC				213	255
29. OIND-MC				1818	1619
30. TRN-MC				54	93
31. OSER-MC				294	210
32. TAX				10107	
33. TARIFF					
34. SUB					4450
35. S-I				34062	6147
36. TOTAL	35014	94550	2191	154143	41277

Source: Own computations (see Section 3).
Note: To save space, row totals (= column totals), are not shown. The imbalances which appeared as a result of rounding to even millions were removed manually.
Notation: "-A" is suffixed for activities, "-DC" for domestic commodities, and "-MC" for imported commodities. The nine categories of activities/commodities are abbreviated as follows: AGRCR = Crop Agriculture; AGRAN = Animal Agriculture; OIND = Other Industry; TRN = Transportation; OSER = Other Services; ELE = Electricity; CON = Construction. Other abbreviations: HHOLD = Household; GOVT = Government; ROW = Rest of World; TAX = Taxes; TARIFF = Import tariffs; SUB = Subsidies; S-I = Savings-Investment.

cont.	6. ROW	7. AGRCR-A	8. AGRAN-A	9. FOOD-A	10. OIL-A
1. LABOR		4592	615	802	447
2. CAPITAL	2358	11750	1861	3094	11820
3. LAND		2191			
4. HHOLD	18695				
5. GOVT	3672				
6. ROW					
7. AGRCR-A	890				
8. AGRAN-A	112				
9. FOOD-A	456				
10. OIL-A	8919				
11. OIND-A	4699				
12. TRN-A	8571				
13. OSER-A	16088				
14. ELE-A					
15. CON-A					
16. AGRCR-DC		800	4249	3446	
17. AGRAN-DC		504	71	1399	
18. FOOD-DC			1076	344	
19. OIL-DC		37	8	17	1291
20. OIND-DC		1173	46	340	532
21. TRN-DC		32	10	34	95
22. OSER-DC		614	450	209	451
23. ELE-DC		16	7	53	140
24. CON-DC		9	4	22	22
25. AGRCR-MC		448	66		
26. AGRAN-MC					
27. FOOD-MC		1		6310	
28. OIL-MC					80
29. OIND-MC		184		324	4
30. TRN-MC					
31. OSER-MC					539
32. TAX		34	12	1135	792
33. TARIFF					
34. SUB		-247	-33		-58
35. S-I	-12089				
36. TOTAL	52371	22138	8442	17529	16155

cont.	11. OIND-A	12. TRN-A	13. OSER-A	14. ELE-A	15. CON-A
1. LABOR	4301	2243	10916	457	2647
2. CAPITAL	13502	11362	33327	1604	3872
3. LAND					
4. HHOLD					
5. GOVT					
6. ROW					
7. AGRCR-A					
8. AGRAN-A					
9. FOOD-A					
10. OIL-A					
11. OIND-A					
12. TRN-A					
13. OSER-A					
14. ELE-A					
15. CON-A					
16. AGRCR-DC	1540	30	92		
17. AGRAN-DC	24	11	55		
18. FOOD-DC	69	207	945		
19. OIL-DC	388	759	31	586	77
20. OIND-DC	8887	857	1258	478	5177
21. TRN-DC	256	185	2662	52	96
22. OSER-DC	2906	317	6004	112	169
23. ELE-DC	679	68	283	3	8
24. CON-DC	180	22	1064	51	2
25. AGRCR-MC					
26. AGRAN-MC					
27. FOOD-MC	91				
28. OIL-MC	88	322			
29. OIND-MC	9048	604	1811	219	2776
30. TRN-MC		502			
31. OSER-MC			2898		
32. TAX	531	323	479	2	85
33. TARIFF					
34. SUB	-88				
35. S-I					
36. TOTAL	42402	17812	61825	3564	14909

cont.	16. AGRCR-DC	17. AGRAN-DC	18. FOOD-DC	19. OIL-DC	20. OIND-DC
1. LABOR					
2. CAPITAL					
3. LAND					
4. HHOLD					
5. GOVT					
6. ROW					
7. AGRCR-A	21248				
8. AGRAN-A		8330			
9. FOOD-A			17073		
10. OIL-A				7236	
11. OIND-A					37703
12. TRN-A					
13. OSER-A					
14. ELE-A					
15. CON-A					
16. AGRCR-DC					
17. AGRAN-DC					
18. FOOD-DC					
19. OIL-DC					
20. OIND-DC					
21. TRN-DC					
22. OSER-DC					
23. ELE-DC					
24. CON-DC					
25. AGRCR-MC					
26. AGRAN-MC					
27. FOOD-MC					
28. OIL-MC					
29. OIND-MC					
30. TRN-MC					
31. OSER-MC					
32. TAX				498	2607
33. TARIFF					
34. SUB					
35. S-I					
36. TOTAL	21248	8330	17073	7734	40310

cont.	21. TRN-DC	22. OSER-DC	23. ELE-DC	24. CON-DC	25. AGRC-MC
1. LABOR					
2. CAPITAL					
3. LAND					
4. HHOLD					
5. GOVT					
6. ROW					1894
7. AGRCR-A					
8. AGRAN-A					
9. FOOD-A					
10. OIL-A					
11. OIND-A					
12. TRN-A	9241				
13. OSER-A		45737			
14. ELE-A			3564		
15. CON-A				14909	
16. AGRCR-DC					
17. AGRAN-DC					
18. FOOD-DC					
19. OIL-DC					
20. OIND-DC					
21. TRN-DC					
22. OSER-DC					
23. ELE-DC					
24. CON-DC					
25. AGRCR-MC					
26. AGRAN-MC					
27. FOOD-MC					
28. OIL-MC					
29. OIND-MC					
30. TRN-MC					
31. OSER-MC					
32. TAX			222	1016	
33. TARIFF					
34. SUB					
35. S-I					
36. TOTAL	9241	45737	3786	15925	1894

cont.	26. AGRAN-MC	27. FOOD-MC	28. OIL-MC	29. OIND-MC	30. TRN-MC
1. LABOR					
2. CAPITAL					
3. LAND					
4. HHOLD					
5. GOVT					
6. ROW	288	12699	955	22602	759
7. AGRCR-A					
8. AGRAN-A					
9. FOOD-A					
10. OIL-A					
11. OIND-A					
12. TRN-A					
13. OSER-A					
14. ELE-A					
15. CON-A					
16. AGRCR-DC					
17. AGRAN-DC					
18. FOOD-DC					
19. OIL-DC					
20. OIND-DC					
21. TRN-DC					
22. OSER-DC					
23. ELE-DC					
24. CON-DC					
25. AGRCR-MC					
26. AGRAN-MC					
27. FOOD-MC					
28. OIL-MC					
29. OIND-MC					
30. TRN-MC					
31. OSER-MC					
32. TAX			68	1827	
33. TARIFF		747	33	3814	
34. SUB					
35. S-I					
36. TOTAL	288	13446	1056	28243	759

cont.	31. OSER-MC	32. TAX	33. TARIFF	34. SUB	35. S-I
1. LABOR					
2. CAPITAL					
3. LAND					
4. HHOLD				4024	
5. GOVT		19738	4594		
6. ROW	4273				
7. AGRCR-A					
8. AGRAN-A					
9. FOOD-A					
10. OIL-A					
11. OIND-A					
12. TRN-A					
13. OSER-A					
14. ELE-A					
15. CON-A					
16. AGRCR-DC					9
17. AGRAN-DC					
18. FOOD-DC					13
19. OIL-DC					44
20. OIND-DC					1146
21. TRN-DC					519
22. OSER-DC					1492
23. ELE-DC					
24. CON-DC					14408
25. AGRCR-MC					
26. AGRAN-MC					113
27. FOOD-MC					
28. OIL-MC					98
29. OIND-MC					9836
30. TRN-MC					110
31. OSER-MC					332
32. TAX					
33. TARIFF					
34. SUB					
35. S-I					
36. TOTAL	4273	19738	4594	4024	28120

Table A.2. Elasticity values for CGE model

Elasticity	Value	Elasticity	Value
Export demand		Factor substitution	
Crop Agriculture	-2.4	Crop Agriculture	0.9
Animal Agriculture	-2.4	Animal Agriculture	0.9
Food	-2.4		
Oil	- š		
Other Industry	-3.0		
Transportation (1)	n.a.		
Other Services	-1.0		
Domestic good-import substitution		Household spending	
Crop Agriculture (2)	1.2	Crop Agriculture	0.333
Animal Agriculture	1.2	Animal Agriculture (4)	0.333
Food	0.8	Food	0.500
Oil (3)	0.2	Oil	1.333
Other Industry	0.6	Other Industry	1.333
Transportation	0.4	Transportation	1.333
Other Services	0.4	Other Services	1.333

Source: Based on values extracted from survey of other CGE models. See Lofgren (1994c).

Notes: 1. Export quantity and price are both fixed.
2. These values apply for all demanders except government for less which a value of 0.2 is used, assuming that the government is price-responsive than producing sectors and household.
3. Low value since specialized products are imported in a public-sector setting.
4. These elasticities satisfy the Engel condition. The value for the Frisch parameter (-5.03) was computed assuming the non-linear relationship between the Frisch parameter and GNP per capita estimated by LLuch et al. (1977:76). 1991/92 GNP per capita was computed as 847 in current dollars and 237 in 1970 dollars (on the basis of data in IMF's International Financial Statistics). See also Dervis et al. (1982:483).

Table A.3. Consumer subsidy rates (percent)

Commodity	Value
Food	17.2
Transportation	4.2
Other Services	0.8

Source: Unpublished government data; author's computations.

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