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LESS POVERTY IN EGYPT? EXPLORATIONS OF ALTERNATIVE PASTS WITH LESSONS FOR THE FUTURE

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Abstract

In this paper, the impact of alternative development strategies on growth and poverty is assessed in an economywide framework, using Egypt as a case study. The analysis is guided by the following question: By pursuing a development strategy different from the one actually pursued since the late 1970s, could Egypt's government significantly have improved the status of its poor? To address this question, a dynamic, recursive, Computable General Equilibrium (CGE) model is used to simulate Egypt's economy for the period 1979-1997. The model is built around a Social Accounting Matrix (SAM) for 1979. The base scenario incorporates Egypt's evolving policy regime and changes in Egypt's external environment, including a gradual transition toward an economy with less government involvement. The other scenarios differ in terms of trade policies, domestic incentives, asset distribution, and the pattern of domestic productivity growth.

The results indicate that pro-poor redistribution of land and human capital assets could have been a particularly effective tool had Egypt prioritized more strongly to improve the welfare of the poor and reduce inequalities. Such policies could have been implemented without any noticeable negative impact on growth or aggregate welfare. The results also suggest that, for Egypt, there was no contradiction between more rapid growth, largely a function of more rapid productivity growth, and improved welfare for the poor. The impact of more rapid reduction of price distortions, induced by taxes and subsidies, is small but positive in terms of aggregate growth. The effects of introducing biases in favor of specific sectors may be stronger and depend on the specific context, including the nature of economic linkages and, with regard to the policies analyzed in this paper, on the ease with which it is possible to raise productivity growth, reduce transactions costs, and get improved access to export markets. The present analysis confirms the finding of earlier analyses that, compared to pro-manufacturing policies, pro-agricultural policies have a more positive impact on household welfare in general and the poor in particular. There is a significant synergy between a pro-agricultural shift in productivity growth, improved market access for agricultural exports, and reduced transactions costs in foreign trade.

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1. INTRODUCTION[1]

In this chapter, the impact of alternative development strategies on growth and poverty is assessed in an economywide framework, using Egypt as a case study. The analysis is guided by the following question: By pursuing a development strategy different from the one actually pursued since the late 1970s, could Egypt's government significantly have improved the status of its poor? To address this question, a dynamic, recursive, Computable General Equilibrium (CGE) model is used to simulate Egypt's economy for the period 1979-1997. The model is built around a Social Accounting Matrix (SAM) for 1979. The base scenario incorporates Egypt's evolving policy regime and changes in Egypt's external environment, including a gradual transition toward an economy with less government involvement. The other scenarios differ in terms of trade policies, domestic incentives, asset distribution, and the pattern of domestic productivity growth.

We will proceed as follows. Section 2 describes the evolution of the Egyptian economy during the period 1979-1997. In Section 3, the model and its database are presented. Section 4 defines the simulations and presents their results. Section 5 discusses the broader implications of the results and extracts conclusions.

2. EGYPT'S ECONOMY 1979-1997

Since the start of its economic "open-door" policy in 1974, Egypt has undergone a gradual transition toward a more open economy with less government involvement and stronger reliance on the private sector.

Tables 2.1 and 2.2 summarize the evolution of Egypt's economy between 1979 and 1997. As indicated by Table 2.1, GDP at market prices and factor cost grew at average rates of around 5% per year. After having benefited from an oil-driven boom after 1974, Egypt faced a deteriorating external environment during most of the 1980s. Relative changes in the international prices of Egypt's exports and imports were unfavorable – in current dollars, export and import prices increased by 12% and 96%,

[1]The author would like to thank Moataz El-Said and Rebecca Harris for professional research assistance and, together with other colleagues in IFPRI's Trade and Macroeconomics Division, for helpful comments.

respectively. The major factor behind this terms-of-trade loss was a strong decline in the real world prices of Egypt's main export, oil. At the same time, the growth rate slowed down for other major sources of foreign exchange, most importantly remittances from workers abroad. These developments were major factors behind a balance-of-payments crisis in the late 1980s, followed by a program of stabilization and structural adjustment in the early 1990s. The severity of the crisis was mitigated by extensive debt forgiveness from Western lenders in the wake of the 1991 Gulf War.[2]

In the context of Egypt's adjustment to tighter external constraints, import growth was relatively slow while exports continued to expand at pace with the rest of the economy. As a result, domestic absorption grew less rapidly than GDP at market prices. Among the components of absorption, investment and government consumption suffered relative to household consumption. On the sectoral level, GDP at factor cost grew most rapidly for services, followed by industry with agriculture lagging in relative terms.[3]

The decline in the GDP share of government consumption is indicative of a general shift toward less government involvement in the economy. Table 2.2 shows that the GDP shares declined for trade taxes (primarily import tariffs), consumer subsidies (non-targeted but providing substantial benefits to the poor) and total current government revenue while the shares of direct taxes and domestic indirect taxes remained roughly unchanged. The fall in the share of the government budget in the overall economy coincided with a gradual reduction in centralized government controls over prices, production, and investment. For the agricultural sector, this has involved a gradual elimination of implicit taxation administered by means of price controls on outputs (taxing the farmers) and inputs (subsidizing the farmers). In 1979, the net effect of these policies was a tax burden that corresponded to 20% of sectoral value-added (Dethier, 1989b, pp. 263-265; Dethier, 1989b, p. 267; Löfgren, 1997, pp. 283-286). At the time, the implicit subsidy on domestic purchases of oil represented a larger GDP share than food subsidies or implicit agricultural taxes. In the 1970s, Egypt's government did not increase

[2]In current dollars, Egypt's foreign debt grew from 14bn in 1979 to $46bn in 1988. By 1997, it had declined to $30bn, primarily as a result of forgiveness (World Development Indicators, 1999).
[3]Table A.1 includes more disaggregated data on the sectoral structure of trade, production, and final demand in 1979 and 1997.

Table 2.1: Macro data for Egypt 1979-1997.

	Annual real growth 1979-97 (%)[1]	Nominal GDP shares (%)	
		1979	1997
GDP at market prices	5.1	100.0	100.0
Private Consumption	4.6	64.4	74.9
Fixed investment	0.9	31.6	17.7
Government consumption	2.8	17.9	10.2
Resource Balance		-13.9	-2.8
Net Indirect Tax		5.4	6.6
GDP at factor cost	5.1	100.0	100.0
Agriculture	2.8	22.1	17.7
Industry	5.2	35.6	31.8
Services	5.9	42.3	50.5
TFP	1.8		
Exports	5.3	29.3	21.4
Imports	0.5	43.3	24.2
Export price index (current dollars 1979=100)		100.0	112.4
Import price index (current dollars 1979=100)		100.0	195.6
Population[2]	2.3	39.9	60.3
Per-capita consumption[3]	2.2	100.0	148.2
Gini Coefficient			
Rural		27.5	32.1
Urban		32.2	38.5
Poverty[4]			
Rural		16.1	23.3
Urban		18.2	22.5

Sources: World Bank, 1999; Handy, 1998, p. 8; Adams, 1999, pp. 13, 17, 34, 38; SAMs for 1979 and 1997 (see Löfgren, 2000)

Notes:

1 Unless otherwise noted this column shows annual real percentage growth for 1979-1997.

2 The first column shows annual growth. The columns 1979 and 1997 show total population in millions.

3 The first column shows annual growth. The columns 1979 and 1997 show real consumption (1979=100).

4 The data are for 1981/82 and 1995/96, respectively. The indicator used is the headcount index with the poor defined as the share of the population that is below both food and non-food poverty lines.

Table 2.2. Selected government items and implicit taxes and subsidies, 1979 and 1997 (% of GDP).

	1979	1997
Government revenues		
Trade taxes	7.9	3.2
Indirect taxes	4.5	5.0
Direct taxes	6.2	5.7
Total*	32.1	18.1
Government expenditures		
Consumption	17.9	10.2
Consumer subsidies	7.0	1.6
Government Savings	0.4	2.9
Implicit agricultural tax	4.9	0.0
Implicit oil subsidy	24.6	0.0

Source: SAMs for 1979 and 1997 (see Löfgren, 2000)
*Total includes other revenue items.

domestic prices of petroleum products as international prices soared. As a result, in the late 1970s and early 1980s, the domestic price was on average only around 20% of the export price (World Bank, 1980, p. 77; Choucri and Lahiri, 1983, p. 2). Since then, the government subsidy has gradually been eliminated as domestic prices have been raised and the export price has fallen.

In summary, during this period Egypt underwent a process of macro stabilization and structural adjustment in response to a deteriorating external environment. At the same time, Egypt managed to raise government savings and move from deficit to surplus in the current account of the Balance of Payments, while overall growth was maintained at a moderate level.

A major issue is how the poor have managed during such a process of stabilization and structural adjustment. Available statistics indicate that, compared to other developing countries, Egypt is relatively egalitarian (Hansen, 1991, pp. 25-26) but has a low level of human development relative to its per-capita income.[4] The data in

[4]Data for 1995 indicate that Egypt ranked 92 according to its real GDP per capita (PPP$) but only 112 on the basis of its Human Development Index value (UNDP, 1998).

Table 2.1 indicates that, although average per-capita household consumption grew by around 2% per year, both poverty and inequality have increased.[5]

Changes in the economic conditions of the poor may be seen as determined by the rate and pattern of economic growth, including the influence of explicit anti-poverty interventions. In the Egyptian context, many analysts have concluded that government interventions in the price system, including both price controls and tax and subsidy policies, have distorted incentives, leading to growth-reducing inefficiencies (Hansen, 1991, p. 167). In addition to explicit taxes, complex export and import procedures give rise to transactions costs that represent a significant part of the value of the traded goods.[6] As noted by Hansen (1991, p. 15), these transaction costs, which are likely to have risen in the second half of the 1970s (during the first years of Egypt's economic opening), may represent socially unnecessary waste. As a form of non-tariff barriers, they also make sales in domestic markets more profitable, thereby reducing economic openness and stifling the impact of government efforts to promote exports (World Bank, 1997, pp. 62-69).

At a given growth rate, the pattern of growth is likely to matter in terms of what happens to the poor. A pro-agricultural strategy has frequently been advocated because of linkage effects and distributional considerations. Such a strategy may raise the incomes of the poor, not only of those working in the agricultural sector, but also of others who, in relatively labor-intensive activities, supply final consumption goods to the poor and intermediate inputs to agricultural production (see for example Adelman, 1984, p. 938; Delgado et al. 1998, pp. 5-25). As noted above, since the early 1980s, Egypt has gradually removed what initially was a severe bias against the agricultural sector.

Explicit anti-poverty interventions may improve the welfare of the poor by raising the quantity or productivity of their assets, by boosting the sale price of the services of these assets, and by subsidizing the prices of commodities in the "basic needs" basket

[5] The poverty and inequality data in Table 2.1 are based on nationally representative household surveys by CAPMAS (Egypt's national statistics agency) in 1981/82 and 1995/96, and by IFPRI in 1997. Both the inequality and the poverty figures are uncertain, for inequality both in terms of levels and direction of change, and for poverty primarily in terms of levels. Informed assessments, based on comparisons between different studies, suggest that both rural and urban poverty rates have increased since the beginning of 1980s (Assaad and Rouchdy, 1999, pp. 12-14; Adams, 1999, pp. 10-14 and 16-19).

[6] The rates vary widely depending on the commodity and the trading partner. According to the World Bank (1997, p. 66), the estimated rates range from 5-90% of the product value.

(Adelman and Robinson, 1989, pp. 983-984). In Egypt, consumer subsidies have protected the living standards of the poor, at least from a short-run perspective. As a share of total household consumption, these subsidies declined from 11% in 1979 to 2% in 1997. In terms of per-capita benefits, they have been higher (by some 30-50%) in urban areas but quite equally distributed across the different households in each area (Alderman and von Braun, 1984, pp. 41-42; Ahmed et al., 1998, pp. 95-96).

Among asset-related poverty interventions, the role of the government in influencing the land and human capital assets of the poor is particularly important.[7] After the 1952 revolution, the land reform and expansion of education and health care enabled the poor to earn higher incomes, thereby reducing inequality and poverty.[8] In recent years, some of these developments have been reversed as land tenancy laws, which, at the time of the land reform in the 1950s, gave tenants with formal contracts near ownership rights, have been modified to the advantage of the owners. At the same time, the quality of public education has deteriorated while its cost has increased (Assaad and Rouchdy, 1999, pp. 24-27, 34-36; the Economist 1999, pp. 10-12). Other things being equal, these developments reduce the shares of the poor in the skilled labor force, and in labor and land incomes.[9]

In this chapter, a CGE model of Egypt is used to simulate the impact on economic performance, including household welfare, from changes in the different areas referred to in the preceding discussion (tax- and subsidy policies; transactions costs in foreign trade; asset distribution; and productivity growth). The analysis pays special attention to potential trade-offs between growth and equity. While the analysis is applied to Egypt during a specific period of its history, the aim is to contribute to a broader

[7] On the basis of a review of several studies, Assaad and Rouchdy (1999, p. 18) conclude that the level of education of the head of household seems to be the best predictor of poverty. The 1996 Human Development Report for Egypt notes that the uneven land distribution contributes greatly to poverty in rural Egypt (Assaad and Rouchdy, p. 34, citing INP, 1996, p. 40).

[8] Between 1958/59 and 1974/75, the Gini coefficient at the national level declined from 0.43 to 0.38. (Hansen, 1991, p. 226). For data documenting improvements in human capital between 1960 and 1986, see Hansen (1991, pp. 229-234). Egypt's Human Development Report for 1997/98 documents increases in the country's Human Development Indicator for the period 1960-1995 (UNDP, 1998b, pp. 14-16).

[9] Appendix Tables A.2 and A.3 summarize the parts of a 1979 Social Accounting Matrix (SAM) of Egypt that links factor payments to disaggregated households groups (rural and urban poor, middle-income and rich households).

understanding of the impact of alternative policies, in particular in terms of the welfare of the poor. The next section presents the model that is used in the analysis.

3. A CGE MODEL OF EGYPT: STRUCTURE AND DATABASE

The dynamic CGE model of this chapter is structured and disaggregated so as to be able to capture major features of Egypt's policy regime and alternative policies aimed at improving the welfare of the poor. The model is distinguished by its inclusion of consumer subsidies, implicit taxes on agriculture and subsidies on oil, transactions cost in foreign trade, perfect transformability in foreign trade for selected commodities, and a flexible treatment of closures for the macro balances. In other respects, it is kept as simple as possible. It functions as a simulation laboratory, permitting the conduct of controlled experiments that address counterfactual, "what-if" questions regarding the impact of alternative policy packages on Egypt's economy during the period 1979-1997.[10]

The model is calibrated to a Social Accounting Matrix (SAM) of Egypt for 1979 and draws on a database that summarizes the evolution of Egypt's economy for the period 1979-1997. One advantage of simulating a CGE model for a historical period is that the validity of the model can be assessed via a comparison between observed and simulated data.[11]

The model consists of two parts, a static within-period submodel and a dynamic, between-period submodel. The static submodel solves for general equilibrium in one time period while the dynamic submodel updates model parameters, either according to exogenous trends (for population, labor force, and changes in the policy regime) or on the basis of earlier model solutions (for capital stocks).

[10] The seminal studies introducing the use of CGE models to analyze alternative development strategies for developing countries are Adelman and Robinson (1978) on South Korea, and Dervis and Robinson (1978) on Turkey. For the analysis of Turkey, see also Dervis *et al*. (1982). Earlier Egypt studies in this vein include Dethier (1985), Ahmed *et al*. (1985), and Löfgren *et al*. (1998). For a review of CGE models of Egypt, see Löfgren (1994).

[11] The relatively few observations that are available over time make it difficult or impossible to pursue the alternative approach of using an econometrically estimated model while maintaining a satisfactory treatment of policy tools and policy-relevant disaggregation of sectors and households.

This section starts with a description of the static submodel. After this, we turn to the dynamic submodel and the database.

3.1. THE STATIC SUBMODEL

Factors, Activities and Domestic Institutions

Table 3.1 shows the disaggregation of factors, activities, and institutions.

Table 3.1. Disaggregation of institutions, factors and activities.

Set	Elements
Factors (4)	Unskilled labor, Skilled labor, Capital, Land
Activities (9)	Agriculture, Oil, Food processing, Textiles, Other industry, Construction, Transportation, Government labor services, Other services
Households (6)	Rural poor, Rural middle, Rural rich Urban poor, Urban middle, Urban rich
Other institutions (2)	Government, Rest of world

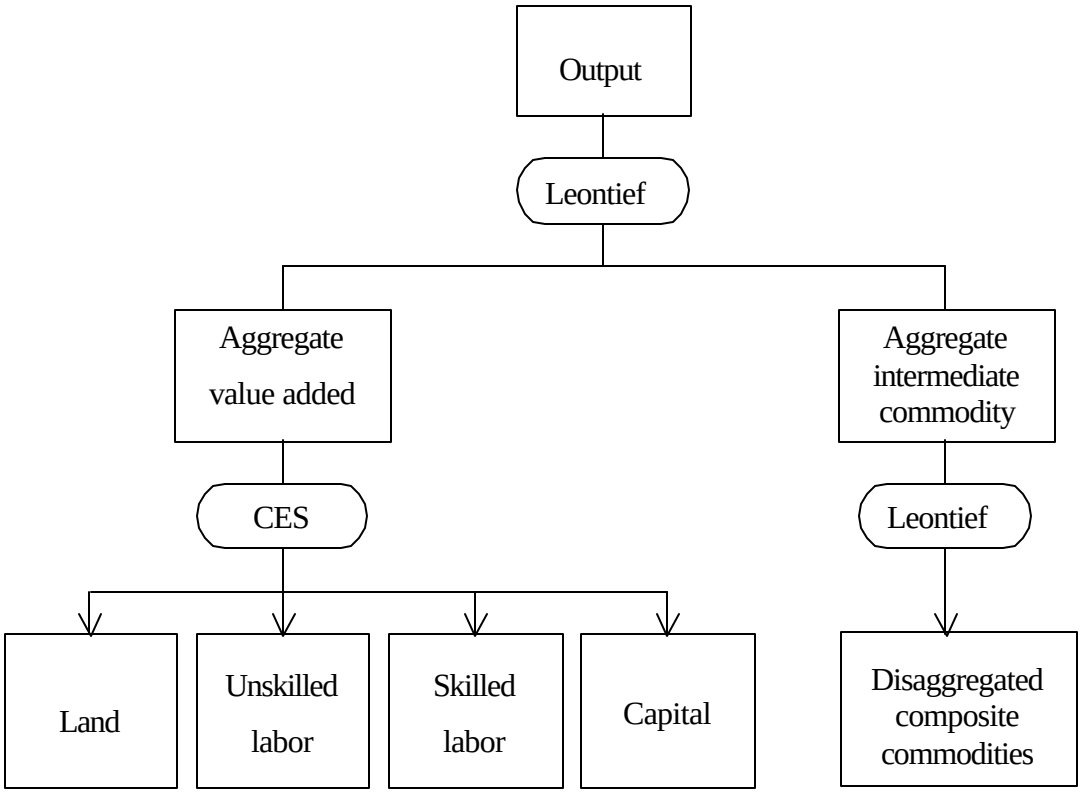
The model includes nine activities, each of which produces a distinct commodity. Most activities use capital and both labor types.[12] The only exceptions are agriculture, which uses land, capital and unskilled labor, and government labor services, which only uses skilled and unskilled labor.

The production technologies are summarized in Figure 3.1. Producers are assumed to maximize profits subject to a multi-level technology. At the top level, output is a Leontief aggregation of aggregate value-added and an intermediate input aggregate. Aggregate value added is produced by factors in a CES (constant-elasticity-of-substitution) function. The intermediate input aggregate is a Leontief aggregation of disaggregated commodities. Like other commodities used domestically, each disaggregated intermediate input is a composite commodity that is made up of imports and domestic output sold domestically. (See the discussion below on the treatment of the rest of the world.)

[12] Dethier (1985, pp. 134-139, 181) has seven labor categories that here have been aggregated to two , skilled and unskilled.

For the oil sector, production is driven by decisions regarding the use of oil reserves, a factor that is not explicit in the model. In order to treat oil production as largely exogenous in a simple manner, capital use in the oil activity is fixed while the elasticity of factor substitution is set at a low level.

Figure 3.1: Production technology



Domestic factor incomes are split among the domestic institutions (households and government) in fixed shares. In addition to factor incomes, government revenue consists of transfers from the rest of the world (fixed in foreign currency), import tariffs, and taxes – direct taxes, activity taxes, sales taxes, and export taxes. On the spending side, government consumption and transfers to households are fixed shares of nominal GDP. Transfers to the rest of the world from the government (as well as any other domestic institution sending money abroad) are fixed in foreign currency. The government subsidizes household food consumption. All taxes and subsidies are *ad valorem*. In addition to these taxes and subsidies (which appear explicitly in the government budget), the implicit taxation to which Egypt's agriculture has been subjected during most of the period studied is modeled as a tax on agricultural value-added that is passed on to domestic demanders of the agricultural commodity in the form of a lower price.

In both rural and urban areas, the bottom two quintiles are classified as "poor."[13] The middle-income households are represented by the third and fourth quintiles and the rich by the top quintile. Each household type is characterized by a specific pattern of factor ownership and other income sources. In addition to the income flows referred to above – factor incomes and government transfers – households receive transfers (primarily remittances from temporary migrant workers abroad) from the rest of the world (fixed in foreign currency). Household incomes are used to pay taxes, save (according to an exogenous saving propensity), and consume. Consumption demand is determined by the linear expenditure system (LES), expressed in per-capita form.

The Rest of the World and Commodity Markets

In addition to paying and receiving transfer payments (all of which are fixed in foreign currency), the rest of the world supplies imports and demands exports.

[13]The shares of the rural and urban populations defined as poor are higher than in Table 2.1. However, poverty rates vary widely between different studies, in part depending on differences in definitions or the data. On the basis of the 1995/96 CAPMAS household survey, El-Laithy (1997, pp. 2-3, 7) arrived at urban, rural and national (upper level) poverty rates of 43.4%, 46.9%, and 45.2%, respectively. The urban and rural per-capita expenditure levels that defined the dividing line between poor and non-poor were derived from estimates of the costs of food baskets meeting minimum nutritional needs in each area and statistically estimated relationships between food and non-food expenditures.

To the extent that a commodity is imported, all domestic users – households, the government, investors, and producers using intermediate inputs – demand a composite commodity that is an aggregation of imports and domestic output sold domestically. (If it is not imported, domestic demanders simply buy the domestic commodity.) The mix between demands for imports and domestic output is sensitive to relative prices in a setting with imperfect substitutability captured by a CES-aggregation function. Similarly, if a commodity is exported, domestic output is transformed into supplies of exports and domestic sales in proportions that are sensitive to relative prices in a setting with imperfect transformability captured by a constant-elasticity-of-transformation (CET) function. In addition, during the years preceding 1979, Egypt liberalized its import regime, among other things by permitting "own-exchange" imports for agents that had earned foreign exchange. As a result, imports surged very rapidly, most likely a reflection of pent-up demand (Hansen, 1991, p. 202). To capture this, the model assumes that, Egypt initially was above its import demand curve but were back on it by 1997 after a gradual shift.

The imperfect substitutability and transformability assumptions grant the domestic price system a certain degree of independence from international prices and dampen export and import responses to changes in the producer environment. The model explicitly considers transactions costs in foreign trade. For every unit of a commodity that is imported or exported, a fixed quantity of service commodities is demanded.

The processes of commodity aggregation (of commodities from different sources for domestic use) and transformation (of domestic outputs to supplies to different destinations) generate demands for and supplies of domestic outputs destined for domestic use. These markets are cleared by flexible domestic prices.

These two processes also generate import demands and export supplies. Egypt is treated as a small country on the import side, buying any quantity it desires at prices that are exogenous in foreign currency. On the export side, Egypt faces downward-sloping but relatively elastic export demand curves. In addition to the foreign-currency price, the prices paid for imports by domestic demanders and received by domestic producers for their exports both depend on the exchange rate, and trade taxes and subsidies. In the

domestic market, consumer subsidies (primarily on food) lower the prices paid by households.

A different treatment of exports is applied to the oil and agriculture commodities, for which quality differences between quality differences are relatively small between items that are traded internationally and sold and produced domestically. For oil, it is assumed that domestic output and exports are perfectly transformable. For both oil and agriculture, export demand is infinitely elastic at prevailing world prices.

Macro and Micro Closures

System constraints are those constraints that have to be satisfied by the economic system, but which are not considered in the decisions of any micro agent (Robinson 1989, p. 907-908). On the macro level, the constraints consist of three balances, associated with the accounts for the government, the rest of the world, and savings-investments. On the micro level, the constraints are represented by supply-demand balances in the product and factor markets. The "closure rules" of the model indicate the mechanisms on the basis of which the model satisfies these constraints. Table 3.2 summarizes the rules that are followed. To assure that the base run provides a numerically realistic reference point for the counterfactual simulations, its closure rules are different for the government and savings-investment balances.

In the base simulation, government savings is a fixed share of GDP; the direct tax rates of the households are adjusted in a neutral manner to generate the target savings level.[14] The second government closure is applied in most experiments: government savings are treated as endogenous while direct tax rates are fixed.[15]

[14] According to the adjustment rule, the change in the direct tax rates is uniform across the different household categories. For example, if the rates of households A and B initially are 5% and 10%, respectively, and there is a need to increase the overall rate by two points, the adjusted tax rates of households A and B become 7% and 12%. The adjustment rule is the same for household savings rates.

[15] The formulation with flexible government savings provides insight about the changes in government savings, total savings and investment that would have taken place in the absence of a complementary change in government tax or spending policy.

Table 3.2. Equilibrating variables for micro and macro constraints.

	Equilibrating variable	
	BASE simulation	Other simulations
Macro Constraints		
Savings-investment balance	Household savings rates (investment is fixed GDP share; investment-driven savings)	Quantities of investment demand (savings-driven investment)
Government balance	Direct income tax rate (government savings is fixed GDP share)	Government savings (fixed direct income tax rates) OR same as BASE
Current account of Balance of Payments	Exchange rate	same as BASE
Micro Constraints		
Markets for exports	Quantity demanded or (foreign-currency) export price	same as BASE
Markets for imports	Quantity supplied	same as BASE
Markets for domestic output sold domestically	Price	same as BASE
Markets for factors	Wage	same as BASE

For the savings-investment balance, the base simulation fixes investment as a share of GDP at observed levels. The savings rates of households are adjusted to assure that savings and investment values are equal. For the non-base simulations, investment quantities are scaled to balance savings and investment values. Household savings rates are kept at the levels of the base simulation.

Across all simulations, the third macro balance, the current account of the rest of the world (i.e. the current part of the Balance of Payments), clears via a flexible exchange rate. Foreign savings are fixed in foreign currency. This is a simplified treatment of Egypt's complex foreign exchange regime (including as many as three parallel exchange rates during part of the 1980s).

The micro level assumptions are also identical across all simulations, base and non-base. As mentioned above, for commodities, most export markets and the markets for domestic output that is sold domestically are cleared by flexible prices. The markets

for imports and selected exports are cleared by the quantities supplied and demanded, respectively (the small-country assumption).

Given the long-run nature of the analysis, it is assumed that all factors are mobile across activities. For capital, the model solves endogenously for the intersectoral allocation that equates the rental rate across sectors and fully employs the aggregate capital stock. A similar treatment is also used in the skilled and unskilled labor markets: total employment is fixed at observed levels while flexible aggregate wages clear each market. However, contrary to capital rents, the wages of both labor types are differentiated by activity on the basis of fixed ratios (calculated from base-year data), reflecting the presence of inter-sectoral wage gaps.

3.2. THE DYNAMIC SUBMODEL

The within-period, static model is solved in three-year intervals for seven years during the period 1979-1997. Between each static-model solution, selected parameters are updated in the dynamic (between-period) submodel. Among these, the aggregate capital stock is updated endogenously, given previous investment and depreciation, extrapolating for the inter-period years. Exogenous updating is applied to the parameters for population, domestic labor force, temporary labor migrants abroad, factor productivity, export and import prices, export demand parameters, government policies, and transfers to and from the rest of the world. The policy parameters include tax, tariff and subsidy rates as well as government consumption and government transfers. To assure that real growth in the oil sector stays close to the historical record, capital use in this sector is also updated exogenously, at the rate of growth in real oil GDP at factor cost.

3.3. DATABASE

The basic data source is a Social Accounting Matrix (SAM) for 1979 to which the bulk of the base year model parameters were calibrated. Initially, a SAM was constructed using the information in Dethier (1985, pp. 172-188). In order to make it possible to address issues raised in the above discussion, this SAM was adjusted and expanded in various areas. Additional data were needed for exogenous parameter updating between the solutions.

More specifically, the treatment of the government in the 1979 SAM was changed, including the separation of food subsidies from other government items. Implicit taxation of agriculture and transactions cost in foreign trade was made explicit. The evolution of rates of taxes and subsidies were derived by interpolating the data in the 1979 SAM and a SAM for 1997 with a similar disaggregation (see Löfgren and El-Said, 1999). Data for population, domestic labor force, and temporary migrants were derived from World Bank sources and various specialized studies.

For household consumption, the income elasticities of Dethier (1985, pp. 187) were retained. For each household group, the Frisch parameter was estimated using the formula in Lluch *et al.* (1977, p. 248). Trade and production elasticities were selected on the basis of the survey in Löfgren (1994b). (The elasticity values used in the model are displayed in Tables A.5-A.6.) [16]

It should be stressed that Egypt's database is incomplete in some areas and that data from different sources sometimes are contradictory. Hence, in various cases, the author had to informally evaluate available information and select plausible numbers.[17]

[16] The main sources that supplemented Dethier (1985) in the construction of the 1979 SAM were Alderman and von Braun (1984, pp. 41-42), Hansen (1991, p. 219), Dethier (1989, vol. II, p. 267), and World Bank (1997). In addition to the 1997 SAM used for Löfgren and El-Said (1999), the values for model parameter in future years were primarily derived from Hansen and Radwan (1982), Richards and Waterbury (1996), Fergany (1991), Ahmed *et al* (1998), IMF's International Financial Statistics (various years), World Bank (1997), World Bank (1999), and FAO (2000) .

[17] For goods trade (excluding oil exports), it was assumed that transactions costs in the base year represented 20% of the domestic price paid by domestic demanders or exporters (in effect reducing producer export revenue by this percentage). This estimate is at the lower end of a wide range (see World Bank, 1997.

4. SIMULATIONS

As mentioned above, the model is used to simulate the Egyptian economy for the period 1979-1997. In these simulations, the static submodel is solved in three-year intervals for seven years (1979, 1982, 1985, 1988, 1991, 1994, and 1997). Between the static solutions for individual years, parameters are updated endogenously (on the basis of simulated data from earlier years) or exogenously (on the basis of real-world data) following the procedure that was outlined in Section 3.

We will first present the results for the base scenario, comparing simulated data to real-world observations. After this we turn to the non-base simulations, which explore the effects of alternative scenarios for price liberalization, productivity growth, and asset redistribution.

4.1. BASE SCENARIO AND MODEL VALIDATION

The model is initially solved for the base simulation that provides the benchmark to which the results for the other simulations are compared. In the dynamic submodel, all changes in parameter values were gradual: the values of most parameters move at a constant percentage rate between 1979 and 1997. The values for 1997 values coincide with observed real-world data.

As noted in Section 3 (see Table 3.2), the closure assumptions for the base simulation are defined to assure that the model more closely tracks observed changes on the macro level. For the government, the rates for explicit taxes and subsidies are scaled so as to assure that each tax and revenue value matched the observed GDP share. Moreover, the efficiency parameters of the value-added functions (indicating total factor productivity) are multiplied by a scalar (uniform across all activities) that adjusted endogenously to generate the trend level of aggregated real GDP at factor cost. In the non-base simulations, efficiency parameters and tax and subsidy rates are all fixed at the levels generated by the base simulation unless changes are introduced as part of the experiments.

Table 4.1 compares the observed and simulated growth rates for the period 1979-1997. In general, the simulated data are reasonably close to the observed data, with the gaps between the two staying within the range of measurement errors for observed data (judging from revisions of macro data and discrepancies between alternative series). [18] The endogenously generated rate of TFP growth is close to an independent estimate. Growth in GDP at factor cost is by construction identical to the observed rate. The only significant discrepancy is for imports, presumably a reflection of errors in data and/or in the model specification.[19]

Table 4.1. Actual and simulated growth rates, 1979-1997.

	Actual growth (% p.yr.)	Simulated growth (% p.yr.)
GDP at market prices	5.1	4.7
Consumption	4.6	5.1
Fixed investment	0.9	0.9
Government consumption	2.8	2.3
GDP at factor cost	5.1	5.1
Agriculture	2.8	3.2
Industry	5.2	4.3
Services	5.9	6.4
TFP	1.8	1.9
Exports	5.3	6.0
Imports	0.5	3.2

Sources: See Table 2.1 for for actual data.

[18] For example, for the period 1981/82-1986/87, the Ministry of Planning and World Bank estimates of annual real growth in public consumption are 7.0% and 3.2%, respectively. The divergences for other national account items are smaller but still substantial (Hansen, 1991, p. 5-6).

[19] Hansen (1991, p. 137-138) notes that measuring commodity imports "throws up disturbing data problems," among other things reflected in large gaps between data from exchange and customs authorities. One potential source of problems is military imports.

The model simulation results include additional information about the evolution of the Egyptian economy between 1979 and 1997. (See the column for the base simulation in Table 4.3 below.) Given the purposes of this study, disaggregated changes in household welfare are of particular importance. While the rate of growth in aggregate real household per-capita consumption is 2.7%, it is only 0.6% for the poor. Inequality (measured by the Theil index) increases during the period.[20] This information is compatible with the observed changes in poverty and inequality that were reported in Section 2.

The above information indicates that the model, in spite of being relatively small, is able to track the evolution of Egypt's economy to a reasonable extent. Given this and the fact that its track record of generating plausible responses to changes in exogenous conditions, it is considered as valid for the current purposes, i.e., to assess the impact of alternative counterfactual policies on growth, the poor and income distribution.

4.2. NON-BASE SCENARIOS

The non-base simulations are divided into three sets. The first analyzes the effects of alternative scenarios in the areas of price liberalization and transactions costs, and the second explores asset redistribution and changes in productivity growth. The third set investigates the impact of simultaneous changes in more than one area. When analyzing the different scenarios, we focus on changes in growth and household welfare.

[20] For information about the Theil index, see Theil (1971, pp. 642 and 645) and Sadoulet and de Janvry (1995, p. 21). Note that the index here measures inequality between the different household groups without considering inequality within each group.

Price policy and transactions costs

As noted in Section 2, relative to GDP, trade taxes, food subsidies, and implicit taxes and subsidies (for agricultural and oil products) declined substantially during the period 1979-1997 while other indirect domestic taxes remained roughly unchanged. This section analyzes the impact of more radical changes in tax and subsidy policies. Tables 4.2 and 4.3 display simulation assumptions and results, the latter in terms of changes for the period as a whole. Subsequently, the path of change will also be discussed.

Table 4.2. Assumptions for price policy simulations.

	CONSSUB	OILSUB	TRCOST	INDTAX
Consumer subsidies eliminated	Yes			Yes
Implicit oil subsidies eliminated		Yes		Yes
Indirect taxes eliminated				Yes
Cut in transactions costs in foreign trade (-50%)			Yes	
Flexible government savings and fixed direct tax rates	Yes	Yes	Yes	
Fixed government savings and flexible direct tax rates				Yes

Under the base scenario, consumer subsidies accounted for 7.0% of GDP in 1979, 5.6% in 1982 and, after a gradual decrease, 1.6% in 1997 (cf. Table 2.2). In the first simulation, CONSSUB, food subsidies are fully eliminated starting from 1982 (without any complementary tax or spending policy on the part of government). Compared to the base simulation, this results in higher government savings, in the final year amounting to 1.8% of GDP but representing a higher figure in earlier years (when the subsidy cuts compared to the base scenario were higher). Higher savings brings about an increase in

Table 4.3. Results for price policy simulations.

	BASE	CONSSUB	OILSUB	TRCOST	INDTAX
		divergence from BASE			
Real household consumption (% gpy)*					
Average	2.7	0.1	0.4	0.5	0.1
Rural	2.9	0.1	0.4	0.5	
Poor	0.8		0.5	0.5	-0.1
Middle	3.4	0.1	0.4	0.5	0.1
Rich	3.3	0.2	0.5	0.5	0.1
Urban	2.6	0.1	0.4	0.5	0.1
Poor	0.4		0.5	0.5	-0.1
Middle	2.2	0.1	0.3	0.4	0.1
Rich	3.7	0.2	0.4	0.5	0.2
Poor	0.6		0.5	0.5	-0.1
Non-poor	3.2	0.2	0.4	0.5	0.1
Theil index, 1997 (1979=100)	133.9	-1.5	-3.0	-1.0	0.5
Factor income share, 1997 (%)					
Labor unskilled	10.5	0.2	0.4	0.2	-0.1
Labor skilled	21.3	-0.2	-0.5	-0.3	0.2
Capital	58.0	-0.4	-0.9	0.2	
Land	10.2	0.4	0.9	-0.1	-0.2
Agricultural labor share, 1997 (%)	39.6	0.5	1.1	-0.7	-0.3
Real GDP at factor cost (%gpy)					
Agriculture	3.2	0.3	0.5	0.1	
Oil	3.2				
Construction	1.7	0.7	0.6	0.5	0.2
Manufacturing	6.0	0.5	0.8	0.7	0.2
Services	6.4	0.4	0.8	0.2	0.2
Total	5.1	0.4	0.7	0.3	0.2
Trade (%gpy)					
Agriculture exports	2.6	1.1	1.7	3.3	0.8
Manufacturing exports	7.6	0.8	1.3	1.8	0.7
Total exports	6.0	0.4	0.7	0.8	0.3
Agriculture imports	6.2	0.1	0.3	1.4	0.2
Manufacturing imports	3.0	0.2	0.4	0.5	0.2
Total imports	3.6	0.2	0.4	0.8	0.2
Real exchange rate (%gpy)	1.6	0.3	0.4	0.5	0.3
Capital stock (%gpy)	4.0	0.7	1.3	0.5	0.3
Government savings, 1997 (%GDP)	2.9	1.8	0.7	0.6	
Direct taxes (%GDP)	5.6	-0.1			7.2

Note: *%gpy = % growth per year.

investment and more rapid growth in the capital stock (by 0.7% per year), and in GDP at factor cost (by 0.4% per year). The production increase is highest for the construction sector (driven by the investment increase). The changes in the distribution of factor incomes and household consumption are small. There are some gains in per-capita consumption for the non-poor and on the aggregate level while the poor are unaffected.

This reflects that the poor benefited more from food subsidies than the non-poor. According to the Theil measure, inequality declines marginally.[21] For this and other scenarios in which GDP growth increases, the exchange rate depreciates since accelerated export expansion, for most sectors, requires a price cut in the face of downward-sloping demand curves.

In the second simulation, OILSUB, where the implicit oil subsidy is eliminated, the effects are larger than for the food subsidy since this subsidy represents a larger share of GDP during most of the period. The gain in domestic sales revenue for the oil sector (which is government-owned) is paid directly to the government. During the years when the implicit oil subsidy was significant under the base scenario, there is under this scenario a significant gain in the values for government savings, total savings and investment. For the period as a whole, both government and household savings grow more rapidly than for the base scenario and, for household savings, also compared to the preceding scenario with the cut in food subsidies. Oil exports increase as higher domestic oil prices reduce domestic consumption. Compared to BASE and CONSSUB, the increases in the growth rates for GDP, the capital stock, and household consumption are also larger. The gains are quite evenly distributed across all household groups.

As noted in Section 2, transactions costs associated with foreign trade may be a major impediment to the performance of Egypt's economy. To the extent that they are unnecessary, they not only waste resources but also distort incentives against foreign trade more strongly then explicit export taxes and import tariffs. In the model, these transactions cost are captured by a demand for "other services" whenever a commodity is traded internationally. In the third experiment, TRCOST, the coefficients that define the quantities of other services demanded per unit of exports and imports are cut by 50%.[22]

[21]The Theil inequality measure is based on the ratio between consumption and population shares for each household group. In the simulation CONSSUB, inequality declines in spite of that non-poor households gain more than the poor. This is driven by the fact that, according to data with two or more decimals, in the poor and middle household groups, the poorer rural households do slightly better than their urban counterparts while the rich households are affected to an almost identical extent in both regions.

[22] At base-year prices, from 20% to 10% of the traded value for goods with explicit trade transactions costs (all flows of goods trade except oil exports).

This cut in transactions costs has strong economywide repercussions. Aggregate real GDP growth increases by 0.3%. On the household level, the impact is a relatively evenly shared consumption gain by 0.5% with no significant change in inequality. Both exports and imports increase as the prices received by domestic exports suppliers increase while the prices paid by domestic import demanders decline. Government tariff revenue increases.

In the last simulation in this set, INDTAX, elimination of food and oil subsidies is accompanied by the elimination of all indirect taxes (explicit import tariffs, export taxes, and domestic activity taxes; and implicit taxes on agriculture). Such a policy shift would be implausible without complementary changes in government policy that assures a reasonable balance between revenue and spending. Here, the policy shift is accompanied by changes in direct tax rates that, in each year for which the model is solved, keep government savings at the base scenario share of GDP.

The overall impact is very limited. Some increases are registered in the consumption of the non-poor, in capital stock growth, and in GDP outside agriculture and the oil sector. These changes show that positive but small efficiency gains result as price-distorting taxes and subsidies are replaced by a less distorting direct tax. The policy shift does, however, require an increase in the GDP share of direct taxes, in 1997 from 5.6% for the base simulation to 12.8% for INDTAX.[23]

The preceding discussion refers to growth rates for the period as a whole or GDP shares for the final year. Figures 4.1-4.3 complement this information by showing the evolution of per-capita consumption for average, poor and non-poor households, respectively under the simulations in the first set.

These figures show that, compared to the base, the households are initially worse off under CONSSUB and OILSUB but not under TRCOST. For the average household, by the early 1990s, the gains from more rapid growth dominate the initial losses from the policy changes. For the poor, the initial losses are stronger, in particular for the scenario

[23]When the simulation INDTAX was implemented with fixed direct tax rates and flexible government savings, the rate of capital stock growth declined sharply (by 0.7%) as a result of lower savings and investment. The rate of GDP growth declined by 0.3%. Growth in household consumption was maintained at base levels at the expense of lower investment spending.

Figure 4.1: Price policy and transaction cost simulations: Average household per capita consumption (1979=100)

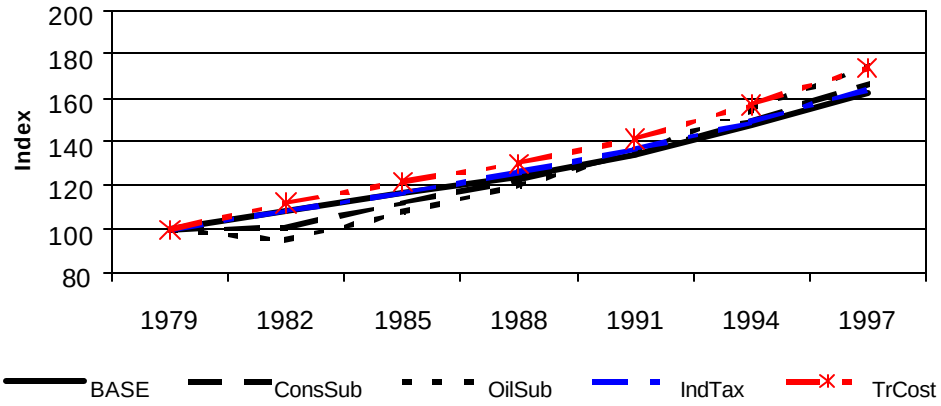


Figure 4.2. Price policy and transaction cost simulations: Poor household consumption (1979=100)

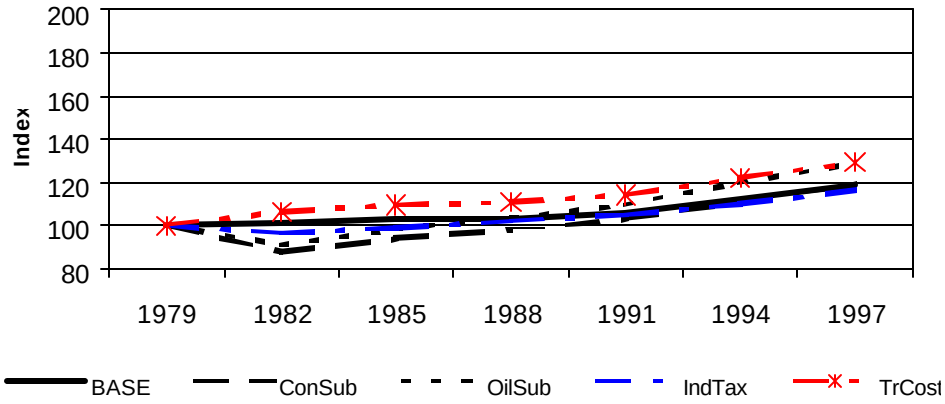
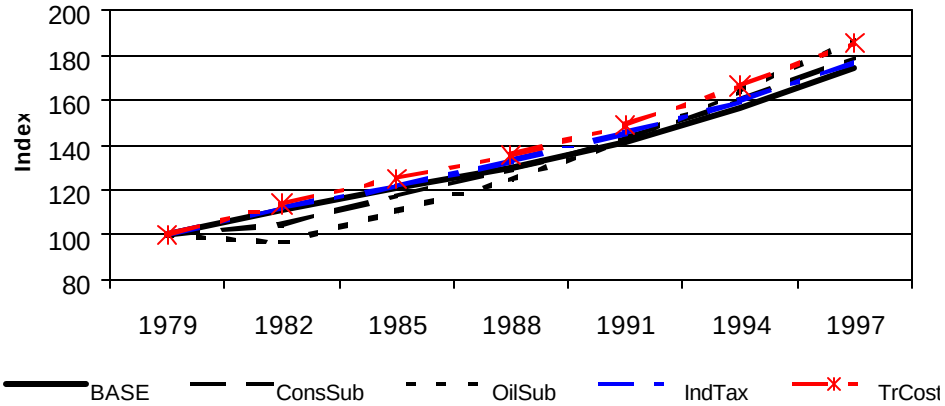


Figure 4.3: Price policy and transaction cost simulations: Non-poor household per capita consumption (1979=100)



where consumer subsidies are eliminated, and the overall impact of the policy changes are less positive.

In a set of additional simulations, the scenarios with elimination of oil and consumer subsidies were implemented assuming the alternative government closure with savings fixed at the levels of the base scenario while the direct tax rates were flexible.[24] The results show that, when government savings are fixed while direct tax rates are flexible, the households are, on average, compensated for the initial negative effects at the expense of long-run growth (since the marginal propensity to save for the households is less than for the government, for which it is unity); the long-run efficiency gain from earlier and complete subsidy elimination are minimal. When, alternatively, government savings are flexible, household consumption increases more in the long run at the expense of a negative initial effect. The negative initial effect predominates until the savings have generated enough capital to significantly raise production and incomes. Irrespective of government closure rule, elimination of consumer subsidies leads to a significant welfare decline for most of the period for the poor households. On the other hand, for oil subsidies, the impact over time on poor households depends on the government closure rule.

To conclude, the results for this set of simulations indicate that the impact of eliminating food and oil subsidies depends on how the government uses the surplus that results. If it is saved, growth accelerates (as a result of more rapid capital accumulation and increased savings) at the expense of consumption during an initial period. If it is used to reduce direct taxes, efficiency gains generate a very small increase in the growth of aggregate household consumption. The efficiency gains are also small when all indirect taxes and subsidies are replaced by direct taxes.[25] By contrast, the scenario with a reduction in trade transaction costs gives rise to broad-based gains throughout the period of analysis. The changes in inequality are minor.

[24] Figures A.1-A.6 compare the household-level impact of eliminating oil and consumer subsidies under the two alternative government closure rules that were described in Table 3.2.

[25] The relatively high degree of sectoral aggregation is likely to reduce the dispersion of indirect tax and subsidy rates. As a result, the efficiency gains from removing the distortionary impact of these taxes and subsidies may be underestimated.

Asset redistribution and productivity growth

In this set of five simulations, we test the impact of two schemes for pro-poor asset redistribution and three scenarios for changes in total factor productivity. Tables 4.4 and 4.5 summarize the assumptions and the results for this group of simulations at the end of the simulated time period. Apart from the last simulation, where aggregate TFP growth is increased, the simulations are by definition primarily redistributional (redistributing assets between households and productivity growth between sectors) and there is no strong a priori reason to expect aggregate GDP growth to change.

Table 4.4. Assumptions for asset redistribution and productivity simulations.

	LAND	SKILL	TFP-AG	TFP-MAN	TFP
Redistribution of agricultural land to rural poor	Yes				
Skill shift favoring low-skill households		Yes			
TFP growth shift favoring agriculture (+2% per year)			Yes		
TFP growth shift favoring manufacturing (+2% per year)				Yes	
Economywide TFP growth increase (+1% per year)					Yes
Flexible government savings and fixed direct tax rates	Yes	Yes	Yes	Yes	Yes

In 1979, land rent accounted for 11% of total factor incomes; the bulk of it was collected by three household groups: rural middle-income and rich, and urban rich.[26] Under the first simulation (LAND), 20% of the agricultural land is in 1982 redistributed from the rural and urban rich to the rural poor. The land losses of each of the two rich household groups are proportional to their initial shares in the total land area. It is assumed that the reform is implemented without any disruption in agricultural production or change in productivity.[27]

[26]Tables A.2 and A.3 show the distribution of land and other income in 1979 and their importance in the budgets of the different household types.

[27]This assumption is reasonable given that the land reform that Egypt implemented in the 1950s and 1960s does not seem to have depressed agricultural productivity. One factor that may explain this outcome is that, in developing countries, small farms seem to be more productive than large farms (Richards, 1982, pp. 177-178). On the other hand, drastic changes in the institutional structure may give rise to production losses, in particular during a transitional period.

Table 4.5. Results for asset redistribution and productivity simulations.

	BASE	LAND	SKILL	TFP-AG	TFP-MAN	TFP
		divergence from BASE				
Real household consumption (%gpy)*						
Average	2.7			0.2	-0.1	1.1
Rural	2.9		0.2	0.1	-0.1	1.3
Poor	0.8	1.4	0.8	0.3	-0.2	1.1
Middle	3.4		0.3	0.2	-0.1	1.3
Rich	3.3	-0.5	-0.1	0.1		1.3
Urban	2.6	-0.1	-0.2	0.2		1.0
Poor	0.4		0.6	0.3	-0.3	1.0
Middle	2.2		-0.5	0.5	0.1	0.7
Rich	3.7	-0.1	-0.2		-0.1	1.2
Poor	0.6	0.7	0.7	0.3	-0.3	1.1
Non-poor	3.2	-0.2	-0.1	0.2		1.1
Theil index, 1997 (1979=100)	133.9	-15.1	-15.2	2.0	2.6	0.3
Factor income share, 1997 (%)						
Labor unskilled	10.5			-0.4	-0.8	0.6
Labor skilled	21.3			2.4	1.9	-4.0
Capital	58.0	0.1		0.3	-1.2	1.9
Land	10.2	-0.1		-2.2	0.1	1.5
Agricultural labor share, 1997 (%)	39.6	-0.1		-4.6	2.2	2.1
Real GDP at factor cost (%gpy)						
Agriculture	3.2			1.5	-0.1	1.6
Oil	3.2			-0.6	-0.3	1.0
Construction	1.7	-0.1	-0.1	-0.4	-0.5	2.2
Manufacturing	6.0	-0.1		-0.2	0.1	2.1
Services	6.4	-0.1		-0.3	-0.3	1.8
Total	5.1	-0.1			-0.2	1.8
Trade (%gpy)						
Agriculture exports	2.6	-0.1	-0.1	5.3	-0.7	4.4
Manufacturing exports	7.6	-0.1		-0.7	0.6	2.9
Total export	6.0	-0.1		-0.5	-0.4	2.0
Agriculture imports	6.2			-3.0		0.4
Manufacturing imports	3.0				-0.3	1.4
Total imports	3.6			-0.7	-0.2	1.1
Real exchange rate (%gpy)	1.6				-0.1	0.9
Capital stock (%gpy)	4.0	-0.1		-0.2	-0.2	1.0
Government savings, 1997 (% GDP)	2.9	-0.2	-0.1	-1.0	-1.8	4.5
Direct taxes, 1997 (% GDP)	5.6	-0.1	-0.1			-0.1

Note: *%gpy = % growth per year.

As expected, land redistribution strongly benefits the rural poor who, compared to the base, register an increase in their rate of consumption growth by 1.4%. Consumption growth declines by 0.5% and 0.1% for the rural and urban rich, respectively, primarily because of lower land incomes. Inequality declines drastically. The fact that the rates for direct taxes and savings are lower for the households that benefit from the policy shift leads to slightly lower growth rates for direct tax revenue and household savings, as well

as government savings, investment values and the capital stock. Aggregate GDP growth declines marginally. Other changes are minor.

According to 1979 data, the average income of a skilled worker (as defined in this study) was approximately three times that of an unskilled worker. In the second simulation (SKILL), part of the increase in the skilled labor force (and its incomes) is gradually redistributed in favor of relatively unskilled household groups.[28] More specifically, the household affiliation of skilled workers is gradually shifted so that, by 1997, compared to the situation in the same year under the base scenario, 20% of the skilled labor force has switched from relatively skilled households (urban middle-income, urban rich, and rural rich) to relatively unskilled households (urban poor, rural poor, and rural middle-income); the households that are classified as skilled have a corresponding increase in their stocks of unskilled labor.[29] There is no change in the total stocks of skilled and unskilled labor. It is assumed that the redistributed labor force earns the average wage. Using Chenery's terminology, the simulated redistribution of skilled labor assets is an example of "redistribution with growth": the fruits from growth, financing the educational system, are allocated in a manner that permits less fortunate household groups to increase their shares in the stock of skilled labor. Politically, it is typically less difficult than land reform.[30]

The impact of this scheme on household consumption is substantial but smaller than for the previous simulation. The three household groups that get a more skilled labor force gain; the others lose. In relative terms, the rural poor gain the most (their consumption growth increases by 0.8%) as they have the lowest per-capita incomes. The relative loss is largest for the urban middle-income group since it initially depended the most on skilled labor income and has a lower per-capita income than both the rural and the urban rich. Apart from a substantial decline in inequality, the broader repercussions of this change are negligible.

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[28] In the base simulation, the shares of each household group in skilled and unskilled labor incomes did not change between 1979 and 1997.

[29] The increase in skilled labor is distributed across the unskilled households is proportion to their population shares. The decrease in skilled labor is distributed across the skilled households in proportion to their shares in skilled labor incomes. (If the decreases in skilled labor had been allocated on the basis of population shares, the rural rich would have lost almost all of their skilled labor income.)

[30] The present analysis is concerned with analyzing the economic effects of alternative policies, not assessments of their past or current political feasibility.

Figures 4.4-4.6, which depict the evolution of per-capita household consumption, confirm the redistributional nature of these two simulations. The gains for the poor are substantial in the beginning whereas the relative loss for the non-poor is smaller. After these initial adjustments, both poor and non-poor consumption grow at rates that are similar to those of the base scenario.

The next two simulations explore the impact of a targeted 2% increase in TFP growth in agriculture and manufacturing, respectively; aggregate TFP growth is kept constant by means of a uniform decline in TFP growth in the non-targeted sectors.[31] The purpose is to investigate the effect of redirecting technical progress along different sectoral patterns, for example via changes in government support to R&D or spending on infrastructure.

Compared to the base simulations, the shift in TFP growth toward agriculture (TFP-AG) raises growth in agriculture (and food processing, which is part of manufacturing). By the year 1997, the share of the labor force in agriculture has shrunk by close to 5%, an indication of that the demand elasticities facing agriculture are too low to permit enough sales to absorb the labor force after it has become more productive. There is no change in aggregate GDP at factor cost. A relative increase in non-agricultural prices (including construction) leads to a decline in investment growth (in spite of an increase in nominal savings and investment values).

This pro-agricultural scenario has a minor positive impact on aggregate welfare and on the welfare of all households groups except the urban rich. The impact on disaggregated household welfare is the net result of changes in factor incomes and consumer prices. In relative terms, prices decrease, not only for agricultural products but also for food products while they increase for other commodities, shifting terms of trade against agriculture. Given their consumption patterns, this pattern of price change is favorable for the poor and particularly unfavorable for the urban rich. This relative price change is partly counteracted by a shift in factor incomes from factors in intensive use in agriculture (unskilled labor and land). This shift in factor incomes (from agriculture to

[31] In each period, aggregate TFP is here defined as a weighted average of activity TFP levels, with the activity weights defined using 1979 activity shares in total value-added. Also after these changes, sectoral and aggregate rates of TFP growth remain within the range of the historical record for developing countries (cf. World Bank, 1993, p. 56).

Figure 4.4: Asset redistribution simulations: Average household per capita consumption (1979=100)

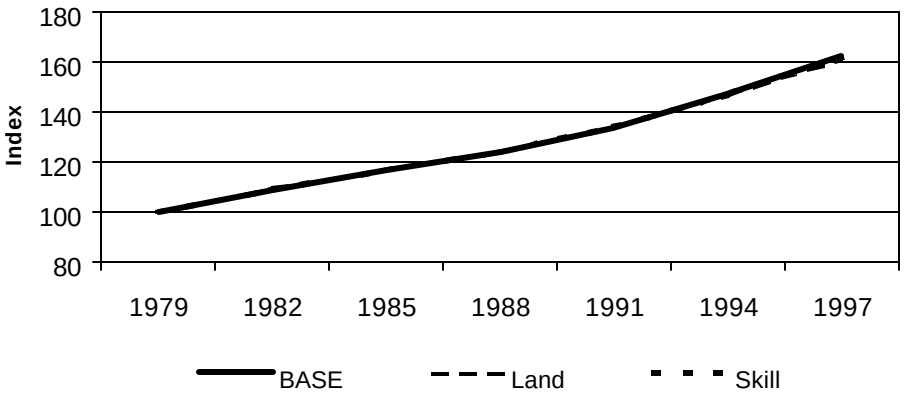


Figure 4.5. Asset redistribution simulations: Poor household per capita consumption (1979=100)

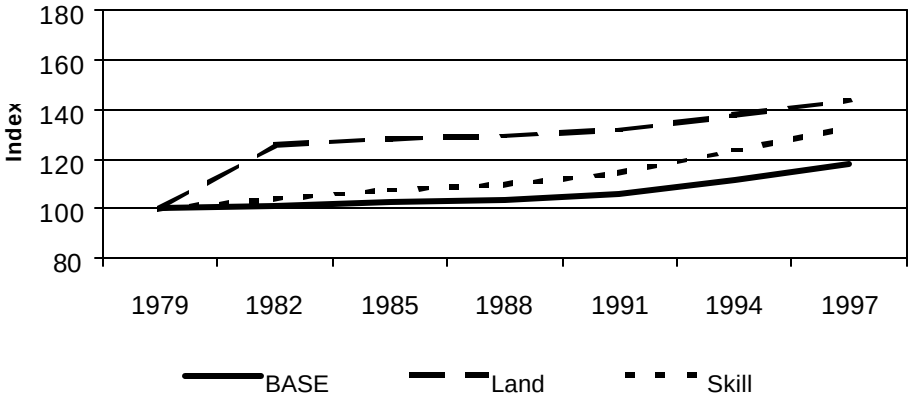
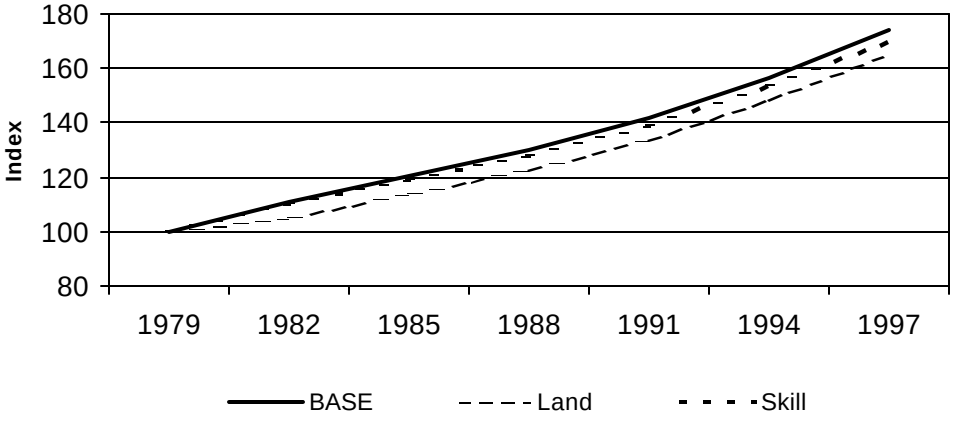


Figure 4.6: Asset redistribution simulations: Non-poor household per capita consumption (1979=100)



other sectors) exemplifies the fact that, if the demands faced by a sector that enjoys a productivity increase (decrease) are relatively inelastic, productivity gains tend to reduce (increase) the incomes of the owners of factors used intensely in this sector (Binswanger, 1980, pp. 201-203). Inequality increases marginally since the urban poor and middle-income groups gain more than their poorer rural counterparts.

In the next simulation, TFP growth shifts instead toward manufacturing (food processing, textiles and other industry; TFP-MAN). This leads to a decline in the shares in total factor incomes for unskilled labor (a factor that is used intensively in manufacturing). The relative prices of manufactured commodities decline. Output increases for two of the three manufacturing sectors. The impact on most indicators of aggregate performance is negative. There are slight declines in real GDP, aggregate household welfare, the savings and investment value, and in real investment growth. Inequality increases moderately as the poor do less well than the non-poor, a reflection of the redistribution of factor incomes (away from unskilled labor) and relative price changes (lower prices for non-agricultural commodities).

The differences between the effects of pro-agricultural and pro-manufacturing scenarios may be due to structural factors (in particular differences between the agriculture and manufacturing in terms of their links with sectors, factors, households, and foreign trade) and sectoral elasticity values (for factor substitution, output transformation, export demand, and composite supply aggregation). Whereas the structural data are reasonably certain, the elasticities are more uncertain. In a set of separate experiments, the two scenarios with pro-agricultural and pro-manufacturing bias (TFP-AG and TFP-MAN) were simulated in a setting where "agricultural" trade and production assumptions were used for all manufacturing sectors.[32] The differences between pro-agricultural and pro-manufacturing scenarios diminished. Nevertheless, compared to the case with pro-manufacturing bias, pro-agricultural bias led to higher consumption growth on the aggregate level and for rural and urban poor and middle-income households.

[32]The elasticities of the agricultural sector (for factor substitution, output transformation, composite supply aggregation, and export demand) were applied to all manufacturing sectors. For export demand, this meant that the foreign-currency export prices for the manufacturing sectors were fixed (infinitely elastic export demand).

As opposed to the first two experiments, which combine a positive productivity change for a targeted sector with a balancing negative productivity change for all non-targeted sectors, the last simulation offers a "free lunch" in the form of an increase in TFP growth by 1% for all sectors. The sources and possible resource costs of such an overall improvement are not specified. International experience suggests that this higher rate of TFP growth is attainable (cf. World Bank, 1997, p. 56). Production growth increases by close to 2% since higher incomes and savings generate a higher rate of growth in the capital stock. The distribution of factor incomes shifts in favor of capital and, to a lesser extent, land. Labor flows into agriculture in response to relative changes in factor prices. On the household level, this translates into a broadly shared gain in consumption growth by around 1%.

Figures 4.7-4.9 compare the evolution of household per-capita consumption for the productivity simulations. They indicate that consumption growth is smooth for all simulations in this set. They confirm the findings of the preceding analysis regarding the impact of accelerating TFP growth or biasing it in favor of agriculture or manufacturing.

In sum, the over-all results for the set of asset and productivity simulations suggest that redistributional policies can be pursued with little impact on aggregate growth. Compared to policy bias in favor of manufacturing, the effects from a productivity shift toward agriculture are more positive for the poor. More rapid productivity growth throughout the economy has a positive and evenly distributed positive impact on all households.

Combined Scenarios

The simulations in this set are focused on testing the impact of combining the individual changes that were included in the preceding simulations. The discussion of the results addresses whether there are significant synergies between the different policies.

Tables 4.6-4.7, and Figures 4.10-4.12 summarize the results for the final simulation set. The first simulation, COMBO-1, combines pro-poor asset redistribution and a shift in productivity growth to agriculture (i.e., the simulations LAND, SKILL and TFP-AG). The aggregate welfare change is positive but small. The poor households gain significantly more as a group and inequality falls strongly. The gain in average

Figure 4.7: Productivity simulations: Average household per capita consumption (1979=100)

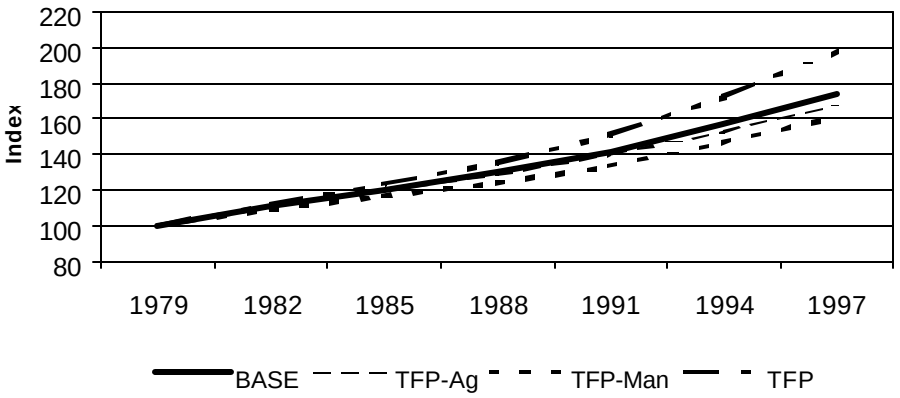


Figure 4.8. Productivity simulations: Poor household per capita consumption (1979=100)

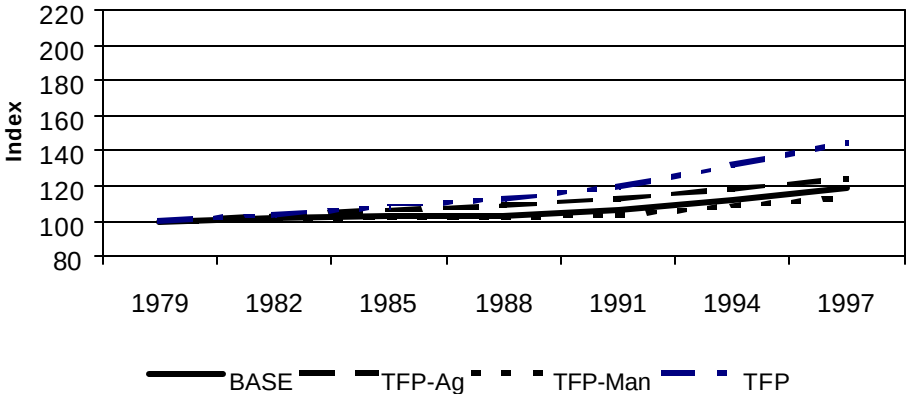
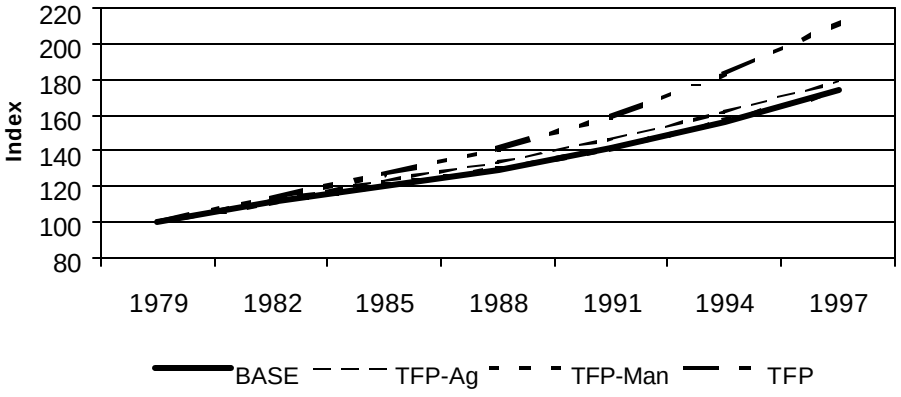


Figure 4.9: Productivity simulations: Non-poor household per capita consumption (1979=100)



consumption is due to the shift in productivity to agriculture whereas pro-poor asset redistribution shifts these gains in favor of the poor. Lower household and government savings reduce the capital stock growth rate.

Table 4.6. Assumptions for combined simulations.

	COMBO-1	COMBO-2	COMBO-3	COMBO-4
Implicit oil subsidies eliminated				Yes
Egalitarian distribution of agricultural land to rural population	Yes	Yes	Yes	Yes
Skill shift in favor of rural and urban poor and rural middle-income households	Yes	Yes	Yes	Yes
TFP growth shift favoring agriculture (+2% per year)	Yes	Yes	Yes	Yes
Increase in agricultural export price (+1% per year)			Yes	Yes
Reduced transactions costs in foreign trade (-50%)		Yes	Yes	Yes
Flexible government savings and fixed direct tax rates	Yes	Yes	Yes	Yes

The next two simulations test the cumulative impact of adding, first, reduced trade transactions costs (COMBO-2) and, secondly, a 1% increase in the annual growth rate for agricultural export prices (COMBO-3), a reflection of improved penetration of agricultural export markets.

In COMBO-2, the reduction in trade transactions costs boosts trade (both exports and imports) in general and agricultural trade in particular. Compared to COMBO-1, production and employment in agriculture grow more rapidly. The factor income shares increase for both labor types. Growth in per-capita consumption increases by 0.6% on average and by 0.7% for the poor. Inequality falls further. More rapid income growth supports and is supported by more rapid growth in real investment and in the capital stock.

The addition of higher agricultural export prices in COMBO-3 (not reported as an individual simulation in the earlier analysis) noticeably strengthens the above-mentioned trends toward stronger welfare growth, especially for poor households. The capital stock grows slightly more rapidly while GDP growth remains unchanged. Agricultural production, employment, and exports expand. Inequality decreases as the gains for the poor in both regions are above average.

Table 4.7. Results for combined simulations.

	BASE	COMBO-1	COMBO-2	COMBO-3	COMBO-4
		divergence from BASE			
Real household consumption (%gpy)*					
Average	2.7	0.1	0.7	0.8	1.3
Rural	2.9	0.4	1.0	1.1	1.6
Poor	0.8	2.2	2.8	3.2	3.9
Middle	3.4	0.5	1.0	1.0	1.5
Rich	3.3	-0.5	0.1	0.2	0.7
Urban	2.6	-0.1	0.4	0.5	0.9
Poor	0.4	0.9	1.5	1.8	2.4
Middle	2.2	-0.2	0.3	0.3	0.7
Rich	3.7	-0.3	0.1	0.2	0.6
Poor	0.6	1.5	2.2	2.5	3.2
Non-poor	3.2	-0.1	0.3	0.4	0.9
Theil index, 1997 (1979=100)	133.9	-27.2	-30.3	-34.7	-39.3
Factor income share, 1997 (%)					
Labor unskilled	10.5	-0.5	0.1	0.7	1.3
Labor skilled	21.3	2.3	1.7	1.5	1.1
Capital	58.0	0.4	-0.3	-1.8	-3.2
Land	10.2	-2.2	-1.5	-0.4	0.8
Agricultural labor share 1997 (%)	39.6	-4.7	-4.2	-2.6	-1.0
Real GDP at factor cost (%gpy)					
Agriculture	3.2	1.4	1.7	1.9	2.5
Oil	3.2	-0.6	-0.6	-0.6	-0.6
Construction	1.7	-0.6		0.1	0.8
Manufacturing	6.0	-0.2	0.4	0.4	1.2
Services	6.4	-0.5	-0.3	-0.3	0.5
Total	5.1	-0.1	0.2	0.2	0.9
Trade (%gpy)					
Agriculture exports	2.6	5.1	8.2	10.0	11.0
Manufacturing exports	7.6	-0.8	0.8	0.4	1.6
Total export	6.0	-0.6	0.4	0.5	1.2
Agriculture imports	6.2	-3.0	-0.9	0.0	0.5
Manufacturing imports	3.0	-0.1	0.6	0.9	1.3
Total imports	3.6	-0.7	0.2	0.6	1.1
Real exchange rate (%gpy)	1.6	-0.1	0.3	0.0	0.3
Capital stock (%gpy)	4.0	-0.4	0.2	0.3	1.6
Government savings, 1997 (% GDP)	2.9	-1.3	-0.8	-0.9	-0.3
Direct taxes, 1997 (% GDP)	5.6	-0.1	-0.2	-0.2	-0.3

Note: *%gpy = % growth per year.

A comparison among the results for the three combined simulations indicates that lower trade transactions coefficients and higher agricultural export prices are the main factors behind the increase in average per-capita consumption; they also contributed significantly to the decline in inequality. However, as noted earlier, pro-poor asset policies contributed strongly to the consumption growth of the poor (especially in rural areas) and are the main source behind the decline in inequality (see the simulations LAND and SKILL).

Figure 4.10: Combined simulations: Average household consumption (1979=100)

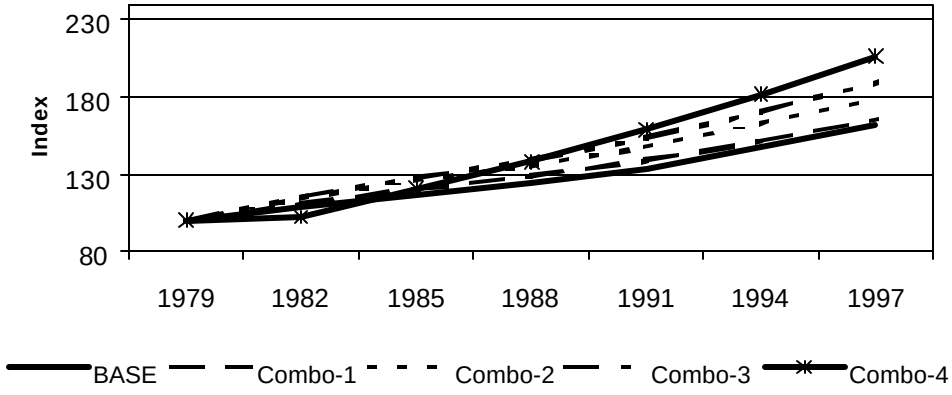


Figure 4.11. Combined simulations: Poor household consumption (1979=100)

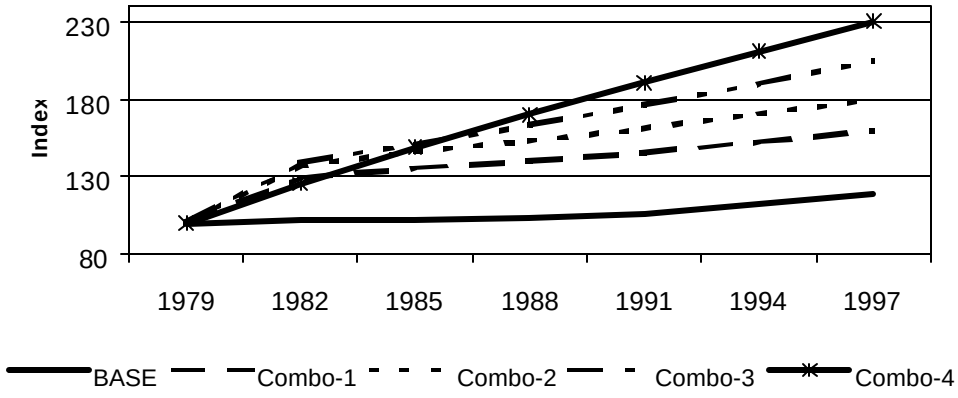
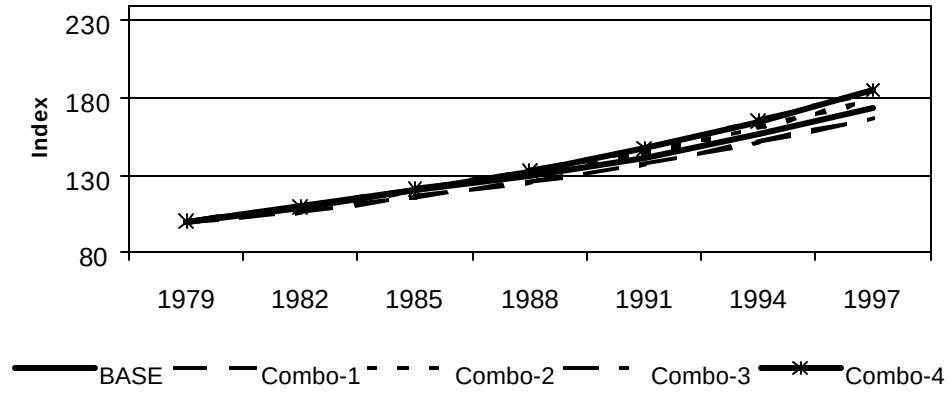


Figure 4.12: Combined simulations: Non-poor household consumption (1979=100)



The final simulation, COMBO-4, adds elimination of implicit oil subsidies in 1982 to COMBO-3. This addition has a significant positive impact on households (both on the aggregate level and for all household groups except the urban rich). The poor gain more than the non-poor and inequality declines further. These changes are stronger than when implicit oil subsidies were eliminated in isolation from other policies.

With regard to COMBO-4, Figures 4.10-4.12 show that, in spite of the oil subsidy cut, household consumption growth is always positive. Hence, when appearing in a policy package, this policy, which in the long run has a positive impact on household welfare, can be introduced without imposing a negative shock on poor households. Also for the other simulations, the figures indicate that real consumption grows smoothly for the different households.

The pro-agricultural productivity shift was incorporated into the combined scenario given its positive welfare effects, in particular for the poor. As noted earlier, some of the trade and production elasticities are uncertain. As part of the sensitivity tests, this set of simulations was implemented with the same assumptions as for the textile sector applied to agriculture (most importantly, reducing the elasticity of export demand from infinity to four). Compared to the results presented in Table 4.7, the aggregate welfare change was very similar and it remained pro-poor and pro-rural. However, consumption growth for the poor households was cut by around one third and the results were less pro-rural, primarily because of a decline in agricultural terms of trade. This points to the importance of access to export markets in influencing the distributional impact of accelerated agricultural productivity growth.

The effect of multiple changes undertaken simultaneously may be different from the sum of the effects of each change undertaken in isolation; in terms of specific indicators, the changes may reinforce each other (positive synergy) or weaken each other (negative synergy).[33]

Table 4.8 extracts information on synergy effects for household welfare and inequality indicators, drawing on results from individual and combined simulations. The first part of the table restates selected data from Table 4.7; the second computes the

[33] For example, the combined welfare effect of a productivity improvement in a sector and improved access to markets for the same sector may be larger than the sum of the welfare effects of each of these changes in isolation.

synergy effects for each combined simulation as the difference between, on the one hand the divergence from the base for the combined simulation and, on the other hand, the sum of the divergences from the base for the individual simulations that make up the combined simulation. For COMBO-1, the consumption gains for the poor and the decline in the Theil coefficient are smaller than for the sum of the individual simulations. The simultaneous pursuit of land and human capital distribution dampens the reduction in inequality and the gains for the poor with little impact on the average household. In terms of reducing inequality and raising consumption growth, both for the poor and on average, positive synergies stem from the introduction of reduced trade transactions costs, higher agricultural exports prices and the elimination of oil subsidies (the changes introduced in the simulations COMBO-2, COMBO-3, and COMBO-4).

Table 4.8. Synergy effects for combined simulations.

	SIMULATION			
INDICATOR	COMBO-1	COMBO-2	COMBO-3	COMBO-4
1. Divergence from BASE for combined simulation				
a. Average household consumption (%gpy)	0.1	0.7	0.8	1.3
b. Poor household consumption (%gpy)	1.5	2.2	2.5	3.2
c. Theil index (1979=100)	-27.2	-30.3	-34.7	-39.3
2. Synergy: (1) minus sum of divergences for simulations with the individual changes of the combined simulation				
a. Average household consumption (%gpy)	0.0	0.0	0.1	0.2
b. Poor household consumption (%gpy)	-0.2	-0.1	0.1	0.3
c. Theil index (1979=100)	1.1	-1	-3.5	-5.1

Note: See Table 4.6 for definitions of the simulations.

5. CONCLUSIONS

In this chapter, a CGE model has been used to simulate, ex post, Egypt's economic performance during the period 1979-1997 under alternative scenarios for price policies, trade transactions costs, asset distribution, and productivity growth. While this chapter analyzed some aspects of economic policy in Egypt during a period that belongs to the past, its lessons are relevant also to the future, both in Egypt and countries with a similar economic structure.

The guiding question for this chapter is whether Egypt's government, by following different policies, could have significantly improved the status of its poor. The analysis, which is subject to the limitations of a model that simplifies a complex reality, indicates that the answer is yes. Pro-poor redistribution of land and human capital assets could have been a particularly effective tool had Egypt prioritized more strongly to improve the welfare of the poor and reduce inequalities. Such policies could have been implemented without any noticeable negative impact on growth or aggregate welfare. Politically, modifying the human capital distribution would probably have been easier since, being an example of "redistribution with growth," it can be implemented with a less noticeable negative impact on those households that are disfavored by the policy.

With regard to the broader issues that this study addresses, the results indicate that, in the Egyptian case, there is no contradiction between more rapid growth, largely a function of more rapid productivity growth, and improved welfare for the poor. The impact of more rapid reduction of price distortions, induced by taxes and subsidies, is small but positive in terms of aggregate growth. The effects of introducing biases in favor of specific sectors are stronger and depend on the specific context, including the nature of economic linkages and, with regard to the policies analyzed in this chapter, on the ease with which it is possible to raise productivity growth, reduce transactions costs, and get improved access to export markets. The present analysis confirms the finding of earlier analyses that, compared to pro-manufacturing policies, pro-agricultural policies have a more positive impact on household welfare in general and the poor in particular. There is a significant synergy between a pro-agricultural shift in productivity growth, improved market access for agricultural exports, and reduced transactions costs in foreign trade.

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APPENDIX

Table A.1. Structure of Egypt's Economy in 1979 and 1997 (%).

Sector	Output	Value added	Final Demand	Exports	Imports	Export/ Output	Import/ final demand
Structure of the Economy in 1979			(%)				
Agriculture	20.8	22.4	19.9	7.7	16.9	5.3	19.3
Food processing	11.0	2.9	12.9	1.4	12.5	1.9	22.0
Textiles	7.4	4.3	6.4	5.9	1.8	11.6	6.3
Oil	11.0	15.6	3.5	54.6	2.7	71.8	17.9
Other industry	11.1	7.4	23.7	3.2	53.2	4.2	50.9
Construction	6.6	5.9	5.8				
Transportation	5.1	7.4	2.7	16.9	1.2	47.5	10.3
Public administration	4.8	10.1	4.3				
Services	22.2	24.0	20.9	10.3	11.7	6.7	12.7
Total	100.0	100.0	100.0	100.0	100.0		
Structure of the Economy in 1997			(%)				
Agriculture	14.4	19.1	15.2	0.5	9.3	0.5	9.5
Food processing	11.9	3.5	11.7	1.8	3.7	1.9	4.8
Textiles	8.0	4.8	7.1	7.2	1.9	11.6	4.2
Oil	4.4	9.4	3.4	18.4	8.2	52.8	37.7
Other industry	14.8	12.7	23.4	10.3	65.2	8.9	43.0
Construction	7.9	5.4	7.6				
Transportation	6.6	8.0	3.9	22.2	1.4	43.0	5.4
Public administration	4.4		4.3				
Services	27.7	37.0	23.5	39.5	10.3	18.2	6.7
Total	100.0	100.0	100.0	100.0	100.0		

Source: SAMs for 1979 and 1997 (see Löfgren, 2000).

Table A.2. Structure of household incomes, 1979 (%).

	Factor income				Government	Rest of the world	Total
	Labor		Capital	Land			
	Skilled	Unskilled					
Rural households							
Poor	10.9	57.8	0.0	7.8	8.0	15.4	100.0
Middle	11.3	5.3	46.1	16.5	7.1	13.7	100.0
Rich	10.5	0.0	34.8	34.1	7.0	13.6	100.0
Urban households							
Poor	17.7	58.6	0.0	0.0	8.1	15.6	100.0
Middle	50.3	4.1	23.1	0.0	7.7	14.9	100.0
Rich	23.8	0.0	49.8	5.5	7.1	13.8	100.0

Source: SAM for 1979 (see Löfgren, 2000)

Table A.3. Allocation of factor incomes to households in 1979 (%).

	Factor income			
	Labor		Capital	Land
	Unskilled	Skilled		
Rural households				
Poor	39.0	3.9	0.0	5.6
Middle	7.0	8.0	22.8	23.3
Rich	0.0	8.9	20.7	57.8
Urban households				
Poor	47.4	7.5	0.0	0.0
Middle	6.6	42.8	13.9	0.0
Rich	0.0	28.9	42.6	13.3
Total	100	100	100	100

Source: SAM for 1979 (see Löfgren, 2000)

Table A.4. Factor income shares disaggregated by sector, 1979 (%).

	Labor		Capital	Land	Total
	Unskilled	Skilled			
Agriculture	24.4		25.3	50.3	100.0
Oil	1.4	1.1	97.5	0.0	100.0
Construction	7.6	27.5	64.9	0.0	100.0
Food Processing	22.1	16.2	61.7	0.0	100.0
Textiles	29.3	17.6	53.2	0.0	100.0
Other Industry	24.8	16.4	58.8	0.0	100.0
Transportation	6.4	18.1	75.5	0.0	100.0
Public Administration	8.3	91.7	0.0	0.0	100.0
Services	2.9	30.7	66.4	0.0	100.0
Total	11.8	22.3	54.8	11.1	

Source: SAM for 1979 (see Löfgren, 2000)

Table A.5. Model values for trade and production elasticities.

	CET[1]	Armington[2]	CES[3]
Agriculture	3.0	2.4	0.9
Oil	∞	0.9	0.2
Construction	n.a.[4]	n.a.[4]	0.9
Food processing	1.5	0.9	0.9
Textiles	1.5	0.9	0.9
Other industry	1.5	0.9	0.9
Transportation	1.5	0.9	0.9
Public administration	1.5	n.a.[4]	0.2
Services	1.5	0.9	0.9

Source: Author assessment, drawing on Löfgren (1994b).
Abbreviations:
[1]CET Elasticity of transformation between exports and domestic sales in CET function (transforming domestic output to exports and domestic sales);
[2]Armington Elasticity of substitution between imports and domestic output in Armington function (CES function aggregating imports and domestic output sold domestically to composite domestic commodity)
[3]CES Elasticity of factor substitution in CES value-added function
[4]n.a. Not applicable

Table A.6. Model values for household expenditure elasticities and Frisch parameter

	Rural			Urban		
	Poor	Middle	Rich	Poor	Middle	Rich
Agriculture	0.09	0.11	0.32	0.27	0.16	0.03
Oil	2.37	2.01	1.64	1.52	1.55	1.39
Construction	0.62	0.62	0.95	0.80	0.66	0.36
Food processing	2.37	2.01	1.64	1.52	1.55	1.39
Textiles	2.37	2.01	1.64	1.52	1.55	1.39
Other industry	2.37	2.01	1.64	1.52	1.55	1.39
Services	2.37	2.01	1.64	1.52	1.55	1.39
Frisch parameter	-7.27	-5.99	-4.21	-6.21	-4.95	-3.34

Source: Dethier 1979, p. 184 (for elasticities); SAM for 1979, IMF (various years), and formula in LLuch *et al.*, 1977, p. 248 (for Frisch parameter)

Figure A.1. Elimination of consumer subsidies under alternative government closures: Average household per capita consumption (1979=100)

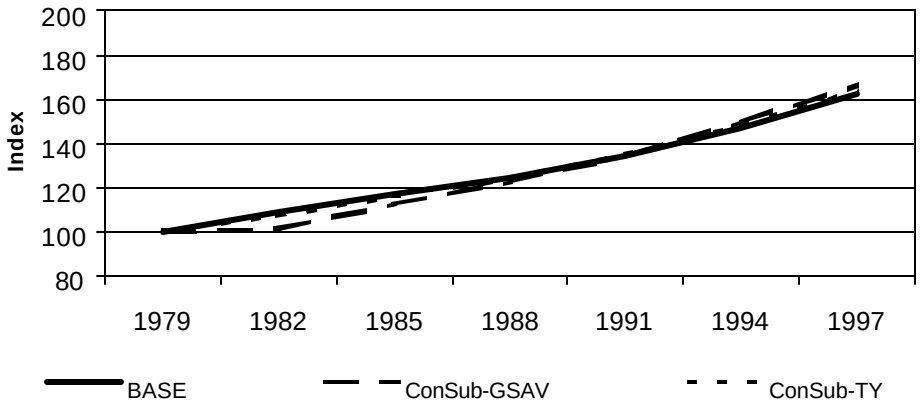


Figure A.2. Elimination of consumer subsidies under alternative government closures: Poor household per capita consumption (1979=100)

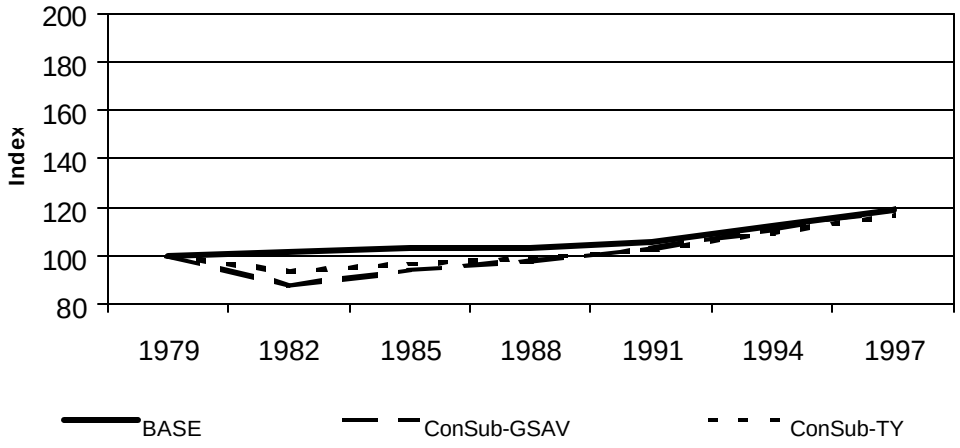


Figure A.3. Elimination of consumer subsidies under alternative government closures: Non-poor household per capita consumption (1979=100)

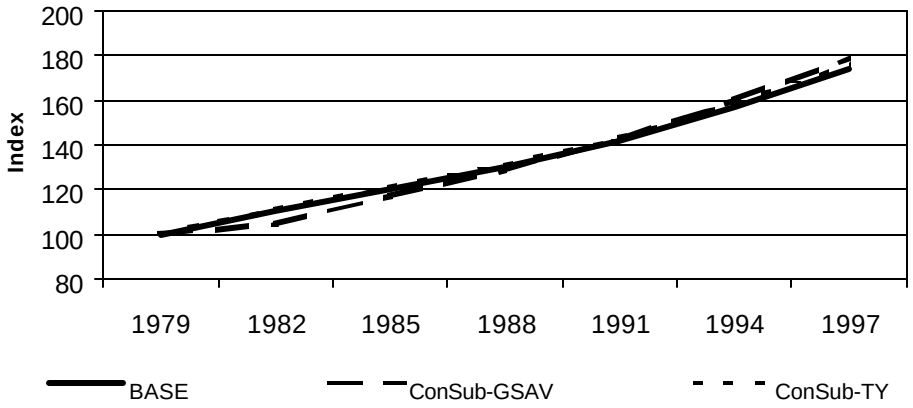


Figure A.4. Elimination of oil subsidies under alternative government closures: Average household per capita consumption (1979=100)

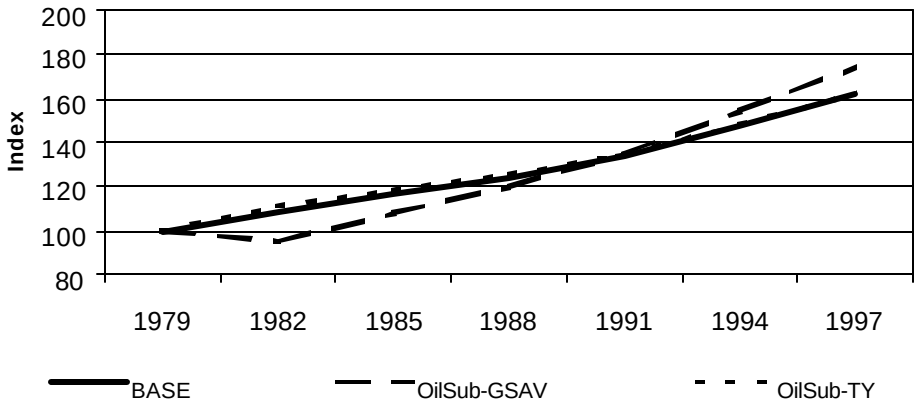


Figure A.5. Elimination of oil subsidies under alternative government closures: Poor household per capita consumption (1979=100)

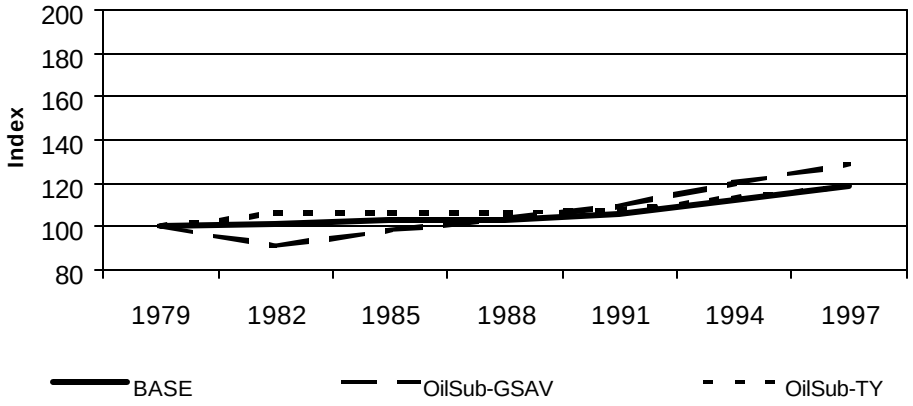
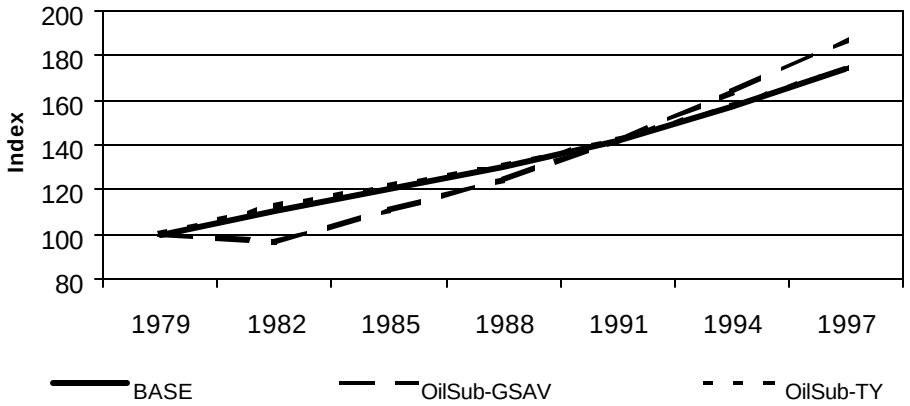


Figure A.6. Elimination of oil subsidies under alternative government closures: Non-poor household per capita consumption (1979=100)



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