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TANIT 83

A general equilibrium model for analyzing the customs duties, quotas, and price controls of the Tunisian economy

N. Bousselmi, B. Decaluwé,
A. Ennaifar, and M. Monette

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I

INTRODUCTION

Since the initial work of Johansen (1960), the construction of general equilibrium models has attracted the attention of many economists, both in the so-called developed countries and elsewhere. The recent popularity of these models is no doubt explained by the fact that they facilitate quantitative assessment of the impact of complex economic policies in such areas as external trade, direct and indirect taxation, government transfer payments, etc. A recent review (B. Decaluwé and A. Martens [1985]) has shown that the application of this methodology to semi-industrialized and developing economies has made it possible to conduct a more complete evaluation of the sectorial and macroeconomic repercussions of the various ways in which the public authorities intervene in economic life.

It is well known that the state plays an important, or even primordial role in the economic life of most developing economies, and in African countries especially. Whether implemented through public enterprises or through regulatory and planning agencies, decisions made by the public authorities often result in distortions in the price system. In addition, such decisions may lead to poor allocation of resources, loss of economic efficiency and even a slowdown in economic growth.

Several general equilibrium models have already attempted to assess the ways in which economic growth rates are affected by such measures as trade restrictions, direct or indirect production subsidies and price control mechanisms.[1] Our study, which is based on a number of these contributions, tries to construct a model that can account for certain characteristics of the Tunisian economy, and also simulate the consequences of alternative policies in the areas of external trade and domestic price regulation.

Following this introduction, Section II of our study outlines some major features of the Tunisian economy, and briefly describes the system for

regulating external trade and the rules for setting domestic prices. In Section III, we then present the structure of the model we used and the fundamental price mechanisms. Section IV briefly describes the principles employed in developing the Tunisian social accounting matrix (SAM) for the year 1983, which is used to calibrate the TANIT model.[2] Finally, Section V discusses the results of various economic policy scenarios.

The approach we have taken is based on the methodology developed by Drud, Grais and Pyatt (1983)(1986), which allows direct comparison of the impact of different economic policies on the major macroeconomic aggregates (GDP, employment, balance of payments, savings, etc.) and on the structure of prices, in terms of both production and consumption. This method uses a social accounting matrix whose various accounts are designed to reflect the institutional characteristics of the economy studied and the behaviour patterns of the economic agents involved. The major steps in the construction of the model are as follows:

1. Selection of an appropriate breakdown for the SAM.
2. Selection of the behaviour specifications for the various agents, institutions and branches of activity.
3. Selection of the predetermined values (parameters or variables) that enter into these behaviour specifications.

II

SOME INSTITUTIONAL CHARACTERISTICS OF THE TUNISIAN ECONOMY

Tunisia, a medium-sized country, has a population of 7 million inhabitants and a per capita income of US $ 1 200.[3] The agricultural sector accounts for 18% of the GDP, and employs nearly one third of the work force. The raw materials that Tunisia produces are phosphates, petroleum and natural gas. During the 1970s, the Tunisian economy experienced extremely rapid growth on the order of 7% to 8 % per year. This growth was accompanied by a structural transformation as the manufacturing sector diversified and increased its share of GDP and exports. Over the last decade Tunisia, as a net exporter of Petroleum, benefited from a substantial improvement in the terms of trade, and was thus able to enjoy substantial growth in consumption and domestic savings.

The years 1980 and 1981 were exceptionally prosperous. Substantial increases in the price of petroleum stimulated growth and further reduced the deficit in the balance of payments. The current account deficit had remained at a reasonable level throughout the 1970s, then had been easily financed through direct foreign investment and external borrowings.

Thanks to these favourable conditions, stimulated by a generous social and wage policy, Tunisia was able to further its own growth through a significant rise in household consumption and in domestic demand. However, this growth of demand put pressure on imports and on the current account despite an ongoing trend to higher customs duties and a systematic reinforcement of import restrictions.

International economic conditions and petroleum income were the determining factors in Tunisian economic growth up to the end of the fifth development plan (1981). During this period, the Tunisian government also established economic policies favourable to growth, which had three major features:

1. An investment policy.

2. A more or less general policy of prices control supporting subsidies for essential food products.

3. A policy of industrialization based on import substitution.

From 1976 to 1981, Tunisian economic growth relied on an extensive program of investment (30% of GDP on the average), which was mainly financed through foreign capital. However, the predictable reduction of export receipts and anticipated balance of payments constraints forced the government to thoroughly revise its investment strategy at the beginning of the sixth development plan (1982-1986). Under this new strategy, the government's objective was to reduce the average investment rate (from 29.8% to a predicted 28.2%) and to give priority to directly productive investment projects, oriented towards the export of manufactured products and principally financed by private capital. In addition, particular attention was to be paid to the acute problem of employment, and priority was to be given to labour-intensive investments.[4]

The composition, structure and level of investments are fundamental factors that determine long-term prospects of growth in an economy. In our study, however, we deliberately chose to forego a detailed analysis of the structure of investments, and to restrict ourselves to scenarios concerning the level of investments.

Price policy has always been an important factor in Tunisia's economic policy. The tunisian system of price regulations can be defined as one of controlled freedom, where the free establishment of prices by market forces only applies to a portion of final consumer products. Price control is viewed above all as a means of attaining a certain level of social justice, by setting the price of essential consumer goods at a low level. Regulation is also regarded as a way of encouraging industrial development, while containing the monopolistic tendencies that could lead to excessive profits.

Since the beginning of the 1970s, the price controls mechanisms fall into five classifications:

1. **Regulated price system.** ("Taxation" in Tunisian terminology) The price of products covered by this system are set by the administration, which thereby seeks to maintain stable prices for major consumer goods such as bread, semolina flour, oil, sugar, etc. The so-called "regulated price" food products are explicitly subsidized at various stages in the production and distribution process, and the difference between the cost of production and the sale price to the consumer is assumed by the **Caisse Générale de Compensation** (Price Stabilization Fund)[PSF].

   However, all "regulated price" products do not necessarily enjoy direct subsidy from the PSF. For example, the prices charged for public services are fixed by the Government and are generally lower than the economic costs involved. In some cases, these prices are even lower than current operating costs. The operating deficit of public enterprises subject to the regulated price system are thus implicitly subsidized by the public authorities.

2. **Approval system** ("Homologation" in Tunisian terminilogy). Here the administration examines the books of a business and determines the prices it can charge. This system covers most manufactured goods, and products and services not covered by another system. The approval process includes a technical and accounting studies and determination of the profit margin.

3. **Self-approval system** ("Auto-homologation" in Tunisian terminology). In this case, businesses can set their own sale prices, but have to apply a scale of profit margins fixed by decree. In the 1970s, this system only applied at the distribution stage, but since 1982 also covers most manufactured goods.

4. **System of controlled freedom** ("Libertée contrôlée" in Tunisian terminology). Under this system, firms are responsible for determining their own sale prices, but must file the proposed prices with the administration before they are put into effect. The system of controlled freedom is different from the approval system in that the administration must respond within 15 days. During the 1970s, products covered by this system were non-essential industrial goods, which were characterized by the existence of some domestic competition. These included, for example, cosmetics, articles manufactured from wood, and hardware. With the reform of 1982, this system declined in importance, being partially replaced by the self-approval system or by a fifth system of so-called **total freedom**, which leaves businesses completely free to set their own prices.

Price controls, in effect in Tunisia since 1970, was justified by an economic environment where there were few enterprises, little variety in the range of manufactured goods and limited competition. The narrowness of the Tunisian market and weak competition were thus the major justification for price controls. The reform of January, 1982 significantly changed this policy, since it set up the self-approval system as the general rule for industrial goods and most services. This reform alsoreduced the number of products whose prices are subject to prior control by the Government.

The 1982 reform led to a decrease in the weight of regulated prices in the calculation of the consumer price index, as is shown by Table 1 (see Table 1 at end of text).

In order to understand the implications of the price regulation system, one must examine it in close association with the foreign trade policy. In addition to customs duties and other import taxes, the Tunisian Government has turned to quotas in order to protect infant industries, and more recently to deal with a rapid increase in the current account deficit of the balance of payments.

Tunisia's customs protection includes various categories of taxes: landing tax, a customs clearance tax and customs duties. These taxes constitute the main source of customs protection. Since 1980, customs duties have been modified on a regular basis, and a recent study has shown that the structure and level of nominal protection remained virtually unchanged from 1972 to 1977. On the other hand, nominal rates of protection increased considerably from 1977 to 1983, and even doubled for some product categories (see Table 2 at end of text).

The notable increase in nominal protection rates was accompanied by an equally significant rise in the effective protection given to economic activities. Over the last few years, there has also been a tendency to make import quotas more stringent, as is shown by the data in Table 3 (see Table 3 at end of text). Non-monopolized products (i.e. goods not exclusively traded by a state monopoly) subject to restrictions represent 71% of total imports, while products imported under the cover of a public monopoly and unrestricted products only represent 10.3% and 18% of total imports respectively.

It is important to interpret correctly the significance of the results in Table 3. The products that are affected by restrictions are not necessarily subject to severe quantitative constraints. In particular, certain prohibited products can only be imported under the cover of an import licence. However, it is generally easy to import certain categories of products, and in particular capital goods, although they require a licence. It is estimated, for example, that two thirds of imports are either prohibited products or are subject to quotas, but 45% of these products are capital goods, which may be imported quite freely (they account for 28% of total imports). Adding this figure to the rate for "free" products, we find that approximately 45% of total imports were governed (in 1980) by a system of relative liberalization, while 43% of imports were subject to more severe restrictions.

Three components of Tunisian economic policy, namely customs protection, import quotas and price regulation, are so closely interrelated that each must be studied in its direct and indirect relationships with the

others. As far as practice is concerned, a recent study (Bousselmi and Nabli, 1985) has shown that governmental decisions are often taken in response to ad hoc emergencies, and do not always fit into an overall strategy. For example, the advantages that accrue to an industrial sector on account of tariff protection may be undermined by inadequate price regulation, which may limit profit margins in order to attract new resources.

Our study therefore tries to account simultaneously for the various ways in which the interventionist measures of the Tunisian government interact with one another. Our analytical methodology is based on the construction of a general equilibrium model, which explicitly incorporates the key instruments of governmental economic policy.

III

STRUCTURE OF THE TANIT 83 MODEL

The essential purpose of a computable general equilibrium model (C.G.E.) is to simulate the impact of economic policies that indirectly influence market mechanisms (such as taxes, tariffs and subsidies) or to study the effects of direct government intervention in the marketplace (through such measures as price policies or import quotas). Our model is based on a methodology developed by Drud, Grais and Pyatt (1983) (1986), which uses social accounting matrices.[6] It is essentially a model of comparative statics, but can be developed to simulate the dynamic repercussions of economic policies.

The results of the model provide a quantitative assessment of the impact of economic policies, and enable one to describe how the economy is effected by exogenous disturbances. As we will see below, the empirical results enables us to visualize the importance of the economic mechanisms put into play, and to quantify the effect of economic policies while taking into account the general interdependence of decisions.[7]

The extent to which a C.G.E. is broken down depends upon available statistics and on the desired refinement of the results. However, the structure and articulation of the accounts are based on the identification of the problems involved, the instruments of intervention used and the functioning of the economy as a whole. In its disaggregated version, for example, the Tunisian model is constructed using a social accounting matrix comprising 108 accounts, where one finds 15 branches of activity and 53 accounts for local, imported, composite and exported products. The breakdown of the product accounts is based both on the nature of the product and on the mechanism of price formation. In its breakdown version, the model comprises more or less of 650 equations, depending on the nature of the simulations carried out.

Production accounts

In the breakdown version of the C.G.E., production activity has been divided into 15 sectors, which cover the 20 branches of Tunisia's national accounts. For our purpose, we separated intermediate goods and value added. Table 4 describes the connections among production, value added, primary factors of production and local or imported intermediate products (see Table 4 at end of text). At the first level, gross production of each branch is derived from a production function associating gross value added and the intermediate consumptions of the branch. This production function is currently of the Leontief type, with fixed technical coefficients of production.

At a second level, value added results from a combination of labour and capital, and we assume that a certain degree of substitution is possible among primary factors of production. This hypothesis implies that job creation will be adversely affected by a rise in the relative cost of labour in comparison to the cost of capital.

The degree of substitution among primary factors of production is determined by various causes: the nature of the economic activity, the technology of production, the more or less capitalist character of the activity, etc. The importance of these factors will have to be carefully reevaluated later on. But for the time being, and in the first simulations presented in this study, the elasticity of substitution between capital and labour is assumed to be unitary, so that the relative proportion of the remunerations of capital and labour in value added remains constant.

Furthermore, intermediate consumptions are broken down into several categories, in order to account for the fundamental characteristics of the Tunisian system of domestic prices (Level 3) and of external trade regulation (Level 4).

Accounts for products and services

The system of domestic prices, customs and tariff regulation, and the system of domestic indirect taxation have an impact on the price of goods and services, and influence the activities of production and resource allocation. The major characteristics of the price system suggest a breakdown and articulation of the various accounts into four levels, which are summarized in Table 5 (see Table 5 at end of text):

- Level 1: Nature of product
- Level 2: System of domestic prices
- Level 3: Product origin
- Level 4: Import system

Depending on their nature, goods and services are classified into seven categories, namely consumer food products, other final consumer products, intermediate products, capital goods, non-traded government services, petroleum products and exported goods. The second level of the breakdown is used to characterize the nature of the domestic price system to which products are subject. As we have seen, Tunisian legislation provides for several price systems. However, for the purposes of economic analysis, one need merely distinguish between the regulated price mechanism, which resembles a strict control of subsidized prices, and the "non regulated price mechanism or "freed" system, which is characterized by greater freedom in the pricing mechanism.

The third level of articulation of the goods and services accounts considers the origin of products, distinguishing domestic from foreign goods. However, many imported goods are also produced locally. Consequently, the degree to which they can be substituted from domestic production should be specified, taking into account their overall characteristics, qualities and relative prices. For example, the degree to which products may be substituted is assumed to be higher for final consumer goods than for intermediate products or capital goods. When an imported product is not made locally, its rate of substitutability with respect to domestic good is null, and importation is said to be

complementary. Tunisia imports a broad range of goods that fall into this category.

The fourth breakdown level makes it possible to account for the foreign trade system, by distinguishing goods subject to import quotas from other imported goods. Studies of Tunisia's import protection have shown that Tunisia's quotas essentially affected non-food and consumer products, which come under the system of so called "freed" or "non-regulated price" mechanisms.[8] As a result of restrictive quotas, these imported products may be sold on the domestic market at a sale price greater than the CIF price augmented by customs duties. The mechanism of price formation will therefore be very different depending on whether local products are facing imported goods subject to quotas or not.

Mechanisms of price formation

Table 5 shows that the process of price formation in the Tunisian economy essentially consists of three fundamental mechanisms (see Table 5 at end of text). Mechanism A affects "regulated price" products, which are subject to the price control system and come either from local production or from non-quota imports. Mechanism B affects "freed" or "non-regulated" products.
These are not subject to domestic price control, and come both from local production and from non-quota imports. Mechanism C affects products subject to quotas, which are not subject to price control and come from local production or from imports subject to quota.

Mechanism A: "Regulated price" products

The retail prices of products subject to a system of price controls are influenced in contradictory ways by a number of factors: costs of production, applicable indirect domestic taxes, import prices including customs duties, competitive products and the margin of public subsidies.

In order to facilitate understanding of this mechanism, Table 6 shows the various components of sale price, identifying receipts and expenses paid at each step in the pricing process (see Table 6 at end of text). The

table is easy to read if one remembers that a line or a column respectively represents a receipt or an expense for the corresponding account. Local production (Account 5) for example, which is measured at ex-factory price, appears in the account of local "regulated price" goods and services ($t_{5,6}$). This account supplies the account of composite products ($t_{6,8}$). The rest of the world supplies imports at the CIF price in dinars ($t_{10,7}$), whose value is increased by customs duties ($t_{3,7}$), and ultimately supplies the composite product account ($t_{7,8}$). However, total resources (both local and imported) are not marketed at their production costs because domestic taxes ($t_{3,8}$) and marketing margins ($t_{5,8}$) have to be added in. The total in Column 8 gives us the value of total resources at their cost price. Subsidies (negative taxes) from the Price Stabilization Fund (P.S.F.) ($t_{4,9}$) or the state ($t_{2,9}$) make it possible to market these products at a sale price lower than the cost price. The total value of resources in "regulated price" products, assessed at their regulated sale price, is absorbed by households in the form of final consumption ($t_{9,1}$) and by the various branches of production in the form of intermediate consumption ($t_{9,5}$). To the extent that the Government sets consumer prices, the P.S.F. must absorb the difference between production costs and regulated sale prices. The value of subsidies is thus determined endogenously by the economic system. The price of the transactions associated with each of Accounts 6, 7 and 8 is indigenous to the model, while the price associated with account 9 is fixed by the Government under the price control mechanism.

Mechanism B: "freed" or "non-regulated price" products

The prices of products that escape both domestic price control and import quotas may be described by using Mechanism A, as mitigated by P.S.F. interventions (Account 4, Table 6) and the account of "subsidized" composite products (Account 9, Table 6). The value of domestic production (Account 4, Table 7) is combined with imports (Account 5, Table 7) to determine total resources in "freed" products (Account 6, Table 7) as increased by domestic taxes and by commerical margins. These resources are then accounted for under household consumption in the case

of final products ($t_{6,1}$) or in the production account if they are intermediate goods ($t_{6,3}$). All the prices associated with each of Accounts 4, 5 and 6 are endogenous to the model.

Mechanism C: Products subject to quota

The existence of import quotas reinforces the protection enjoyed by local production of competitive products. In the Tunisian context, these quotas primarily apply to non-food "no set price" products of final consumption (See Table 5 at end of text). The process of price formation for these products will be described using the structure of products and services accounts given in Table 8 (see Table 8 at end of text).

We shall follow the treatment of scarcity rent proposed in the works of Neary and Roberts (1980) and of Grais, de Melo and Urata (1984). These authors have shown that one may describe the behaviour of import demand for a product under quota by employing the concept of virtual price. The virtual price is the hypothetical price that would have led the buyers to consume exactly the volume of imported goods under quota. The difference between the virtual price and the import cost price, namely the CIF price including customs duties, represents the income that is enjoyed by the importers. In our study, we are going to assume
that this income constitutes additional income used by households to increase their final consumption.

The prices associated with Accounts 4 to 7 of Table 8 are as follows:

P_4 = local ex-factory price of local products subjected to competition from import products under quota.

P_5 = CIF price (in dinars) plus customs duties of imported goods subject to quotas.

P_6 = "virtual price" of imported goods under quota. This is price P_5 increased by the rate of implicit rent enjoyed by the importers of products subject to quotas.

P_7 = market price of the "composite" product made up of local products and of imported products under quota. This price is a weighted average of prices P_4 and P_6, to which are added the marketing margin and indirect domestic taxes.

This approach enables us to take account of the fact that the scarcity rent creates an additional income for some households, generally importing traders or other intermediaries, and that this income is allocated by the households receiving it to current consumption and to savings. This mechanism incorporates a process of reoptimizing the expenditures of consuming households over the whole basket of consumer goods, and thereby introduces an impact on prices of all products, including goods that are not subject to quotas.

IV

THE TUNISIAN SOCIAL ACCOUNTING MATRIX

Computable general equilibrium models draw on a broad range of statistics, and rely on the accounting framework supplied by social accounting matrices (SAMs). A SAM takes the form of a square input and output table where, for a given year, the accounting flows of receipts and expenditures are recorded. Receipts are entered on lines (index i) and expenditures in columns (index j). The matrix thus generally represents "transactions" between receiving and paying accounts. The internal accounting consistency of the matrix is itself ensured by the fact that for each of the accounts opened, total receipts are equal to total expenditures.[10]

Table 9 gives, for the year 1983, the aggregate SAM of the Tunisian economy. This SAM comprises the following accounts: two factor accounts (1 and 2); six accounts for institutions (3 to 8), including 4 accounts for households and one account each for firms and for the government; four accounts for taxes and subsidies (9 to 12); an accumulation account (13); two accounts for activities (14 and 15); sixteen accounts for products and services (16 to 31); and one account for the rest of the world (32).

In the aggregate version of the TANIT model on which the simulations presented in the next section are based, we have deliberately chosen to sacrifice the detail of a breakdown of branches and products, and have only retained price setting mechanisms and external trade policies. The aggregate version includes about 160 equations, while the breakdown version comprises 650.

We can begin reading Table 9 by looking at Line 15, which describes receipts from the branch of production (see Table 9 at end of text). These receipts come from the sale of the following items: local "regulated price" products ($t_{15,16}$); local "freed" products ($t_{15,20}$); local products subject to quotas ($t_{15,23}$); bread ($t_{15,27}$); crude

petroleum ($t_{15,29}$); administrative services ($t_{15,30}$); and exports ($t_{15,31}$). Also included are receipts from commercial margins ($t_{15,18}$; $t_{15,22}$; $t_{15,26}$). For each product, in accordance with the articulation of the products accounts presented in Tables 6 to 8, we calculate the value of total resources available, at market price, of the various categories of products and exports. These resources (Lines 19, 22, 26, 28, 29, 30) are allocated to the final consumption of households (Columns 5, 6) and of the Government ($t_{30,8}$), to investment (Column 13) and to various intermediate consumptions (Column 15).

Accounts 1 to 12 are used to describe the receipts and expenditures flows of production factors and institutions. Accounts 9 to 12 are reconciliation accounts, which enable us to take taxes (Account 9) and various types of subsidy (Accounts 10 to 12) into consideration. The factors of production are identified by only two accounts. This choice assumes the hypothesis of perfect mobility of capital and labour. Four (4) accounts are required to characterize the behaviour of households. Households are measured in regard to total income (Account 3), disposable income (Account 4), budget for consumption (Account 5), and budget for discretionary consumption (Account 6). This articulation of accounts is chosen in order to describe household consumption in terms of a non-linear system of expenditures. One account is provided for businesses, and one for the state. Finally, Account 13 makes it possible to establish an equilibrium between savings and investment.

In addition to the particular features of the products accounts (16 to 31), as described above, the aggregate SAM provides two further characteristics. Firstly we have chosen, in this aggregate model, to separate "bread" from the other "regulated price" products. The treatment of these accounts (27 and 28) is relatively simple. Account 27 ("Bread at cost price") is supplied by the production account ($t_{15,27}$), and this production is distributed on the market at a sale price fixed by the Government (Account 28, "Bread at regulated price"). The difference between the cost price and the regulated price is met through a subsidy from the P.S.F. ($t_{12,28}$). The residual difference between the value of bread production and the value of its sale to consumers is equivalent to a **negative** receipt (subsidy) of the the P.S.F. (Line 12).

In the second place, the Tunisian SAM treats the P.S.F. account (Account 12) in a particular way. All subsidies paid by the P.S.F. are interpreted as negative expenditures of the accounts for products whose price is set. The subsidies granted by the P.S.F. are thus negative receipts recorded in ($t_{15,19}$) for "regulated price" products and in ($t_{15,28}$) for bread. However, the actual receipts of the P.S.F., which come from a state transfer ($t_{12,8}$), are not sufficient to balance the budget of the P.S.F. Its deficit is therefore covered by resorting to savings ($t_{13,12}$), and the national savings available to finance investments (Column 13) are reduced by the amount of this deficit.

V

THE SIMULATIONS AND THEIR RESULTS

Given the hypotheses of the TANIT model, we find ourselves dealing with an economy where producers use intermediate inputs according to a Leontief type relationship, and maintain constant the relative shares of production factors in value added. The wage rate is fixed, and the level of employment adjusts to the demand of firms. The capital endowment is fixed in volume, and the return on capital is endogenous. Households obtain their income from labour and capital, and some of them appropriate a scarcity rent from the trade in imports subject to quotas. Households save a portion of their available income, and allocate their budget for consumption to compulsory and discretionary expenditures. Compulsory expenditures can be interpreted as representing the consumption of essential goods (fixed volumes), while discretionary expenditures vary with income. The gross operating surplus of firms (including operating subsidies) is allocated to households, to the government, to the rest of the world and to savings (including amortization) in fixed proportions.

Current expenditures of the government in goods and services, for transfers to households and businesses and for equipment subsidies are exogenous. With endogenous direct and indirect tax receipts, the current surplus of the government's budget (i.e. not including investment expenditures) represents the gross savings of the public authorities (residual balance). In the case of "freed" products, prices are formed freely and the goods in question are subject to competition from imports. The "regulated price" products enjoy an offsetting subsidization from the P.S.F., while the restriction on international competition created by import quotas causes the price of goods under quota to be higher than the import price plus customs duties.

Finally, we assume that the volume of investment is the result of a centralized planning process. Consequently, the insufficiency of national

savings causes increased reliance on external borrowing, and leads to a deficit in the current account in a fixed exchange rate system.

The TANIT model is used to simulate the impact of various economic policies. The first five simulations operate on the hypothesis that the Tunisian economy remains subject to the system of price controls for bread and so-called "set price" products, and that imports of certain categories of products are governed by quantitative restrictions. The five simulation scenarios presented in Tables 10 and 11 are as follows (see Tables 10 and 11 at end of text):

Scenario 1: Increase (+10%) in the volume of investments.
Scenario 2: Increase (+25%) in the price of bread.
Scenario 3: Uniform reduction (-10%) in import tariffs.
Scenario 4: Reinforcement of quantitative restrictions (-10%).
Scenario 5: Devaluation (-10%) of the Tunisian dinar.

Scenario 6 presents the impact of a 10% devaluation, combined with a liberalization of domestic prices for all products and an elimination of quotas. Scenario 7 shows the effects of a devaluation that is offset by a reduction in customs duties on imports and accompanied by a liberalization of domestic prices and of imports subject to quotas.

Scenario 6: Liberalization, and devaluation (-10%) of the Tunisian dinar.
Scenario 7: Liberalization, and devaluation (-10%) of the Tunisain dinar offset by a reduction (-10%) on import tariffs.

Scenario 1: Increase in investment

By combining the results supplied by Tables 10 and 11, we can easily assess the repercussions of an increase in investment. Greater investment creates an increase in overall demand, which results in a rise in production costs (+1.5%) and a decrease in the real wage cost (-2.1%). With a fixed nominal wage, an increase in production costs and in value added (net price) produces higher profit margins and induces firms to

increase real production (+1.1%) and employment (+3.5%). With constant public expenditures, a rise in governmental tax receipts leads to an increase in the administration's current savings. Higher savings on the part of households and firms, combined with those of the government, prove insufficent to finance the increase in investment, and as a result, the deficit in the balance of current payments goes up (+26.6%).

What are the consequences of an increase of investment where a system of price controls and import quotas exist? By exercising upward pressure on production costs, higher investment causes the financial position of the P.S.F. to deteriorate. The volume of compensatory subsidies will increase to cover the growing disparity between regulated sale prices and production costs. The deficit of the P.S.F. rises by 254%, going from 11 million to 32 million Tunisian dinars.

Furthermore, as far as import quotas are concerned, greater overall demand and higher P.S.F. will tend to increase the volume of desired imports. If the Government maintains the volume of imports subject to quotas at a constant level, it thereby increases their scarcity, which in turn exercises an upward pressure on their price. The value of the scarcity rent thus generated is equal to 4.3% of the value of imports subject to quotas, or 11.8 million Tunisian dinars.

Scenario 2: Increase in the price of bread

The rise in the price of bread produces an increase in consumer prices (+0.2%), which is rather slight because it is offset by a relative decrease in other prices. The greater real wage cost results in a modest decline in economic activity, and in lower household incomes and consumption (-0.4%). On the other hand, the higher price of bread reduces compensation charges and improves the financial position of the Price Stabilization Fund.

Scenario 3: Decrease in customs duties

The reduction of customs duties makes imported goods more attractive, and causes the volume of imports to rise (by +0.5%). At the same time, by

increasing domestic competition and substitution between local and imported products, lower customs duties reduce production costs and consumer prices (-0.3%).

The rise in the wage cost in relation to sale prices is minimal, and has an insignificant effect on GDP and employment. On the other hand, the decline in customs receipts substantially decreases the government's current surplus (-6.3%). However, the financial position of the P.S.F. is improved, and its deficit is reduced from 11 to 1.8 million Tunisian dinars. As one might expect, the reduction of customs duties results in an increase (+3.3%) of the current balance of payments deficit.

Scenario 4: Reduction of the volume of products subject to quotas

Greater quantitative restrictions on imports are reflected in a decrease in the authorized volume of imports subject to quotas. Tighter restrictions enhance the protection of products subject to international competition, by bringing about a rise in the price of imports under quota. In relation to the base year, the price of imports under quota goes up by 14%, which causes the average price of products subject to quotas (both local and imported) to rise by 3%. Greater restrictions on imports slightly favour local production, GDP and employment increasing by 0.1% and 0.5% respectively.

The current deficit of the balance of payments declines (by 2.2%), but the P.S.F. forced to increase its compensatory subsidies as a result of a higher cost price for "regulated price" products, and its deficit goes up by 45.4%. Consumer prices rise by 1.4%, and the volume of household consumption decreases by 0.2%. The value of the income that is appropriated by certain middlemen is evaluated at 33.9 million Tunisian dinars.

Scenario 5: Devaluation of the Tunisian dinar

In Scenario 5, we have simulated the impact of a 10% reduction in the value of the Tunisian dinar. This devaluation of the dinar improves the competitive position of the Tunisian economy, and stimulates exports. At

the same time, the higher cost of imports reduces their volume (by -0.3%), but increases the total import bill (by +9.7%). Devaluation exercises an upward pressure on consumer prices, whose rise (+5.1%) is tempered by maintenance of the system of controls for certain prices. Higher prices and fixed wages combine to lower substantially the real wage cost (by -5.8%), which favours domestic production (+3.7%) and employment (+10.2%).

The rise in the GDP produces increases in incomes, final and intermediate consumption, and imports. A positive income effect on the demand for imports counterbalances the reduction in the volume of imported goods, which is due to the higher cost of imports. However, the volume of imports declines only slightly, so that the deficit in the current account balance mounts (by 6.3%). Because certain prices are still controlled, the P.S.F. is forced to increase its compensatory subsidies as cost prices rise (by +5.6%), and the Fund's deficit climbs from 11 to 199 million dinars.

Scenario 6: Liberalization and devaluation

In the preceding scenario, a devaluation of the Tunisian dinar took place, but the Government did not alter pricing systems or the regulation of external trade. In this scenario, however, we simulated a policy of devaluation combined with liberalization of prices and of external trade (elimination of quotas, but maintenance of customs duties at their previous level). The abolition of price controls leads to the elimination of P.S.F. subsidies.

What results are obtained? Devaluation combined with removal of price controls results in higher production costs (+4%) and consumer prices (+10%). However, the stability of the wage cost (+0.6%) keeps gross domestic product and employment almost unchanged (variance of -0.3% and -0.8% respectively).

Through the elimination of subsidies, the value of total resources measured at market price increases. This rise in resources creates an exportable surplus, and makes it possible to maintain the level of

private and public consumption. However, the volume of private consumption decreases substantially (by -9.2%), while the volume of exports goes up by 5.7%. In contrast with the preceding scenario, devaluation accompanied by liberalization proves to be an effective instrument for improving the current account (the deficit goes down by 41.3%) and the public finance deficit (improvement of +49.6%). The burden of the adjustment is entirely borne by households, which see their real consumption decline by 9.2%.

Scenario 7: Liberalization and offset devaluation

Our last scenario provides for devaluation accompanied by liberalization and by a reduction of customs duties on imports. Through these measures, the Government seeks to mitigate the rise of prices resulting from devaluation, offsetting it by lower customs duties.

As in the preceding case, Scenario 7 leaves gross domestic product and the real wage costs virtually unchanged. Consumer prices do not go up as much (9.4% instead of 10%), and the reduction in the volume of private consumption is less marked (-8.7% instead of -9.2%). Lower customs duties improve public finances and the deficit in the balance of current payments (-36.8% instead of -41.3%).

VI

CONCLUSION

More frequently than in the past, semi-industrialized countries like Tunisia are confronted with increasingly complex economic policy questions. The solution to these problems is far from obvious, if one wishes to take into account the complexity of the economic structure, the multiplicity of policy instruments and the behaviour of the economic agents involved.

However, it must be admitted that in our present state of knowledge, providing satisfactory answers to these questions is still a great challenge. We therefore have to be very cautious in determining the extent to which our results are reliable. These comments apply to the interpretation of the results obtained with our TANIT 83 model, and the following points should be noted:

1. Our results are based on an aggregate version, and a better understanding of Tunisia's economic reality would require a more detailed breakdown.

2. Our knowledge of the major behaviour parameters of the economic agents is rather slight. More detailed analysis should be made, possibly through econometric studies, of the values of the various price, substitution and income elasticities.

3. The model should be made dynamic, in order to introduce a government planning horizon; and so on.

Each of these improvements will necessarily require a substantial research effort. Nevertheless, we remain convinced that the construction of computable general equilibriuim models for semi-industrialized and developing economies is a very fruitful avenue of research, since it is superior to other methods in evaluating the impact of complex policies of structural adjustment.

NOTES

1. See, for example, the work of Decaluwé and Martens (1985) for an overview of the literature on this question.

2. TANIT is the name of a divinity of commerce venerated in the ancient city of Carthage.

3. Price and exchange rate of 1983.

4. Analysis of economic performance over the first three years of the sixth plan indicates that these objectives have not been attained, and that the average rate of investment has increased over the first years of the plan. Moreover, most of the major investment projects realized do not fulfill the particular conditions for selection.

5. The complementary imports are almost entirely "freed". The portion of these imports that is subject to restrictions is either monopolized and consists of final consumer products (coffee, tea), or is prohibited or subject to quotas and primarily comprises final consumer products and investment goods.

6. See Drud, Grais and Pyatt (1983) and (1986). The method of construction is described in a manual produced by the CRDE researchers; see CRDE (1984). For a presentation of a social accounting matrix see, for example, Decaluwé, Martens and Monette (1985).

7. The complete system of equations used in the model may be obtained from the authors.

8. See, for example, Bousselmi and Decaluwé (1985), and Institute for Quantitative Economy (1983 a and b) (1984 a and b).

9. For a different treatment, see Dervis, de Melo and Robinson (1980), and Michel and Noël (1984).

10. Regarding the criteria for the construction of a SAM according to the transaction values (TV) method, see Decaluwé and Grais (1983).

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* Translator's note: The titles given in full in this bibliography are translations of the original French titles.

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Table 1: Weighting of the consumer price index

System of prices	1980	1981
1. Regulated	48.2	39.9
- Stabilization Fund	(22.0)	(21.6)
- Other products	(21.2)	(13.3)
- Public tariffs	(5.0)	(5.0)
2. Approval	8.1	4.2
3. Self-approval	0.0	24.5
4. Controlled freedom	18.5	1.1
5. Total freedom	25.2	30.3
Total	100	100

Source: N. Bousselmi and M. Nabli, **Évolution de la protection et des incitations effectives aux activités économiques en 1977, 1980 et 1983** (Development of protection and of effective incentives to economic activity in 1977, 1980 and 1983). Institute for Quantitative Economy, Tunis, January, 1985.

Table 2: Rates of nominal protection by product

Categories	1972	1977	1980	1983
Mineral raw materials	8.04	7.82	14.25	16.75
Vegetable and animal raw materials	10.12	13.87	23.05	24.29
Energy products	8.76	7.84	4.84	12.85
Semi-finished goods	11.92	15.73	22.95	25.01
Agricultural equipment	6.44	5.05	12.42	24.13
Industrial equipment	10.81	14.33	17.45	21.98
Food for human consumption	30.93	34.21	77.61	63.73
Consumer products	22.57	32.42	63.97	53.28

Source: N. Bousselmi and M. Nabli, op. cit., p. 20 (Table 2.1).

Table 3: Quantitative restrictions on imports

Structure according to total imports	Restrictions	Public monopolies	Free imports
0. Food	4.5	95.0	1.1
1. Beverages and tobacco	0.5	0.4	4.7
2. Non-combustible raw materials	8.1	0.8	9.6
3. Fuels	16.2	-	0.9
4. Oils	2.5	0.1	0.1
5. Chemicals	4.0	2.2	25.9
6. Manufactured goods	26.6	0.0	14.7
7. Transportation equipment	31.4	-	32.7
8. Other manufacturing	5.6	1.2	10.2
9. Other	0.6	-	0.0
Total	100	100	100
	71.7%	10.3%	18.0%

Source: N. Bousselmi and M. Nabli, op. cit., p. 72 (Table 3.6).

Table 4: Breakdown of production

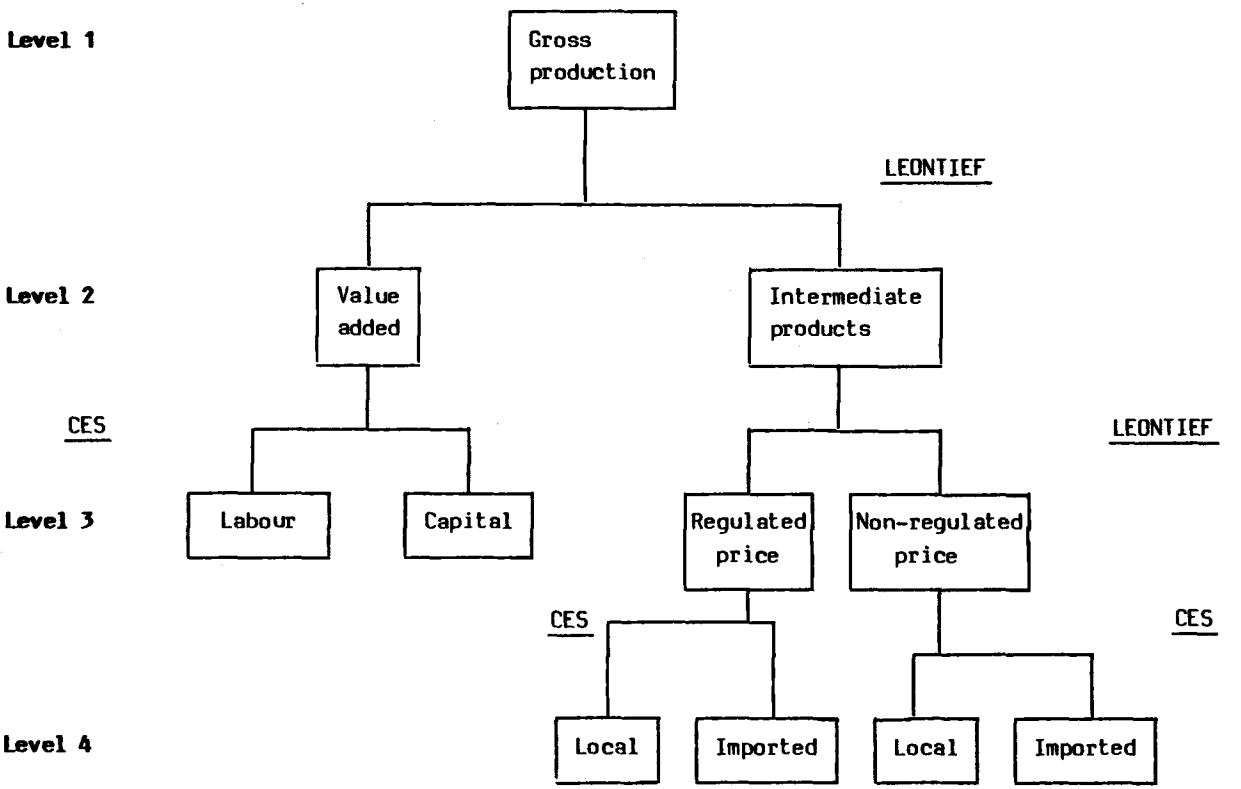

Table 5: Breakdown of goods and services Accounts

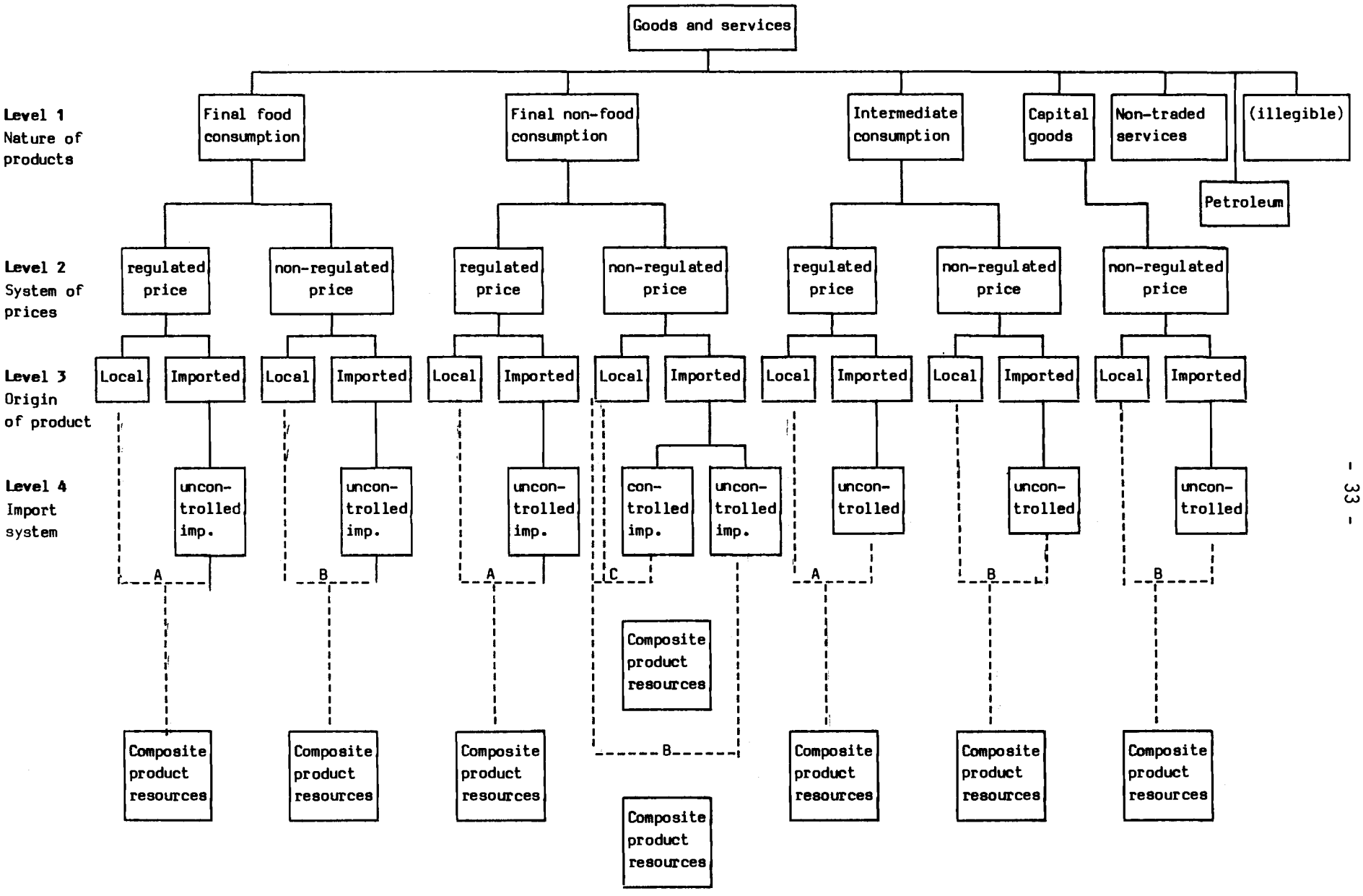

Table 6: Products with regulated prices

		Agents		Taxes and duties	G.C.F.	Production	Products with regulated prices				Rest of world	TOTAL
		Households	State				Local	Imported	Composite cost price	subsidized price		
		1	2	3	4	5	6	7	8	9	10	11
Agents: Households	1											
State	2									- X		
Taxes and duties	3							X	X			
P.S.F.	4									- X		
Production	5						X		X			X
PRODUCTS WITH	Local 6								X			X
	Imported 7								X			X
	Composite cost price 8									X		X
	Composite adjusted price 9	X				X						X
Rest of world	10							X				
TOTAL	11					X	X	X	X	X		

P.S. Tous les comptes de la matrice n'ont pas été "balancé". On a uniquement décrit les interrelations entre les comptes 6 à 9 et les autres comptes de cette SAM hypothétique.

Table 7: "Freed" products

		Households	Taxes	Production	Freed products			Rest of world	TOTAL
					Local	Imported	Composite		
		1	2	3	4	5	6	7	8
Households	1								
Taxes	2					X	X		
Production	3				X		X		
FREED PRODUCTS: Local	4						X		X
FREED PRODUCTS: Imported	5						X		X
FREED PRODUCTS: Composite	6	X		X					X
Rest of world	7					X			
TOTAL	8				X	X	X		

Table 8: Products subject to quotas

		Households	Taxes and duties	Production	Products subject to quotas: Local	Imported	Rent income	Composite market price	Rest of world	TOTAL
		1	2	3	4	5	6	7	8	9
Households	1						X			
Taxes and duties	2					X		X		
Production	3				X			X		
PRODUCTS (Local)	4							X		X
PRODUCTS (Imported)	5						X			X
PRODUCTS (Rent income)	6							X		X
PRODUCTS (Composite market price)	7	X		X						X
Rest of world	8					X				
TOTAL	9			X	X	X	X	X		

Table 9: Social accounting matrix: the data

REGULATED

Designations of accounts		Factors		Institutions						Subsidies				Accumulation	Value added	Production	"Set price" prods.				"Freed" prods.			Prods. under quota				Bread		Crude petroleum	Admin. services	Exports	Rest of world	TOTAL
				Households				Businesses FIRMS	State GOVERNMENT																									
		Labour	Capital	Income	Available income	Consumption	Discretionary consumption			Taxes	Operations & equilibrium	Equipment	Gr. fix. P.S.F.				Local	Imported	Composite, cost price	Composite, adjusted price REGULATED	Local	Imported	Composite	Local	Imported	Composite, without sale	Composite, market price	Cost price	Adjusted price REGULATED					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Factors																																		
Labour	1														1807																		1807
Capital	2														2969																		2969
Institutions																																		
Households: Income	3	1807						2013	216																	-0.1						244	4280
Available income	4			3894																														3894
Consumption	5				3463																													3463
Discretionary cons.	6					2677																												2677
~~Businesses~~ FIRMS	7		2969						49		81						25			-104			178		47		210			5			80	3178
~~State~~ GOVERNMENT	8			380				729		983								44	272			218											2013
Taxes	9																														10		983
Subsidies subsidies																																		
Operations ~~and equilibrium~~	10								81																									81
Equipment subsidies	11								216																									216
~~General Compensation Fund~~	12								150											-125									-36					-11
Accumulation P.S.F.	13				431			257	320			216	-11																			416	1630
Value added	14															4776														90	914	1932		4776
Production	15																1334		124		2995		169	987			224	96						8866
"~~Set~~ price" products REGULATED																																		
Local	16																		1359															1359
Imported	17																		670															670
Composite, cost price	18																			2426														2425
Composite, ~~adjusted~~ price	19					734	229									1233																		2196
"Freed" products REGULATED																																		
Local	20																						2995											2995
Imported	21																						1802											1802
Composite	22						860							1630		2655																		5144
Products subject to quotas																																		
Local	23																									987								987
Imported	24																									267								267
Composite, without sale	25																										267							267
Composite, market price	26						1583									106																		1688
Bread																																		
Bread, cost price	27															-																		96
Bread, ~~adjusted~~ price	28					51	6									3													96					60
Crude petroleum → REGULATED	29															94																		94
Government services	30								914																									914
Exports	31																																	1942
Rest of world	32			6				180	66									626				1584			220							1942	2683
		1807	2969	4280	3894	3463	2677	3179	2013	983	81	216	-11	1630	4776	8866	1359	670	2425	2196	2995	1802	5144	987	267	267	1688	96	60	94	914	1942	2683	

Table 10: Balance of resources and uses

	Base year 1983		1 Volume of investments (+10%)		2 Increase in price of bread (+25%)		3 Decrease in customs duties (-10%)		4 Reduction in quota imports (-10%)		5 Devaluation (-10%)		6 Liberalization & devaluation (-10%)		7 Liberalization and adjusted devaluation	
	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume
Total resources	7949		8244 +3.71%		7933 -0.2%		7939 -0.1%		7994 +0.6%		8598 +8.1%		8245 +3.7%		8236 +3.6%	
Gross domestic product	4776	4776	4945 +3.5%	4951 +1.1%	4754 -0.4%	4770 -0.2%	4769 -0.1%	4776 0.0%	4800 +0.5%	4787 +0.2%	5264 +10.2%	4957 +3.7%	4737 -0.8%	4763 -0.3%	4738 -0.8%	4764 -0.3%
CIF imports	2430	2430	2535 +4.3%	2535 +4.3%	2422 -0.3%	2422 -0.3%	2444 +0.5%	2444 +0.5%	2420 -0.4%	2420 -0.4%	2665 +9.6%	2422 -0.3%	2485 +2.2%	2259 -7.0%	2505 +5.5%	2277 +4.0%
Indirect taxes	1008		1058 +4.9%		1000 -0.8%		981 -2.6%		1044 +3.5%		1124 +11.5%		1023 +1.5%		992 -1.6%	
Subsidies	-265		-294 +10.9%		-246 -7.1%		-256 -3.4%		-270 +1.9%		-456 +72.0%		0		0	
Total uses	7949		8244 +3.7%		7933 -0.2%		7939 -0.1%		7994 +0.6%		8597 +8.1%		8245 +3.7%		8236 +3.6%	
Private consumption	3463	3463	3578 +3.3%	3536 +2.11%	3448 -0.4%	3441 -0.6%	3462 0.0%	3471 0.2%	3505 +1.2%	3456 -0.2%	3798 +9.7%	3613 4.3%	3462 0.0%	3145 -9.2%	3463 0.0%	3163 -8.7%
Public consumption	914	914	914 0.0%	901 -1.42%	914 0.0%	916 0.0%	914 0.0%	917 0.3%	914 0.0%	912 -0.2%	914 0.0%	865 -5.3%	914 0.0%	878 -4.0%	914 0.0%	880 -4.0%
Investments	1630	1630	1810 +11.0%	1793 +10.0%	1628 -0.1%	1630 0.0%	1620 -0.6%	1630 0.0%	1632 +0.1%	1630 0.0%	1748 +7.2%	1630 0.0%	1732 +6.2%	1630 0.0%	1721 +5.5%	1630 0.0%
Exports	1942	1942	1942 0.0%	1914 -1.44%	1942 0.0%	1946 0.2%	1942 0.0%	1948 0.3%	1942 0.0%	1938 -0.2%	2136 +10.0%	2022 +4.1%	2136 +10.0%	2053 5.7%	2136 +10.0%	2058 5.8%

Table 11: Simulation results

	Base year 1983	1 Volume of investments (+10%)		2 Increase in price of bread (+25%)		3 Decrease in customs duties (-10%)		4 Reduction in quota imports (-10%)		5 Devaluation (-10%)		6 Liberalization & devaluation (-10%)		7 Liberalization and adjusted devaluation	
	Value	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Financing of investments															
Investments	1630	1810	+11.0%	1628	-0.1%	1619	-0.6%	1632	0.1%	1748	7.2%	1732	6.2%	1721	5.6%
National savings:															
- Households	431	446	3.5%	429	-0.5%	431	0.0%	437	1.3%	473	9.7%	431	0.0%	431	0.0%
- Businesses	257	265	3.1%	256	-0.8%	256	-0.8%	258	0.3%	282	9.7%	257	0.0%	257	0.0%
- State	536	610	12.0%	526	-1.9%	502	-6.3%	545	1.6%	748	39.6%	802	49.6%	771	43.8%
- G.C.F.	-11	-39	254.5%	8		-1.8	-77.5%	-16	45.4%	-199	1709%	0		0	
Current balance of payments deficit															
Employment (% increase)			3.54%		-0.4%		-0.1%		0.5%		10.2%		-0.8%		-0.8%
Prices: (% increase)															
Production	1.0		1.5%		-0.2%		-0.3%		0.2%		5.6%		4.0%		3.8%
Consumption	1.0		1.2%		0.2%		-0.3%		1.4%		5.1%		10.0%		9.4%
Import	1.0		0.0%		0.0%		0.0%		0.0%		10.0%		10.0%		10.0%
Export	1.0		1.5%		-0.2%		-0.3%		0.02%		5.6%		4.0%		3.8%
Exchange rate	1.0		0.0%		-		0.0%		0.0%		10.0%		10.0%		10.0%
Real wage cost	1.0		-2.1%		0.3%		+0.1%		-0.3%		-5.8%		0.6%		0.6%