THE TUNISIA-EU FREE TRADE AREA: A GENERAL EQUILIBRIUM LOOK AT PROBABLE IMPACTS IN TUNISIA

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ABSTRACT

A general equilibrium model of the Tunisian economy, in which special attention is given to agricultural production and processing, suggests the recently instituted free trade area between Tunisia and the European Union will increase Tunisia's gross domestic product, raise rural and urban incomes, and increase prices of domestically produced intermediate goods such as raw farm products. If exchange rates continue fixed as trade restrictions are liberalized, the trade deficit will rise substantially. However, even modest reductions in the local currency are sufficient to maintain the trade balance at financially feasible levels.

RÉSUMÉ

Un modèle d'équilibre général de l'économie Tunisienne, dans lequel une attention particulière est donnée à la production agricole et alimentaire, montre que la zone de libre échange récemment instituée entre la Tunisie et l'Union Européenne devra augmenter le produit intérieur brut, améliorer les salaires ruraux et urbains et augmenter les prix des biens intermédiaires produits localement tels que les produits agricoles. Si le taux de change reste fixe, alors que les échanges sont libéralisés, le déficit extérieur augmentera de façon significative. Cependant, même une dévaluation modeste de la monnaie locale est suffisante pour maintenir le déficit à des niveaux financièrement acceptables.

Tunisia and the European Union have recently agreed to an economic Free Trade Area (FTA) entailing the gradual removal of tariff and non-tariff trade barriers between the two partners. The agreement has generated debate over the likely impact of integration on the Tunisian economy.

While it seems the FTA should stimulate growth in Tunisia through enhanced market size, improved capital mobility, and technology transfer, concerns remain that full trade liberalization with Europe would threaten the infant and often protected Tunisian industries and create sectorial and general maladjustments besides.

Studies bearing on this debate are limited and differ in both approach and conclusions.

Chourou (1988) says the FTA likely will bring no net benefits to Tunisia and may create major economic difficulties, arguing that free-trade areas between unequally developed countries generally are harmful to the weaker partner.

In a neoclassical partial equilibrium analysis, Boudhiaf (1996) concludes the FTA's overall effect on Tunisia will be negative.

He notes that, under the existing special preference trade arrangement with the EU, most Tunisian industrial exports and many agricultural products already enter European markets duty free or at reduced tariff rates. In the short run, then, not much would be gained from the new arrangement. An FTA, that is, does little more than open Tunisian markets to European goods. On the other hand, using an industry-focused general equilibrium model, Rutherford, Rutstrom, and Tarr (1995) find that trade liberalization with Europe improves Tunisian welfare under most scenarios and that improvement is greater in the long run than in the short run.

In this paper, we evaluate the economy-wide and sector-specific effects of full trade liberalization between the European Union and Tunisia.

Emphasis is placed on the agricultural sector, which accounts for a large part of Tunisia's gdp and employment and which attracts a significant share of public spending. Changes in agricultural policies have important macroeconomic effects that are best studied in a general equilibrium framework.

The general equilibrium approach considers inter-sectorial linkages by way of input-output relationships and inter-sector factor mobility, as well through substitution and income effects most often overlooked in a partial equilibrium setting. Hence, it is a useful tool for tracing out the multiple effects of an imposed external shock, particularly where sectorial and macroeconomic phenomena such as investment and saving, balance of payments, and government budget all prove important.

We formulate here a static, multisectorial computable general equilibrium model in which Tunisian agriculture is disaggregated into seven sub-sectors, plus fishing and food processing.

The model is used to estimate the effects of complete elimination of tariffs and subsidies on imports from and exports to the EU. We analyze the same policy scenarios as in Boudhiaf (1996), permitting us to draw direct

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comparisons between the general equilibrium and partial equilibrium effects of trade liberalization.

Tunisian trade structure and policy

Partly for historical reasons, Tunisia's foreign trade is skewed heavily toward the European Union. On average, EU countries absorb 79% of Tunisian exports and supply 72% of Tunisian imports, accounting for 73% of Tunisia's total trade deficit (**table 1**). Tunisia's trade dependence on European markets is greater still in certain commodities, often exceeding 90% of traded value. France is Tunisia's leading customer and supplier in Europe, followed by Italy and Germany. As **table 2** shows, just over 80% of the value of Tunisia's imports and exports are in non-food manufactured goods, about 8% in agriculture and food processing, and about 10% in energy. Approximately three-quarters of agricultural export revenues are from olive oil, seafood, dates, wine and alcoholic beverages, citrus fruits, cereal-based preparations, and cereal flour. Olive oil alone accounts for 30% to 50% of agricultural exports, most of which are highly vulnerable to random weather, political, and demand changes at home and abroad. Tunisian imports, on the other hand, are dominated by cereals, vegetable oils, sugar, and maize. Cereals are the leading import sector and, in some years, represent up to 40% of import value. Tunisia's intimate relationship with the EU is explained partly by pre-FTA preferential trade agreements. In particular, the EU traditionally has granted non-reciprocal advantages to Tunisian exports. Almost all Tunisian manufactured goods have free access to EU markets and many agricultural products benefit from important tariff reductions. Among agricultural goods, however, tariff concessions are granted only within certain quotas and are limited to certain periods of the year. A Tunisia-EU free trade area therefore will improve market access for Tunisian products but will also require the reciprocal action of liberalizing Tunisian imports. Over a 12-year period, Tunisia must eliminate tariff duties on imports from the EU (1). Both parties have agreed, however, to exclude the agricultural sector from this FTA until 2000, at which time agricultural trade will again be reviewed. The ostensible reason for the exclusion is that Tunisian agriculture needs time to prepare itself for an open-trade environment. EU nations also are unwilling in the short run to further reduce the protection granted to their agricultural sectors by the common agricultural policy.

Table 1 ***Tunisian trade, by groups of countries, 1996***

Region	Imports		Exports	
	Value	Share (%)	Value	Share (%)
Europe	5920.00	78.49	4341.10	80.81
Eu	5454.90	72.32	4230.10	78.74
Other Europe	465.10	6.17	111.00	2.07
Nafta	392.20	5.20	44.00	0.82
Maghreb Countries plus Egypt	411.00	5.45	321.00	5.98
Gulf Countries	60.90	0.81	49.30	0.92
Japan, China and India	245.00	3.25	150.00	2.79
Rest of the world	513.60	6.81	466.60	8.69
Total	**7542.70**	**100.00**	**5372.00**	**100.00**

Source: Tunisian Central Bank annual report
Values are in millions of Tunisian dinar.

Table 2 ***Tunisian foreign trade by sector of activity, 1996***

	Exports		Imports	
	Value	Share (%)	Value	Share (%)
Agriculture, fisheries and food processing	404.8	7.5	748.2	9.9
Agriculture and fisheries	169.9	3.1	341.5	4.5
Food processing	234.9	4.4	406.7	5.4
Energy	563	10.5	629.2	8.3
Mining products	62.5	1.2	29.6	0.4
Non-food manufacturing industries	4341.7	80.8	6135.7	81.4
Textiles, leather, and footwear	2583.2	49.9	1882.6	25.2
Mechanical and electrical	669.6	12.5	2717.2	36.0
Phosphate by-products	552.4	10.3	163.1	2.2
Other manufactured products	372	6.9	1259.3	16.7
Total	**5172.9**	**100**	**7464.1**	**100**

Source: Tunisian Central Bank annual report 1996
Values are in millions of Tunisian dinar.

General equilibrium model

Our computable general equilibrium model is, in most respects, typical of multisectorial, trade-oriented models used for developing nations (Dervis, de Melo, and Robinson, 1982; Sahn, Dorosh, and Younger, 1996; Benjamin, 1996). These frameworks permit optimizing behavour among economic agents and allow the researcher to maintain alternative assumptions about market structure. They incorporate macroeconomic aggregates, especially investment, government budget, and the balance of trade, and are calibrated to agree in a base year with a reference database, the social accounting matrix or sam. De Maio, Stewart, and van der Hoeven (1999) recently have questioned whether some of the assumptions frequently used in general equilibrium models are realistic or focus adequately on the poor. They mention, in particular, the standard stipulations that labour remain in full employment and that substitution elasticities in production be constant. Sahn, Dorosh, and Younger (1999) provide, in their response,

(1) Tariffs will be dismantled over twelve years, but at rates depending upon the nature of the product and on the sensitivity of its domestic equivalent to foreign competition. For example, custom duties on raw materials and on production goods for which there is no locally produced equivalent will be totally eliminated during the first year of the agreement. Duties on finished goods will be eliminated in the first year at an annual 20% rate. Tariffs on other products will be reduced later but at equally-spaced rates until there is total elimination at the end of the twelve years.

a detailed defense of such assumptions for many Sub-Saharan African economies. Below, we summarize our own model and indicate its applicability to Tunisian conditions. The model includes sixteen sectors consistent with the product classifications used in the Tunisian national income and product accounts and in the ministry of Agriculture data base. Seven agricultural sub-sectors are considered to produce seven aggregate commodities: cereals, meat, milk, oranges, sugarbeets, olives and other agriculture. In addition, there are nine non-agricultural sectors: food processing, fishing, chemicals, energy, construction, tourism, urban water, other industries and government administration. The non-agricultural sectors were selected on the basis of their links to the agricultural sectors in terms of interindustry output flows and competition for resource use. We include five primary factors of production: rural labour, urban labour, irrigation water, cropland and capital. The agricultural sectors use rural labour, water, cropland and capital, while the non-agricultural sectors use only urban labour and capital. In Tunisia, agricultural and urban labour markets are poorly integrated with one another, as evidenced by the large differentials between rural and urban areas in unskilled wages. We therefore assume here that labour is immobile between the agricultural and non-agricultural sectors, although mobile within a given sector. Certainly, workers do migrate between agricultural and urban jobs if they have sufficient time and opportunity. However, the zero-mobility assumption is useful because it captures a short- to medium-run environment which, as de Maio, Stewart, and van der Hoeven (1999) point out, is of greatest concern to the poor. By the same token, we suppose that capital is fixed by sector, implying that rates of return to capital differ from one sector to another. The immobile-capital assumption probably is reflective of a medium-term length of run, inasmuch as most capital in Tunisia is industry-specific and can not easily be adapted to alternative uses. In addition, Tunisian capital markets are quite imperfect, preventing equalization of rates of return except in a very long run sense (Devarajan and Offerdal, 1989). Finally, aggregate supplies of all primary factors are assumed fixed, so we permit no long-run growth in aggregate resource size. Five economic agents or institutions use or consume resources: rural households, urban households, firms, government and the rest of the world. Households and firms derive income from their ownership of labour and capital, from government subsidies and from transfers from abroad. Government derives revenue through taxes and tariffs and from subsidies from abroad. The complete model is given in the appendix. In the following, we present an overview of its major features.

(a) Technology, demand and income

Each production activity is characterized by a nested, two-level production function in which value-added is combined in fixed proportions with aggregates of domestic and imported intermediate inputs to produce an output. Labour, capital, cropland, and water generate real value-added by way of sector-specific production functions, so that substitution is permitted among these primary inputs. Sector-specific demands for the intermediate inputs are derived from the above fixed-proportion production functions. Sector-specific demands for the primary factors are derived by assuming that the rental price of each factor equals the value of its marginal product. This is not an unrealistic assumption: at the sectorial level of aggregation employed here, the combination of inter-firm and inter-product competition in Tunisia is typically vigorous ([2]). Households derive incomes from wages, shares in firm profits, and remittances from abroad. Firms receive incomes from capital ownership and government transfers. Payments to capital in each sector are determined residually from payments to the other factors. Government receives income through direct and indirect taxes, tariffs on imports and exports and capital ownership. Each agent saves a fixed proportion of after-tax income and spends the remainder on consumer goods. Two representative consumers (urban and rural) purchase goods according to known expenditure shares ([3]). Total investment demand is determined by total saving, which is the sum of private, public, and foreign savings. Investment in each sector is a fixed proportion of total investment.

(b) Trade and prices

Commodities in a given sector of our model are differentiated by country of origin; that is, domestic and foreign goods are imperfect substitutes. On the import side, consumers have utility for an imported and for a locally produced good, with constant elasticity of substitution between them. The mix demanded of these two goods depends on their relative prices and on the substitution elasticity ([4]). In the classical theory of trade, foreign and domestic products are perfect substitutes,

([2]) The factor demand functions are derived by solving, for the nth sector, the first-order conditions of profit equation $P_n^{va} VA_n - W_r L_m - W_u Lu_n - P_T T_n - P_E E_n$, where $P_n^{va} VA_n$ is price of value-added; VA_n is value-added; W is an input price; L is labour and r and u refer to rural and urban, respectively; T and E are land and water, respectively; and P_T and P_E are the associated prices.

([3]) This assumption implies the utility function underlying consumer behaviour is Cobb-Douglas.

([4]) The demands for imports and domestically produced goods are derived demands. Given prices of imports and domestic goods, buyers are assumed to minimize the cost of obtaining a mix of both goods, subject to a specified quantity of the composite commodity. The solution to such cost minimization problem is to set the marginal rate of substitution between imported and domestic goods equal to the ratio of prices of imports and domestically produced goods. Intermediate materials are, then, composite goods whose prices are weighted averages of the import and domestic goods' prices and whose weights are the shares of the imported and domestic goods in total domestic demand. The value-added or net price is equal to the producer price minus cost of intermediate materials. An increase in the value-added price is an indication of either an increase in output price or decrease in intermediate commodity price.

so the latter elasticity is infinite and domestic and import prices are identical to one another. The present formulation allows such prices to differ.

On the export side, each sector's output is specified as a function of a quantity of good for export and a quantity of good for domestic sale, with constant elasticity of transformation between them (5). The elasticity of transformation reflects the ease with which Tunisian sellers can switch from domestic to export markets. Total export supply is derived from the producer's first-order condition for revenue maximization given domestic and foreign prices and the domestic-to-foreign-good transformation function. Tunisia's balance of trade is denominated in foreign currencies and includes both remittances from abroad and transfers from Tunisian firms to the rest of the world. If the exchange rate is fixed, the trade balance is determined endogenously. However, if the trade balance is set exogenously, our model solves for the equilibrium exchange rate (Robinson, 1989).

World prices for Tunisian imports and exports are regarded here as given. Government trade instruments, such as import tariffs and export subsidies, create a wedge between domestic import and export prices on the one hand and world prices on the other one. Each sector's output price is a weighted average of the prices received by domestic firms for exports and for domestic sales. Similarly, each sector's import price is a weighted average of prices paid by domestic firms for imports and for domestic purchases. Domestic demand for a given sector's composite good equals the sum of final consumption demand, intermediate demand, and investment demand. For each primary input, aggregate demand must equal the fixed total supply.

(c) Closure properties

Implementing this model requires assigning parameter values to production, demand, import, and export equations. Two types of parameters are involved: substitution elasticities and shift and share parameters. We derived the former from a collection of studies inside and outside Tunisia, in several cases as adjusted by the opinions of knowledgeable individuals. Generally, agricultural products which are more homogenous and which are produced in more competitive industries (primarily cereals) have higher substitution elasticities than do those that are less homogenous or that are produced in less competitive industries (primarily livestock and processed food) (Sadoulet and de Janvry, 1992). Condon, Dahl and Devarajan's work (1987), technological characteristics in which largely match those in Tunisia, served as the starting point for many of the substitution elasticities we employed for Tunisia's industrial goods. They were all less than unity. As a robustness check, we successively recomputed the model solutions over a range of elasticity assumptions and found that results were only weakly sensitive to the parametric changes. Shift and share parameters were selected in such a way that the model reproduced as an equilibrium solution the baseline data set, given the exogenous estimates of the substitution elasticities. We calibrate the model using a data set consistent with a social accounting matrix of the 1998 Tunisian economy, showing the circular flow of income and expenditure (6).

SAM's usually contain three macro aggregates: balance of trade, investment and saving, and the government budget. The equilibrating mechanism in such accounts constitutes the "closure" property of the model (7). In our own study, total investment is determined endogenously as the sum of private, government, and foreign saving. That is, investment must adjust to the total saving which the model generates, an adjustment known as savings-driven closure (8). Any changes in exogenous variables will lead to a new equilibrium that can be compared to the base-case equilibrium as represented by the prices and quantities observed in the social accounting matrix. Base-case data are denominated in value terms and quantity units are selected such that the corresponding prices equal unity. The model was implemented using GAMS software, which solves the nonlinear equation system numerically (9).

A complete free trade area entails eliminating all tariff and nontariff barriers between both partners while maintaining tariff policies with countries outside the FTA. We compare such a scenario with the status quo, in which trade between Tunisia and Europe is regulated by the Tariff Preferential Accord (TPA). The latter accord had granted tariff reductions on Tunisian exports to the EU without requiring equivalent treatment of EU exports to Tunisia. In conformance with the notion of an FTA and with the scenario examined in Boudhiaf (1996), goods whose prices in the EU are lower than in Tunisia are assumed in our study to be imported into Tunisia at prevailing EU prices. The latter, on the other hand, are functions of world prices and of the common

(5) The rationale behind this formulation is that domestic goods falling into the same sectorial classification as do a given set of exports actually represent goods of a different quality or sub-sector composition. This is especially the case when, as in the present situation, each sector represents an aggregation of moderately heterogeneous goods. Constant elasticity of substitution is maintained largely for computational tractability. Robinson et al. (1993) employ an almost ideal demand specification to circumvent the elasticity constancy.

(6) This sam is constructed by the groupe de recherche en economie des politiques agricoles et agro-alimentaires (grepa), based at the national institute of agronomy, Tunis.

(7) For a discussion of this question, see Robinson (1989).

(8) This type of macro closure, in which investment adjusts passively to savings (i.e. savings-driven investment) is opposed to the Kaldorian or classical closure in which investment is fixed exogenously. The latter specification is often used in planning models that focus on alternative investment strategies. Each specification has a different implication for the distribution of income; see Dervis, de Melo, and Robinson (1981), Shoven and Whalley (1984), and Kilkenny and Robinson (1990).

(9) For a description of gams software, see Brooke, Kendrick, and Meeraus (1988).

tariff rates which the EU imposes on imports from outside the FTA. Tunisian exports under the FTA enjoy free access to the EU market, which remains protected from imports from the rest of the world. A Free Trade Area is modeled here under two alternative exchange rate regimes: fixed rates and flexible rates. At present, Tunisia's dinar is held at largely fixed ratios to foreign currencies.

Table 3 ***Economy-wide effects of trade liberalization in Tunisia***

Variables	Base line data	Fixed exchange rates		Flexible exchange rate	
	Value	Value	% Change	Value	% Change
Real gdp	9647.24	9858.40	2.19	9720.34	0.76
Rural wage	1.00	1.02	2.30	1.06	6.30
Urban wage	1.00	1.03	3.10	0.98	-1.90
Land price	1.00	1.02	2.20	1.06	5.70
Water price	1.00	1.03	2.70	1.05	4.90
Exchange rate	1.00	1.00	0.00	1.04	4.20
Rural household income	2475.22	2512.77	1.52	2547.48	2.92
Urban household income	5434.30	5568.44	2.47	5419.00	-0.28
Firms' income	1703.14	1721.79	1.10	1737.39	2.01
Government income	2369.87	1509.20	-36.32	1491.06	-37.08
Balance of trade	474.91	1465.99	208.69	474.90	0.00
Investment	2634.00	2776.00	5.39	1804.00	-31.51

Values are in millions of Tunisian dinar.

Table 4 ***Agricultural and industrial effects of trade liberalization in Tunisia***

Variables	Base line data	Fixed exchange rates		Flexible exchange rates	
	value	value	% change	value	% change
Value-added					
Agriculture	2150	2222	3.4	2279	6.0
Industry	5282	5369	1.6	5241	-0.8
Imports					
Agriculture	515	702	36.4	689	33.8
Industry	4957	5768	16.4	5500	10.9
Exports					
Agriculture	349	413	18.5	466	33.5
Industry	4308	4270	-0.9	4865	12.9
Production					
Agriculture	4421	4508	2.0	4609	4.3
Industry	13601	13656	0.4	13591	-0.1
Demand for domestic good					
Agriculture	4072	4094	0.5	4143	1.7
Industry	9302	9386	0.9	8726	-6.2
Demand for composite good					
Agriculture	4722	4797	1.6	4832	2.3
Industry	15007	15154	1.00	14226	-5.2
Consumption					
Agriculture	2717	2776	2.2	2743	1.0
Industry	4013	4103	2.2	4041	0.7
Producer price					
Agriculture	1.00	1.02	1.7	1.03	2.8
Industry	1.00	1.01	0.7	1.00	-0.2
Consumer price					
Agriculture	1.00	1.00	-0.5	1.00	0.4
Industry	1.00	1.00	0.3	1.00	-0.3
Domestic good price					
Agriculture	1.00	1.01	1.2	1.02	1.9
Industry	1.00	1.01	0.9	0.98	-2.4
Import price					
Agriculture	1.26	1.17	-7.3	1.22	-3.4
Industry	1.15	1.13	-1.6	1.18	2.5
Export price					
Agriculture	1.00	1.06	6.6	1.11	11.1
Industry	1.00	1.00	0.2	1.04	4.4

FREE TRADE AREA UNDER FIXED EXCHANGE RATES

(a) Aggregate effects

Results under fixed exchange rates are shown in the middle two columns of **tables 3** and **4** and in **table 5**. Table 3 shows that, in the aggregate, trade liberalization benefits the Tunisian economy. An FTA-induced reallocation of labour and land from less to more productive sectors increases Tunisian real gross domestic product by 2.2%. Land and water prices rise. Urban and rural wages increase by 3.1% and 2.3%, respectively, as labour demand rises in the face of a fixed labour supply. Besides expanding Tunisia's GDP, however, free trade induces significant adjustments in the country's macro balances. In particular, imports rise much more than exports (table 4), and the balance-of-trade deficit increases by a nonnegligible 209% (table 3).

Table 4 sheds light on these results and reveals an interesting relationship between the prices of imported and domestically produced intermediate goods. As a consequence of the tariff cuts, prices of imported agricultural products in Tunisia fall by 7.3% and prices of imported industrial products fall by 1.6%. These lower purchase prices enhance returns to Tunisia's processing industries, so that demands for both Tunisian and imported intermediate goods rise. Tunisian supplies of water, land, and labour, which are used to produce such intermediate goods as raw farm products, are inelastic; hence, their prices must go up.

Increased primary factor prices have two consequences: (a) urban and rural incomes rise (table 3), and (b) prices of domestically produced intermediate products ("producer prices" in table 4) increase to cover the higher factor costs.

An important conclusion is that liberalization-induced declines in import prices do not, as partial equilibrium trade theory would maintain, necessarily lead to de-

Table 5 ***Resource allocation, trade and price effects of trade liberalization: fixed exchange rates***

	Cereals %	Meat %	Milk %	Olives %	Citrus %	Sugar beets %	Other Ag %	Fishing %
1. Production and trade (volume)								
Production	-1.07	0.31	1.00	0.58	0.08	0.50	0.03	-0.10
Value-added	-1.07	0.31	1.00	0.58	0.08	0.49	0.03	-0.10
Demand for domestic good	-1.07	0.21	1.00	0.58	-0.14	0.50	-0.13	1.17
Demand for composite good	1.20	0.21	1.00	0.58	-0.14	0.50	0.07	1.17
Total consumption	2.05	-0.55	1.60	-0.44	-0.36		-0.06	1.16
Intermediate demand	0.19	0.45	0.47	0.48	-0.11	0.50	0.16	-0.04
Investment		-48.23		3.98	3.70		4.10	5.20
Imports	4.48						3.35	
Exports	2.33	5.06			1.53		8.98	-0.87
2. Resource allocation								
Rural labour	-1.84	4.12	1.65	0.84	0.76	1.33	0.36	
Urban labour								-2.66
Land	-1.83	4.31	1.80	0.87	1.39	0.00	0.39	
Capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water	-2.31	3.80	1.52	0.31	0.41	0.56	-0.06	
3. Prices								
World price of imports	13.00	20.00	16.00	4.00	20.00	80.00	15.00	20.00
World price of exports	12.60	20.00	16.00	4.00	3.20	80.00	8.20	-0.20
Domestic price of imports	-1.74	20.00	16.00	-100.00	20.00	80.00	0.00	20.00
Domestic price of exports	13.34	20.00	16.00	4.00	3.40	80.00	8.72	0.20
Domestic price	1.00	2.80	0.70	2.30	2.60	1.80	2.40	1.10
Producer price	1.00	3.10	0.70	2.30	2.70	1.80	2.50	0.40
Composite price	-1.20	2.80	0.70	2.30	2.60	1.80	2.40	1.10
Value-added price								
4. Production and trade (value)								
Production	-0.08	3.42	1.70	2.89	2.78	2.31	2.53	0.30
Value-added	0.32	6.63	4.13	3.10	3.18	3.41	2.63	0.40
Imports	18.06						18.85	
Exports	15.23	26.08			4.78		17.92	-1.06

	Processed foods %	Chemicals %	Energy %	Other industry %	Transport %	Tourism %	Other sectors %	Admin. %
1. Production and trade (volume)								
Production	0.49	-4.53	-0.71	-0.65	0.39	-1.60	2.03	-0.20
Value-added	0.49	-4.53	-0.71	-0.65	0.39	-1.60	2.03	
Demand for domestic good	-1.39	-4.54	-3.55	-0.07	1.40	0.17	2.16	
Demand for composite good	2.86	-1.18	1.24	1.61	-0.60	1.19	1.80	-0.20
Total consumption	4.20	4.62	9.12	2.17	-2.56	2.07	0.11	-2.07
Intermediate demand	-0.13	-3.00	-0.35	-0.09	0.65	-0.57	0.35	
Investment		8.91		6.48			4.10	
Imports	26.77	2.45	12.16	2.91	-11.11	1.62	-7.31	
Exports	17.18	-4.52	4.70	-1.62	-2.18	-1.70	-0.79	
2. Resource allocation								
Rural labour								
Urban labour	1.66	-7.51	-8.07	-1.74	0.79	-4.49	3.43	-0.20
Land								
Capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Water								
3. Prices								
World price of imports	20.00	15.00	0.00	15.00	15.00	0.00	15.00	
World price of exports	8.90	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	
Domestic price of imports	-11.76	-4.64	-11.03	-0.95	15.00	0.00	8.80	
Domestic price of exports	9.32	0.20	0.20	0.20	0.20	0.20	0.20	
Domestic price	0.10	0.00	-4.00	1.00	3.10	0.90	2.00	
Producer price	1.00	0.00	-2.60	0.70	2.20	0.10	1.90	2.10
Composite price	-2.00	-2.30	-6.30	-0.10	4.80	0.30	2.20.	
Value-added price								
4. Production and trade (value)								
Production	1.49	-4.53	-3.29	0.04	2.60	-1.50	3.97	
Value-added	4.81	-4.63	-5.18	1.33	3.91	-1.50	6.62	
Imports	52.12	17.82	12.16	18.34	2.22	1.62	6.59	
Exports	27.61	-4.71	4.49	-1.82	-2.37	-1.89	-0.99	

clines in the prices of their domestic substitutes ([10]). Because substitution between domestic and foreign goods is imperfect, the relation between domestic and import prices depends on the substitution elasticities among primary factors and on the transformation elasticities between domestic intermediate and foreign intermediate inputs.

Removing tariffs promises to affect government revenue in a number of ways. Given the domestic production increases in table 4, we compute that indirect tax revenues (from sales and value-added taxes) would rise by 8.5%. Income increases in table 3 imply that income tax revenues would rise by a further 11.5%. However, government tariff revenues would fall to zero. Overall, government revenue falls by 36%. The resulting increase in the government deficit would put heavy pressure on Tunisia to take ameliorative action such as allowing interest or inflation rates to rise or introducing another form of taxation. Indeed, expecting that a free-trade agreement will reduce its revenues, Tunisia is already introducing major reforms that will substitute a value-added tax for the existing, distortionary system of import and export taxes.

(b) Sectorial effects

In this section we examine the consequences for individual sectors of trade liberalization under fixed exchange rates, with particular emphasis on agriculture and processed food. Tables 4 and 5 show that tariff removal is, with the exception of cereals, slightly expansionary to the agricultural sector. Depending on sub-sector, real output would rise by anywhere from 0.03% to 1%. Domestic cereal output would decline

([10]) Developing and developed countries alike are often reluctant to remove tariffs and other trade protection instruments, arguing that cheap imported goods will displace local production. In such reluctance lies an implicit assumption of high price transmission between foreign and domestic markets, an assumption that does not always hold true.

by 1.1% and cereal import demand rise by 4.5% over current levels. Labour and land use in cereal production decline by 1.8% and water use on cereal farms falls by 2.3%. The displaced resources move to other agricultural industries, especially to meat and milk production. These adjustments reflect the strong protection afforded to cereal products under the current trade regime and the high elasticity of substitution between local and foreign cereal types.

The food processing sector is highly aggregated here; it consists mainly of the processing of imported cereals, vegetable oils and sugar products and of the manufacture for export of domestically produced olive oil and vegetables. At present, Tunisian food processing is highly protected in that high tariff rates are imposed on processed food imports. In contrast, processed food exports are only slightly taxed. Trade liberalization with Europe implies, a priori, a contraction of import prices and an expansion of export prices, and this is indeed what our model predicts. In particular, table 5 shows that processed food import prices fall by 11.8%, processed food export prices rise by 9.3%, and domestic prices of processed foods remain practically unchanged. In response to these price changes, processed food import volume rises by 26.8%, export volume rises by 17.2%, and domestic demand for domestically processed food falls by a slight 1.4%. Aggregate processed food output in Tunisia (termed "production" in tables 4 and 5) rises, but by only 0.5%. The proportionally strong increase in export sales must be interpreted in light of the small volumes that Tunisia presently ships overseas.

On the whole, however, Tunisian food processors are better off under free trade than under the current regime because their export markets expand more than their domestic markets shrink. Tunisian food consumers also gain because processed food prices fall by 2%, increasing the quantity demanded of both foreign and domestically processed foods. However, most of the demand increase is for foreign foods; the total processed food import bill in table 4 rises by 52% and Tunisiàs trade deficit in processed foods rises by 280%.

In the nonfood industries, trade liberalization reduces output in every sector except in transport and in the "other" categories. The most affected industrial sector is chemicals, which presently enjoys the highest level of trade protection and whose output would fall by 4.5% under liberalization (table 5). Other affected sectors would be tourism (a 1.6% drop) and energy (a 0.7% drop). In most non-agricultural sectors, exports decline while imports increase. The principal factor determining such corrections is the ratio of the export or import price to the price of the domestic good. In the major industrial categories, trade liberalization reduces the import-to-domestic price ratio but leaves the export-to-domestic price ratio virtually unchanged. This is because, as discussed earlier, Tunisian exports already enter the European Union duty free or at least enjoy important tariff reductions, while no reciprocity is required with respect to imports from Europe. A Free Trade Area does not, thus, change the price structure for Tunisian exports as much as it does for imports. Nevertheless, the quantity demanded of most non-agricultural goods would rise because consumer prices would decline, in some cases substantially. Full trade liberalization under fixed exchange rates would enhance labour mobility in Tunisia's industrial sectors. Labour would be reallocated from the more tradable sectors (chemicals, energy, tourism) to the less tradable ones (transport and the residual sector) since the former group would contract and the latter expand. Note that the labour allocation shifts indicated in table 5 probably are not reflective of the long run, since labour's substitute, capital, is fixed in our model at both the aggregate and sectorial level. As mentioned earlier, our principal intention has been to reflect liberalization's impacts in the short and intermediate term.

Free trade area under flexible exchange rates

In the above simulations, foreign capital inflows financing the trade deficit are endogenous and the exchange rate is exogenous. Despite recent movements toward exchange rate flexibility, exogenous exchange rates do roughly describe current Tunisian exchange rate policy. In a fixed-rate regime, trade deficits are balanced by short-term borrowing. However, as in many developing countries, foreign exchange is a scarce resource in Tunisia because the dinar tends to be deliberately overvalued. Short-term borrowing may not, therefore, be available when deficits are high. Furthermore, the import rationing which government often practices to help maintain the dinar at its artificially high level are not permissible under either GATT rules or the Free Trade Agreement. Thus, the doubling of Tunisia's trade deficit in the fixed-exchange-rate scenario suggests that a free-trade policy under fixed rates may not be politically feasible. Exchange rate flexibility of some sort may be needed in order to implicitly tax or subsidize trade and to adjust the current account. More particularly, government might allow the exchange rate to adjust so as to clear the foreign exchange market.

To model such a scenario, we next fix the Tunisian trade deficit at its pre-liberalization level and, as trade liberalization proceeds, permit the exchange rate to adjust endogenously to the demand and supply of foreign exchange. Results (right-hand columns of table 3) indicate that to maintain the present trade deficit in the face of price changes brought about by tariff elimination, a 4.2% exchange rate devaluation is needed. That is, liberalization creates an excess demand for foreign currency and hence an upward pressure on the dollar/dinar rate. With such a devaluation, liberalization induces

export prices of agricultural commodities to rise by 11% and of non-agricultural commodities by 4%, in contrast to the price increases of 6.6% and 0.2% under fixed exchange rates (table 4). As a consequence, trade liberalization under flexible rates has a more positive effect on export quantities (33% in agricultural and 13% in non-agricultural industries) than it does under fixed rates (18% and −0.9%, respectively). The effect of liberalization on real GDP is, however, larger under fixed than under flexible rates. In a fixed-rate regime, as table 3 shows, GDP rises by 2.2%, while under a flexible-rate regime it rises by only 0.8%. The main reason for the higher growth possibilities with fixed rates is that the trade deficit induced by liberalization is largely financed from abroad. This foreign investment more than makes up for the lost tariff revenue, so aggregate investment rises by 5.4%. In a flexible-rate regime, no deficits arise to attract foreign capital, and aggregate investment falls by 31.5%. Such an investment shortfall would, in a dynamic setting, negatively affect future economic growth. With flexible exchange rates, liberalization expands agricultural output by 4.3%, higher than the 2.0% under fixed rates (table 4). Farm output growth increases the demand for farm resources that are fixed in aggregate supply, putting upward pressure on their prices. Rural wages increase by 6.3%, raising rural household income by 3.0%, compared to the 2.3% wage and 1.5% income rise in the presence of fixed rates. Import-substituting agricultural subsectors (those in which domestic consumption is supplied largely by imports), such as cereals, meats, and food processing, grow and become less dependent on imports than they do under fixed rates. Export-oriented agricultural subsectors, namely citrus, fisheries, and food processing, also grow via increases in export volumes. Overall, the external terms of trade (ratio of export to import price) for agricultural commodities improves and the internal terms of trade (ratio of agricultural domestic to industrial domestic price) moves in favour of agriculture. Table 4 indicates that Tunisia's industrial goods sales to the domestic market fall by 6.2% as domestic prices fall by 2.4%. In contrast, sales to the foreign market rise by 12.9%. Aggregate industrial output contracts by a slight 0.1%.

Conclusion

We have provided quantitative estimates of the impacts on the Tunisian economy of a Tunisia-EU free-trade area (FTA), with particular focus on agriculture. Our analysis is based on a general equilibrium model in which agriculture is disaggregated into seven sub-sectors. Such detailed representation of agriculture constitutes a departure from past Tunisian input-output and national-accounts-based modelling, in which agricultural industries have been grouped together. We employ the model to simulate economy-wide and sectorial effects of complete removal of tariff barriers between Tunisia and the EU. Two sub-cases are considered: fixed exchange rates and flexible ones. Results suggest the FTA would have a positive but small impact on Tunisia's gross domestic product. This is consistent with a number of empirical studies in other countries, in which the aggregate welfare gain of reducing trade distortions appears to be rather small. However, that the aggregate effect is positive at all differs from conclusions drawn from partial equilibrium studies, which have indicated a negative relationship between liberalization and domestic output. Trade liberalization under fixed exchange rates would bring higher GDP growth than it would under flexible rates if foreign sources were indeed available to fund the entire trade deficit which fixed rates would engender. Because the deficit increase would, we estimate, be in the neighbourhood of 208% in the presence of fixed rates, a full-financing assumption is perhaps unrealistic. On the other hand, allowing exchange rates to adjust to a level that would sustain the current trade deficit would forego the possibility of any such deficit-financing inflows ([11]). As it embarks on major tariff reform, then, Tunisia's principal policy concern must be to preserve investment levels in the face of tariff revenue reductions while avoiding serious deterioration in the balance of trade. This would involve a mix of additional capital inflow, exchange rate flexibility and new sources of domestic tax revenue. The present simulations suggest that the resource reallocation and domestic price changes needed in Tunisia to accommodate free trade with the EU are not large. Liberalization-induced declines in input prices would not be fully transmitted to the domestic market([12]).

Furthermore, and somewhat surprisingly, domestic prices of agricultural commodities would increase, with positive effects on rural wages.

A positive wage effect is more visible under flexible exchange rates, where rural incomes increase by 3%, than it is under fixed rates, where they rise by only 1.5%. Combined liberalization of trade and foreign exchange markets, that is, seems to improve agriculture's external

([11]) To examine this predicament further, a simulation was also conducted in which investment was fixed at its current (base) volume and the exchange rate and balance of trade were permitted to be endogenous. It was found that the deficit would have to rise to three times its current level, and the exchange rate depreciate slightly (by only 0.6%) in order to maintain the base investment. Because of such a large deficit increase, many developing countries are opting for tax reforms that would increase alternative tax collections and make up for the tariff loss. In Tunisia, there seems now to be a preference for raising domestic indirect (non-income) taxes in order to compensate for the expected government deficit following tariff cuts. A simulation experiment easily could be run with our present model to determine by how much such taxes should be raised.

([12]) Sadoulet and de Janvry (1992) have shown that this transmission depends on the substitution elasticity between the foreign and domestic good and on the composite good's demand elasticity, not accounting for general equilibrium or income effects. Indeed, a fall in the import price may lead to an increase in the domestic price, depending on the magnitude of these elasticities.

as well as internal terms of trade with other sectors.
Aggregate and sector-specific conclusions drawn here are, of course, probably sensitive to model assumptions. We have not, in particular, allowed rural unemployment, rural-urban migration, or dynamic investment effects. In the presence of full employment, aggregate output can change only by a reallocation of resources among sectors. Any improvements in aggregate employment would bring additional gains.
Measured benefits of trade liberalization also might have been higher in a model permitting liberalization to boost size economies and productivity.
Plane's (1999) results in the Côte d'Ivoire suggest that privatization programs enhance total factor productivity, which here are embodied in production function coefficients. Further, new investment stimulated by rising entrepreneurial profit almost certainly would bring technical improvements which enable their own productivity gains. Sjoholm (1999) shows in the Indonesian case that increased trade participation boosts multifactor productivity, if for no other reason than that domestic companies obtain greater access to new foreign technology. Incorporating any such factors in the present model likely would have increased rather than reduced the indicated benefits of liberalized trade.
Fears in Tunisia of the new Tunisia-EU free trade agreement would, in short, seem to be greatly exaggerated.
Despite its emphasis on reducing import prices rather than enhancing export prices, the agreement is likely to have significantly positive effects on most sectors of the Tunisian economy. ●

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