Agricultural Trade Liberalization and Poverty in Tunisia: Micro-simulation in a General Equilibrium Framework

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Abstract-

The study tries to answer the following questions: Will exposure to world agricultural prices generate more poverty or less? To what extent will households be affected by changes in agricultural trade polices? Do multilateral agricultural liberalization matter more than bilateral changes?

Results of simulations using a computable general equilibrium (CGE) model linked to household survey data suggest that trade liberalization has only modest effects on the level of GDP, but it has a substantial effect in reducing poverty. Moreover, the combined effects of global and domestic liberalization are more pro-poor than the effect of domestic liberalization alone. As a net importer of agricultural commodities, Tunisia may be expected to experience terms-of-trade losses from higher world agricultural prices. However, given Tunisia's significant agricultural import protection policies, it is expected that the agricultural sector will lose from trade liberalization that removes this protection.

Keywords- Tunisia, agricultural trade liberalization, poverty.

I. INTRODUCTION

Determining the pattern and trends in poverty are central in policymaking in developing countries. Trade policies and external shocks are also seen as a way of tackling poverty given their impact on stakeholders through various transmission channels: employment, prices, assets, and transfers. Accordingly, and in addition to their effects on sectoral demand for labour, particularly in those sectors that employ the poor, the manner by which trade liberalization affects prices will have an important bearing on income and expenditures and, directly or indirectly, on welfare measures. Thus, trade policies affect poverty through their effects on economic growth in one hand as well as through their distributional effects on the other.

Tunisia is about to start implementing a new agreement on trade in agricultural products with the European Union (EU) under the association agreement signed in 1995, simultaneous to its participation to the multilateral negotiation on agricultural trade under the Doha Development Agenda (DDA). The aggregate impact of trade liberalization is likely to be positive, but like other major changes in economic policy, agricultural trade liberalization, may have some negative effects. Given that Tunisia's agricultural sector currently enjoys substantial protection, additional broad-based trade liberalization will likely have a detrimental impact on some classes of households, including the bulk of the poor population.

Two major questions rise: How will the Tunisian economy be affected by the new expected agreements on agricultural trade liberalization, both at the bilateral and multilateral levels? How will households react to these macro changes? Accounting for the effects of trade policy reform and external shocks on the distribution of welfare among individuals and households has long been on the agenda of economists. However, doing it satisfactorily has proved difficult, though progress in economic analysis and the increasing availability of micro-economic household data has helped to ease this difficulty.

This study uses a static CGE model and micro-simulation techniques of Tunisia as a laboratory for analyzing alternative trade reforms. The paper is organized in six sections. The second section is a background note on the poverty and agricultural sector in Tunisia. The third section describes the main features of the model used. The fourth section presents the simulations carried out and analyzes their results. The final section concludes.

II. BACKGROUND

Tunisia has achieved a relatively impressive record of poverty reduction over the past five decades, reducing the poverty incidence (using the national line poverty) from 40 percent in 1960 to 4.1 percent by 2000. Poverty is primarily a rural phenomenon in Tunisia. In 2000, the incidence of rural poverty was 8.3 percent compared to 0.8 percent in metropolitan areas and 2.3 percent in other urban areas. With less than 40 percent of the total population, rural areas accounted for 74 percent of the poor in 2000 compared to 76 percent in 1990 (World Bank, 2003). Poor rural households engaged in production activities typically have access to land, but their land holdings are small (averaging 2 hectares), rarely irrigated, and often exhibit low productivity, especially in rain-fed areas. The urban poor are mostly wage earners in low-skill occupations, or unemployed (National Institute for Statistics INS, 2000).

Despite the relatively high level of diversification of the Tunisian economy, the agricultural sector remains economically and socially important. It contributes less than 15 percent to Tunisia's GDP and accounts for around 20 percent of the total employment. The agricultural sector in Tunisia is characterized by a relative specialization in fruit, horticultural, and livestock production, which together contribute up to 80 percent of the total agricultural and fisheries value-added. Food processing contributes nearly 10 percent to Tunisia total exports. Olive oil is by far the main exported agricultural product and represents 30 percent of food and agricultural exports. Fish and seafood products represent the second highest traded commodity with almost 20 percent of total food processing exports, while fruit exports, essentially dates and citrus, are third. On the other hand, agricultural and food imports, represent also around 10 percent of the total Tunisian imports of commodities. The structure of food processing imports reveals the chronic dependence on cereal imports as well as sugar and vegetable oils.

Despite the successive reductions in food subsidies, in the frame of the Agricultural Structural Adjustment Program, food subsidies still represent 2 percent of government expenditures. The most subsidized products are cereals (absorbing more than 65% of total food subsidies), followed by vegetable oil (30%) and milk (5%). Given its importance in the Tunisian economy, agriculture currently benefits from substantial protection compared with the rest of the economy. Overall, the non-discriminatory rates (MFN) applied by Tunisia remain among the highest in the world. The economy-wide average level of protection reached 34.5 percent in 2002 against only 12.8 percent in the same year for other countries with intermediate income levels. Moreover, MFN rates have slightly evolved since the beginning of the 1990s, whereas they have been reduced by more than 40 percent on average in the other countries with intermediate income levels (Chemingui and Lahouel, 2004). For agricultural and food products, they are still highly protected even with the implementation of the partnership agreement with the EU in 1996 as the agreement has bearing only on non-agricultural manufacturing goods. Thus, imports of agricultural

and food products is currently governed by the commitments undertaken by Tunisia within the multilateral framework of the GATT agreement in 1994. Accordingly, consolidated tariff rates have been fixed at very high levels but vary highly across products. They are relatively high for fruit, forestry products, tobacco, meat, dairy products, cereals processing, canned products, and beverages. But they are lower for cereals, livestock, oils and sugar.

Currently, Tunisia is implementing both its association agreement with the EU and its GATT/WTO commitments in the Uruguay Round[1] . The EU is the major trading partner of Tunisia, accounting for 76 per cent of Tunisia's two-way trade. This dependence is primarily due to industry – 80 percent of imported industrial products come from Europe and 78 percent of Tunisia's industrial exports are for the European market – but much of the same holds for agricultural products and their derivatives, since 70 percent of Tunisia's exports of such products go to the EU.

Tunisia signed the association agreement in 1995 and started its gradual implementation in 1996 covering a period of 12 years. For industrial imports, Tunisia already finalized the elimination of its tariffs on industrial imports from the European Union in January 2008. In addition, agricultural trade has been amended by a further protocol, which came into effect in January 2001. This protocol increased the duty-free quotas for most Tunisian agricultural exports such as olive oil and citrus. A new agreement is under negotiation between the two parties but is still pending on the progress of multilateral negotiations under the DDA.

III. THEORETICAL AND CONCEPTUAL FRAMEWORK

Theoretical analysis shows the positive correlation between trade and poverty. The standard Stopler-Samuelson result of trade liberalization in economies that are labour-abundant and capital-scarce is that labour gains at the expense of capital owners (Winters, 1999). However, the standard result is valid provided that all markets are functioning perfectly. Indeed, in cases of labour market segmentation and when natural resources are important as an additional production factor, Bussolo and Lay (2003), who based their study on Latin America and Africa, show that trade liberalization may have resulted in a shift in the distribution of earnings away from unskilled workers (who are more likely to be among the poor and the poorest) by expanding exports of certain sectors that are intensive in the combined use of natural resources and skilled labour.

The strong redistribution effects of trade liberalization have been firmly established by economists. Bussolo and Solignac-Lecomte (1999) have shown that a reduction of average tariffs from 40 percent to 10 percent in Sub-Saharan Africa entails real income losses of 35 percent for urban employers and 41 percent for recipients of trade rents, compared with a gain of 20 percent for farmers. The overall net gain to the economy is estimated at 2.5 percent. The relatively small size of this efficiency gain compared to the redistribution effects makes trade liberalization a hard task decision for policy makers who have to seek instruments that could alleviate these burdens. Thus, it is obvious that trade policy reforms will result in some households winning and some others losing (at least in the short run), and this consequently can affect poverty. For Richardson (1995), the real question, which brings us back to the old compensation issue, is whether reforms should be implemented only if total benefits exceed total costs, or only if those who lose are fully compensated.

Given the high correlation between trade and poverty on one side and labour segmentation in developing countries on the other, it is important to take into account heterogeneity and labour market segmentation when analyzing the effects of trade liberalization on poverty. The more comprehensive way of modelling the overall impact of policy changes on the economy is CGE modelling, which incorporates many important economic interactions. These models

[1] Other bilateral and regional agreements are also being implemented by Tunisia such as the Great Arab Free Trade Area, the Free Trade Agreement with Turkey, and the Agadir agreement, to name a few.

are well suited to explain medium- to long-term trends and structural responses to changes in development policy. An effort to adapt CGE models to the analysis of different adjustment programs and to estimate the costs of other strategies was made in the late 1980's by the OECD, through the work of Bourguignon and al. (1991). Their "macro-micro" model links the short-run impacts of macroeconomic policies that affect the distribution of income through inflation, interest rates and other asset price changes with the medium-run impacts of structural adjustment policies that affect the distribution of income through relative commodity and factor price changes. To measure distributive impacts, these extended CGE models map factor income to different types of households. The models were then applied to analyze different policy changes in several developing countries. This procedure is a straightforward combination of household surveys, which provide the structure of households' consumption at the moment of simulation, and of simulated or actual price changes. The change in the cost of living by segment of the population is then used to assess the impact on income distribution. It provides an upper bound measurement of the required increase in income for each group to purchase the same quantities of goods as in the base situation.

Understanding the current consumption patterns in a given country and the anticipated behavioural responses of households to price and income changes following trade liberalization is a primary condition to developing a suitable tool for impact analysis (Case, 2000). Accordingly, the most promising direction for estimating the impact of trade reform on poverty consists in seeking a true integration between the CGE model and the observed heterogeneity in a household survey. There are two main approaches to achieve the consistency between the macro framework and the micro-economic surveys. The first approach, proposed by Cogneau and Robilliard (2000) has been labelled the "fully integrated micro-macro framework". It is based on a standard CGE model where representative households and workers are replaced by a full sample of households and workers whose behaviours are identified from household and labour force surveys. The advantage of this method is its ability to capture the impact of macroeconomic changes on workers and households, and also the feedback effects of micro-simulation on the macro part of the model. The second approach is named the "sequential micro-macro framework". The macro-part of the model is an extended CGE model, which is supposed to describe the functioning of the economy under analysis. The link with the micro-simulation module is established through a vector of prices, wages, and aggregate employment. Knowing the change in the link variables resulting from a shock in the macro-part of the model, the micro household module, which describes the real income generation behaviour, is modified in a way that is consistent with the link variables. Hence, the full distribution of real household income corresponding to the shock or policy change initially stimulated in the macro model can be evaluated (Bourguignon and al., 2002). Thus, the main difference between the fully integrated and the sequential micro-simulations approaches is in the way each evaluates impacts on household. By integrating individual households in the core-model, the first approach allows the feedback effects and substitution possibilities both on consumption among products as well as occupation among sectors for workers. However, in the second approach households are only experiencing exogenous shocks through changes in consumption prices and income-factors. Furthermore, the changes in consumption prices and factor remunerations are assumed to be the same across all households. The first approach is selected for this study, following the work of Cogneau and Robillard (2000). Currently, the conduct of a general equilibrium analysis with full-integrated micro-simulation analysis is still rare, and most of existing models use the sequential micro-simulation approach. For Tunisia, a literature review reveals the existence of only one study that has tackled the issue of trade liberalization and poverty using a sequential micro-macro methodology (Bibi and Chatti, 2006). The results obtained clearly show the importance of intra-group information and therefore the relevance of micro-simulation exercises.

IV. MODEL STRUCTURE AND DATA

The current model, which draws on existing economy-wide models for Tunisia (Chemingui and Dessus, 1999) is distinguished by its focus on the agricultural sector as well as on income distribution among various households using the fully integrated micro-simulation approach. The disaggregation aims at identifying the factors and activities from which households, and mostly rural households, earn their incomes.

A. Dimension of the model:

Table 1 displays the dimension of the model based on a Social Accounting Matrix for the year 1996.

Table 1: Model dimension

Activities	Cereals, Legumes, Other crops, Fruits, Vegetables, Other agriculture products, Livestock, Forestry, Fishing, Meat, Dairy, Sugar, Beverages, Other food-processing industries, Other manufacturing, Non-manufacturing, Services
Labour Factors	Non-wage agricultural workers, Skilled-wage workers in agriculture, Unskilled-wage workers in agriculture, Skilled workers in non-agriculture Unskilled workers in non-agriculture
Other factors	Land, Other natural resources, physical capital
Institutions	Government, 397 Households, European Union, Rest of the World
Other accounts	TVA, Subsidies on production, Subsidies on consumption, Taxes on income, Inventory changes, Saving-investment.

All activities use capital and labour. Each agricultural activity requires land (except livestock). The current model desegregation allows each activity to produce only one commodity. The model includes 397 households representing the Tunisian population and based on a sample of representative households extracted from the 1995 survey on household expenditures in Tunisia.

B. Model Structure:

The following section is not intended to describe precisely the characteristics of the model employed here, but rather to describe in non-mathematical terms its main hypotheses and the developments introduced on its basic structure for the requirement of this study. A formal presentation of this model is available in Beghin and al. (1996)

Prices are endogenous on each market (goods, factors) and equalize supply and demand so as to obtain the equilibrium. The equilibrium is general in the sense that it concerns all the markets simultaneously. Supply is modelled using nested constant elasticity of substitution (CES) functions, which describe the substitution and complementary relations among the various inputs. Producers are cost-minimizers and constant return to scale is assumed. Output results from a combination of two composite goods in fixed proportions: intermediate consumption and value added. The intermediate aggregate is obtained by combining all products in fixed proportions (Leontief structure). The value-added is then decomposed into two substitutable parts: labour and capital. Capital is further disaggregated between the different categories using a CES function (physical capital, natural resources, and land). The labour factor is further disaggregated into five categories according to the sector of employment (i.e. agricultural activities versus non-agricultural activities) and skill level (i.e. skilled versus un-skilled). A fifth type of labour, specific to the agricultural sector, was added to the four categories listed above. It represents the familial work or the unpaid work performed by the farmers and their family members in the agriculture sector. The relative wage by worker is estimated using the sectoral remuneration of each category (as it appears in the Social Accounting Matrix, SAM) on one side and the total number of workers by category and sector on the other. Accordingly, this version of the model has been extended from its original structure to better account for the potential substitutability between unskilled labour engaged in agricultural and non-agricultural sectors.

In particular, the model features a nested structure of the production function, which allows for high substitutability between unskilled workers in agricultural sectors and unskilled workers in non-agricultural activities. Only at the upper nest of the production function are the respective aggregates (unskilled workers in all activities) merged with skilled labour and family workers. This more flexible functional form guarantees a more realistic substitutability between factors that are close substitutes and avoids excessive substitution of factors that are complementary to each other. Thus, family workers are considered specific to agricultural activities and are fully employed. A flexible wage is applied for this segment, which assures the equilibrium between supply and demand. For skilled workers, it is assumed that they are specific for both types of activities (agricultural versus non-agricultural). Both skilled and unskilled workers are supposed to be remunerated at constant real wage levels. Accordingly, the model assumes the existence of unemployment for both skilled and unskilled workers in agricultural as well as non-agricultural activities.

Income from labour and capital is allocated to the different households according to a fixed coefficient derived from the SAM. Household demand is derived from maximizing the utility function, subject to the constraints of available income and the consumer price vector. Household utility is a positive function of consumption of the various products and savings. Income elasticities are differentiated by product and household, and vary from 0.75 for staple products of households with highest income to 1.20 for services. The calibration of the model determines a per capita subsistence minimum for each product and each household, which will be consumed whatever the price and the income of the households, while the remaining demand is derived through an optimization process. The subsistence share in the consumption of basic goods is higher than the share in the consumption of luxury goods. Government and investment demands are disaggregated in sectoral demands once their total value is determined according to fixed coefficient functions.

The model assumes imperfect substitution among goods originating from different geographical areas (the so-called Armington assumption). Import demand results from a CES aggregation function of domestic and imported goods. Export supply is symmetrically modelled as a constant elasticity of transformation function. Producers decide to allocate their output to domestic or foreign markets responding to relative prices. At the second stage, importers (exporters) choose the optimal choice of demand (supply) across regions, again as a function of the relative import (export) prices and the degree of substitution across regions.

Several macro-economic constraints are introduced in this model. First, the small country assumption holds. Capital transfers are exogenous as well, and therefore the trade balance is fixed, so as to achieve the balance of payments equilibrium. Second, the model imposes a fixed real government deficit and fixed real public expenditures. Public receipts thus adjust endogenously in order to achieve the predetermined net government position by shifting the Value Added Tax (VAT) rate. Third, investment is determined by the availability of savings, the latter originating from households, government, and abroad. Since government and foreign savings are exogenous in this model, changes in investment volumes reflect changes in household savings and changes in the price of investment.

Policy impacts are compared to the situation observed in 1996, in terms of macroeconomic indicators, sectoral performance, and poverty indicators. Even though the model is static, it captures the long term re-allocation effects of different trade policies, since adjustment costs of reallocating productive factors are ignored.

V. SIMULATIONS

To assess the policy effects of trade reforms on macro-economic aggregates, trade volumes, sectoral outputs, and poverty indicators are compared with those in the reference scenario. Given that the model used in this study is static, the economy is not affected by structural modifications, as demography or the

changes in the levels of availability of land and other natural resources are, for example. Four scenarios are analyzed here. The first experiment (L1) consists of evaluating the effect of phasing-out tariffs on manufactured products imported from the EU. The second experiment (L2) looks at the effects of tariff liberalization on all imports from the EU, including agricultural products. The third scenario (L3) extends tariff dismantling on imports from the non-EU countries. Finally, the fourth experiment (L4) combines the effects of unilateral liberalization as specified in the third scenario with a multilateral agricultural liberalization. The latter is reflected by the expected rise in world prices of most agricultural and food products imported by Tunisia as an outcome of a multilateral agreement on agricultural trade under the Doha Round.

The results of the four scenarios are presented in tables 4-6. They indicate deviations from the base values, showing the impact of each of the four scenarios described above. For poverty, four indicators are computed. The headcount ratio (P0) measures the proportion of the population that is poor using the selected poverty line (lower poverty line defined by the World Bank, 2003)[2]. The second indicator is the number of poor. The poverty gap (P1) and the squared poverty gap (P2) represent the third and the fourth indicators of poverty measures. For the measure of inequality, the most popular indicator is the Gini coefficient.

Table 4. Macroeconomic results

Variable/Simulation	Base-year	L1	L2	L3	L4
RealGDP	38672.9	0.2	0.3	0.2	0.2
Total output	39910.4	3.7	4.1	5.6	5.2
Total investment	4759.8	8.5	8.5	10.9	9.6
CPI	1	-2.3	-3.5	-4.1	-4.3
Tariff income for the government	1327.8	-71.0	-79.8	-100.0	-100.0
Adjustment in average VAT	1.0	1.988	2.193	2.496	2.937
Total final consumption	14586.1	-1.9	-1.7	-1.6	-1.5
Total exports	8030.3	23.2	26.1	32.0	33.7
Exports to EU	4158.1	15.7	17.7	14.9	17.7
Exports to non-EU	3872.2	51.3	57.8	95.8	93.3
Total imports	8325.7	15.9	18.0	22.0	22.5
Imports from EU	5482.6	32.1	36.4	23.4	24.0
Imports from non-EU	2843.1	-30.8	-35.4	18.0	18.1

Source: Author's calculations

Note: Values in the base-year are expressed in millions Tunisian Dinar (TD). For alternative scenarios, values represent percentage change compared to the base-year.
Data are rounded to one decimal point.

[2] The lower poverty line adopted by the World Bank for 1995 was 196 TD at the national level, which corresponds to 483 PPP US$. It implies a lower urban poverty line of 218 TD (537 PPP US$) and a rural lower poverty line of 185 TD (456 PPP US$)

Table 5. Sectoral production (in percentage change compared to the base-year)

Variable/Simulation	Base-year	L1	L2	L3	L4
Cereals	590.9	-0.5	-0.1	-1.8	-1.8
Legumes	32.5	-1.8	-0.8	-0.1	-5.5
Other crops	220.4	-1.6	-8.7	-9.9	35.0
Fruits	840.2	-0.7	-0.6	-0.8	0.5
Vegetables	526.4	-0.9	0.0	0.0	-5.6
Other agricultural activities	29.1	7.5	4.3	6.9	-2.4
Livestock	1011	-3.2	-6.7	-7.7	-2.7
Forestry	72.3	-1.2	-1.4	-1.5	-1.8
Fishing	276.3	-6.4	-6.6	-8.6	-9.6
Meat	633.1	-4.1	-8.2	-8.7	-3.5
Milk	191.3	0.1	-14.7	-20.4	8.4
Sugar	141.2	-1.3	-2.9	-6.6	64.0
Beverages	227.9	-4.0	-7.6	-7.7	-3.1
Other food processing activities	2765	-1.5	0.1	0.7	-12.6
Other manufacturing	11404	16.4	18.3	23.6	23.5
Non-manufacturing industries	2362	8.7	9.7	15.9	14.4
Services	18587	-0.9	-0.9	-0.8	-1.3

Source: Author's calculations

Note: values in the base-year are expressed in millions TD. For alternative scenarios, values represent percentage change compared to the base-year.

Table 6. Effects on poverty

	Base	L1	L2	L3	L4
Poverty incidence (P0)					
National	8.1	7.7	7.7	7.6	5.4
Urban areas	3.2	3.5	3.5	3.5	3.7
Rural areas	15.8	14.3	14.3	14.1	7.9
Number of poor					
National	735215	-4.7	-4.9	-5.7	-33.7
Urban	178005	10.3	9.8	9.8	16.4
Rural	557210	-9.5	-9.5	-10.6	-49.7
Poverty gap index (P1)					
National	1.72	1.83	1.83	1.82	1.82
Urban areas	0.36	0.34	0.34	0.34	0.27
Rural areas	3.55	3.92	3.91	3.91	4.15
Severity of poverty (P2)					
National	0.59	0.58	0.58	0.58	0.58
Urban areas	0.11	0.11	0.11	0.11	0.12
Rural areas	1.24	1.19	1.19	1.19	1.16
Gini coefficient					
National	0.417	0.415	0.409	0.394	0.424
Urban areas	0.389	0.39	0.385	0.371	0.401
Rural areas	0.353	0.345	0.357	0.342	0.38

Source: Authors' calculations

Notes: P0, P1, and P2 are calculated at the lower poverty line according to the World Bank's approach (2003).

Number of poor in the base-year is expressed in persons. In the alternative scenarios, figures represent percentage change compared to the base-year

Results for the four scenarios show a relatively small improvement in economic activity with an increase in GDP ranging between 0.2 and 0.3 percentage points compared to the base year. However, the amplitude of gains is higher on total output and trade. In this respect, the first scenario induces a 3.7 percentage point increase in the total output compared to 4.1, 5.6 and 5.2 respectively for the second, the third and the fourth scenarios. For the first three scenarios (L1, L2 and L3), the increase of total output is mostly driven by the activities with relatively lower levels of value added which are mostly in the manufacturing sector,

such as textiles and clothing. However, for the forth scenario (L4), the contribution of the agricultural and food sectors in the growth of total production is illustrated by the improvement in the level of domestic production for other crops, milk, and sugar, and a lower decrease for the other activities. In addition, the lower domestic prices for imported goods in all scenarios, except for some agricultural products in the fourth scenario, are illustrated by a decline in the consumer price index, which explains the drop in the real value of final consumption.

The loss of tariff income is offset by an increase in the average rate of VAT, which rises proportionally with the amplitude of trade liberalization. In the first scenario (L1), the rate is increased by 1.988 times than the base-year, moving from an average of 4.2 percent to 8.34 percent. However, the rate of VAT reached 9.21 percent, 10.48 percent and 12.33 percent respectively for the second, the third and the fourth scenarios. The changes in trade are the most important net effects of the various simulations.

Due to the preference granted by Tunisia to European industrial products, imports from the Rest of the World experience a high decline compared to the base-year with a decrease of about one third. However, imports from the European Union experience an increase by approximately the same level as the decline of the Rest of the World's share in the Tunisian market.

In the first scenario (L1), the increase in exports is largely due to the expansion of the industrial sector, whereas agricultural exports tend to fall in volume. Gains in competitiveness allowing Tunisia to increase its export market share are not due to genuine depreciation, given that the price of value added remains unchanged, because the cut in revenue on capital offsets the rise in real wages. These gains are in fact due to the reduction in prices of imported inputs and a lessening of the distortion of international trade other than in agriculture, a situation, which benefits the industrial sector particularly. Agricultural activity does not appear to be able to derive benefit from the increasing openness of the Tunisian economy to trade and partnership with Europe, and remains to a large extent outside the globalization process. Moreover, mobile production factors (physical capital and unskilled labour) are more captured by industry, which is translated into a drop in domestic production for most of agricultural activities as a result of changes in comparative advantage to the benefit of industrial sector. Accordingly, consumer prices for agricultural products climb and those for industrial products fall, leading to a change in poverty patterns for both categories of household. Naturally, the changes in poverty are also explained by the changes in wage levels and other factors' income (physical capital and land). In this respect, relative real wages for skilled workers in agricultural activities as well as farmers decline in the first stage. However, the resulting higher wages in the non-agricultural sector increase the level of mobility of wage-workers from agricultural activities to non-agricultural activities, which in turn increases real wages in rural areas. Consequently, and combined with lower consumer prices, the welfare of the Tunisian population as a whole goes up and poverty declines. However, there is a net increase of poverty in urban areas as a result of lower real wages.

The reinforcement of the European Union's preferential status on the Tunisian market has a very-weak macro-economic impact compared to the previous simulation (L1). In fact, the inclusion of agricultural products in the agreement is reflected in a marginal rise in total import volume (2% compared with the first simulation). All of these new imports come from Europe. Consequently, the volume of imports from the Rest of the World declines, but proportionally less than the rise in imports from Europe. In other words, consumers substitute European imports for imports from the Rest of the World and local production given that domestic production for almost all products declined. The loss in customs income is evaluated at around 79.8 percent of total government customs income in 1996. Only 8.8 percent of this loss can be attributed to the liberalization of trade in agricultural products.

The total level of production increase closely marginally by an additional 0.4 percentage points in volume compared to its level before this reform. The higher increase was realized by the same sectors as in the previous simulation, which included other food processing activities, other manufacturing, and non-manufacturing industries. For the rest of agricultural and food processing activities, we observe an

improvement in the levels of domestic production for cereals, legumes, other crops, fruits, vegetables, and other agricultural activities, given that the decline in their domestic production is lower than in the previous simulation (L1).

However, for the rest of agricultural and food activities (livestock, forestry, fishing, meat, milk, sugar, and beverages), the decline in domestic production is higher than in the first scenario. This is the direct effect of the loss in competitiveness of domestic products compared to the European products being highly subsidized. For these same sectors, a higher increase in imports is observed. The decline in the domestic prices for these imported products increases the profitability of the existing capital in these activities and allows a reallocation of the primary production factors from the weakly integrated activities that participate in international trade to the activities which benefit most from trade openness.

Compared to the first scenario, this reform (L2) does not remain unchanged with respect to the incidence of poverty in both urban and rural areas. However, there is a slight decrease in the number of poor in urban areas directly linked to lower domestic prices for some agricultural products, mainly those structurally imported by Tunisia. For the Gini coefficient it goes from 0.417 to 0.409, implying that changes in trade policy have a positive impact on income distribution for the whole population. However, income distribution is only improved for urban households, while it is negative for rural households. For all households, the simulation L2 reduces the domestic prices of both agricultural and manufacturing products. Producers gain from the decrease in input and equipment prices, while consumers gain from lower consumption prices.

However, the effect of this reform on urban households is more mitigated. In fact, the decrease in the number of poor has only affected the households, where the heads are employed as wageworkers in the non-agricultural sectors, as a result of higher real wages. This decrease is the direct result of the relative development of certain urban activities, mainly those which maintain an unskilled workforce (for which the country has a comparative advantage such as textiles and clothing) and which are enjoying a lower cost for their imported equipment. However, farmers and agricultural workers benefit less from tariff liberalization on all imports from the European Union given the relatively low dependence of the agriculture sector on imported goods on one side and the comparative advantage of European products on foreign markets as a result of the support provided by the Common Agricultural Policy, on the other.

The generalization of tariff dismantling on imported agricultural products (L3) causes an improvement in the global activity of the country by 5.6 percent in comparison with the base-year and 1.5 percentage point compared to the second simulation (L2). Total exports as well as total imports increase in comparison with the base-year respectively by 32 percent and 22 percent, which means an additional increase by 5.9 percent for exports and 4 percent for imports in comparison with the L2 simulation. The increase in exports is mainly explained by the increase in the demand for Tunisian products by the Rest of the World in comparison with the base-year. At the sectoral level, this reform entails a fall in the domestic production of most agricultural activities. This decrease is explained by the weak capacity of the Tunisian agricultural sector in resource reallocation. In other words, the agricultural land, suitable for cultivation in Tunisia is characterized by an almost fixed distribution of its productive capacities. If, for example, the production price of cereal products rises, in comparison with vegetables, the assignment of the available land from the cultivation of vegetables towards cereal production is too limited, even impossible. Accordingly, the adjustments in Tunisian agriculture are more the result of changes in the consumption levels than the production levels, in reaction to changes in the relative prices.

The effect of this reform on poverty is a consolidation of the observed tendencies in the preceding scenario. Thus, the farmers' incomes are improved, especially because of the improvement in the preferences given to Tunisian agriculture by the Rest of the World, and the decrease in the costs of agricultural input. This mostly concerns the price of seeds and cattle food. The improvement in the profitability of some agricultural activities prompted wages to increase. These combined result in a very small decline in poverty incidence for the country

(-0.1 percentage point). This reduction in poverty incidence is explained by a significant decline in the number of poor in rural areas, which compensate for the increase in the number of poor in the urban areas. In addition, this reform increases income distribution both at the national as well at regional levels. The fall in the Gini coefficient is homogeneous across areas.

Along with the three previous scenarios, the last scenario (L4) simulates an increase in the world prices of the basic agricultural products as a result of a multilateral liberalization of trade in agricultural products. The analysis of the implications of agricultural trade liberalization at the country level must not be limited to the mere removal of tariff and non-tariff barriers, imposed on imported products. Through trade, the trade balance situation of agricultural products, for such a small country as Tunisia is largely determined by world prices, mostly the result of policies implemented in rich countries exporting agricultural products. Nefarious and undesirable effects of high agricultural protectionism in the rich countries exporting basic agricultural products have remained through the decades. On the one hand, protection has depressed the agricultural world prices, which, in fact, has penalized all farmers by shrinking the world market. On the other hand, protection has caused much greater instability in world prices, which led all countries into a vicious cycle of protection.

A potential conclusion of the Doha round, according to the ministerial declaration of Hong Kong, could appreciably affect the world market in basic agricultural products, and considerably reduce the distortions that have affected it for so long. Thus, we simulate here an increase in the world prices of the basic agricultural products, resulting from a scenario of thoroughly freed world agricultural trade and the removal of all the distortions that affect them. The expected changes in world prices as a result of multilateral agricultural liberalization under the DDA used in this study are based on the estimation carried out by Bchir and al. (2007). During the simulation period, the changes are expected to vary between 1.75 percent and 23 percent compared to the base-year. The total production of goods and services rises by 5.2 percent compared with the base year; a net reduction of 0.4 percent compared with the L3 scenario. Total imports as much as total exports rise respectively by 22.5 percent and 33.7 percent compared with the base-year. The scenario L4 thus enhances the competitiveness of domestic agricultural production for three categories of products: other crops, milk, and sugar, which witness a net increase in their production.

This shock also includes a rise in the consumption prices of the main agricultural products, which consequently implies the reduction of the internal demand for these products. Thus, the reduction of production on one hand, and the relatively high decrease in the consumption of the main food products on the other hand, leads to an increase in export levels as a net result of the rise in export prices. This situation was actually observed during the previous agricultural year (2005) in Tunisia for olive oil, when the high level of export prices led to a rise in consumption prices, which weakened the level of local demand and consequently increased the level of exports. This scenario, consequently gives a favourable income gain to agricultural households who attain a higher level of income following the rise in world prices, while urban households witness a deterioration of their purchasing power following the rise in the consumption prices of most agricultural products.

As far as poverty is concerned, this scenario leads to a high reduction in the poverty level (poverty rate drops from 8.1% to 5.4% compared with the base-year). However, the reduction in poverty incidence is higher for rural households (from 15.8 to only 7.9%) following the generalized increase in agricultural wages and farmers' income. Accordingly, the number of poor in rural areas decreases by almost half its level in the base-year while the number of urban poor increase by more than 16 percent. Finally, this simulation improves income distribution for rural households but deteriorates for urban households.

VI. CONCLUSION

Multilateral liberalization is expected to raise agricultural prices. If all agricultural commodity prices rise proportionately, Tunisia will face declining terms of trade because it is a net agricultural importer. On

the other hand, it would benefit from domestic liberalization due to efficiency gains. The combined effect is likely to be positive for Tunisia as a whole because most estimates show that efficiency gains are larger than terms-of-trade losses. However, the combination of global and domestic liberalization would probably reduce agricultural prices because the effect of the loss in high levels of protection (89% on average) would be greater than the modest increase in world prices (5 to 20%) due to global trade liberalization.

Two most important implications can be drawn from the empirical analysis. First, the impact on rural poverty of trade liberalization may be quite different from the impact one might assume based on simple indicators. As a net importer of agricultural commodities, Tunisia may be expected to experience terms-of-trade losses from higher world agricultural prices. Furthermore, because Tunisia has significant agricultural import protection, it is expected that the agricultural sector will lose in a liberalized trade regime that would remove this protection. Yet, the simulations suggest that trade liberalization reduces poverty among rural households, composed mainly of farmers and wage-earners in the agricultural sector. Second, the positive outcome of these simulations is partly based on the ability of farmers to replace activities that were once protected, such as wheat and livestock production, by activities involving export commodities such as olives, dates and citrus. The need to facilitate the replacement of one set of activities by another highlights the importance of farmer training and marketing information systems and extension services, as well as investments at a farm-level and in the public infrastructure required to expand the newly competitive crops.

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