North African Countries and Agricultural Trade Liberalization Under the Doha Round: Does a Top-Down Analysis Matters?

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Abstract

The countries of North Africa are characterized by a relatively high contribution of agriculture sector in their economies. At the same time, all the countries in the region are net agricultural importers. In this context, any potential agreement on agricultural trade liberalization under the Doha Round multilateral negotiations will raises world agricultural prices and could adversely affect the region.

Although there are numerous studies on the impact of multilateral agricultural trade liberalization on North African countries, few studies have examined the impact of these global changes on the agricultural sector and on income distribution. Moreover, all the past studies use either global or country CGE models. This study attempts to address this gap in the literature. First, it combines the advantages of global and country models by linking the MIRAGE model to two countries dynamic CGE models built specially for this study. Second, we examine the distributional impact of agricultural trade liberalization in the two countries by integrating individually various household categories in both models.

Our results show that drawing policy implications from global models for a specific country is completely misleading. In fact, while the results of the global model show that Tunisia will be winner and Morocco a loser from agricultural trade liberalization, the country models show a completely different picture. For both countries, results show that while the macroeconomic effects are relatively modest, all categories of households lose.

1. Introduction

Agriculture is one of the most problematic areas in international trade negotiations. While significant progress has been achieved in reducing trade barriers and other policy distortions in manufacturing through various multilateral agreements, in regional and bilateral arrangements and under unilateral trade reforms, agricultural markets remain highly distorted. In fact, both industrial and developing countries still provide relatively high levels of protection and support to agricultural sectors and farmers. These trade barriers conjoined with exports subsidies and domestic support has lead to inefficiencies in the allocation of resources in all countries. Although there is a consensus that eliminating global policy distortions in agricultural markets could lead to significant welfare gains. Nevertheless, concerns have been expressed on the potential short and medium-term negative effects on some developing countries, while some others will partially benefit from the removal of these distortions. The sensitivity of the developing countries to eliminating of global policy distortions in agricultural markets is justified by the crucial role that this sector is still playing in these economies.

For the region of North Africa examined in this paper, the contribution of the agricultural sector in GDP vary from a high of about 16 and 17% for Egypt and Morocco respectively to 10 and 12% for Algeria and Tunisia. However, it is important to note that the limited contribution of agriculture to GDP in some countries of the region does not reflect its contribution in employment. Most countries tend to have a sizeable agricultural population. In 2003, agriculture sector represents 24% of total employment in Algeria and Tunisia while its contribution reach 32% in Egypt and 35% in Morocco (Minot et al, 2006). Accordingly, a potential agreement on multilateral agricultural liberalization under the Doha Round in line with the implementation of Hong Kong's declaration will certainly affect the economies of these countries. These effects may include growth and trade balance as well as employment and poverty patterns in the region.

The debate on the effects of the global distortions on agricultural market is not new but concerns are more pronounced in a context of enhancing global trade liberalization and the role that could play in reducing poverty in developing countries. Generally, it is believed that global distortions on agricultural market have lead to three main effects. The first two effects are linked to the driving down of world prices of some agricultural products. Accordingly, these policies have increased the competitiveness of developed countries' agricultural products on international markets, reducing the export levels of many developing countries exporting the same products. The cases of Cotton, which forms the main agricultural product produced and exported by Egypt, is one from a long list of products suffering from protection and support in the North. At the same time, and given that all countries of the region are net importers of many basic agricultural products, such as cereals and sugar, they have benefited from an import prices much lower than the real costs which, would have prevailed in a pure and perfect competition. This level of prices has allowed them to reduce their food bill, which has already weighed on the equilibrium of their balances of foreign payments. The third effect is related to the high level of tariff and non-tariff protection applied in most developed countries as part of their agricultural policies. These barriers have adversely affected the degree of openness of the developed countries' markets for some other agricultural products while traditionally exported by North African countries, this may include fruits and vegetables products.

For these reasons, the agriculture sector in the North African region is inseparable from any changes in the world market and from agricultural policies implemented in rich countries. Under these conditions, it is crucial to research to what extent and cost, the economies of this region will be affected by any of the potential modalities of implementing the Hong Kong's declaration on reducing global distortions in agricultural trade. While the final ministerial declaration contained some minor gains on agriculture, most of the crucial decisions on agriculture have not been addressed yet. Thus, the issues are complicated and the upcoming negotiations are crucial for North African countries to enhance their participation in international trade by improving their competitiveness edge on the developed countries' markets. Accordingly, the potential effects of agricultural trade liberalization on welfare, trade, and growth still not addressed correctly for a better understanding of the challenges and opportunities for North Africa's agriculture in the context of multilateral trade reforms. The paper attempts to address these questions using appropriate quantitative tools.

In situation where a large number of distortions are present, the theory of international trade is inadequate if used alone and we must used computational tools in an attempt to assess the consequences of the multilateral trade reforms. Computable general equilibrium models (CGE) are usually used for this. Their main advantage lies in offering a coherent framework for analysis based on highly detailed statistics and a fully explored corpus of economic theory. There is a large body of qualitative as well as quantitative research regarding the effect of multilateral agricultural trade liberalization (Anderson et al, 2006; Bouet et al., 2003 and 2004; Bchir et al., 2007…). However, there are no detailed studies on the issue of the effect of multilateral agricultural trade liberalization under the DDA on a single North African country using a top-down approach combining a global as well as a country framework. Almost, all the empirical research focuses on only one or a few dimensions of this very complex process. Most studies focus only on the implications of the DDA on the agriculture sector in selected countries or in the whole continent. To our knowledge, none of the modeling studies takes into account the complex international environment within which the DDA will be implemented as well as the main features of the country studies such as the labor market segmentation as well as the trade and fiscal policies[1]. Furthermore, and given the sensitivity of model's results to the closure rules adopted and the parameters selected, global models are not suitable to evaluate the effects of these reforms on a single economy. Thus, the impact analysis provided by these studies can sometimes be completely misleading. Finally, there is a lack of consistency in the modeling framework in the existing literature. A large number of papers on North African countries use general equilibrium modeling, most of the time in static framework, while the implementation of DDA will be progressively during many years. This sequential dimension of the implementation of DDA related to the agriculture sector is very important given the adjustment effect of the economy during the reform phase which can not captured by static models. Accordingly, both the issue of coordination of policies and the net effect over time of these policies is also important and justifies the use of dynamic models. At the same time, single-country models are not appropriate to analyze the impact of multilateral trade agreements and by taking ad hoc estimation of international price changes many provide misleading, incomplete, and inconsistent results. For these reasons, global framework is the best tool for assessing the effects of multilateral liberalization, since it produces interactions between countries, on international price and bilateral demand changes. However, country models are much more suitable to assess the effects of these changes in world prices at country level. The approach used in this paper is the "sequential global-country-models or top-down approach". The global model is used to evaluate the suggested reforms in agricultural policies in developed countries on the world economy including changes in world prices and trade flows. The link with the country model is through a vector of world prices for specific products and country. The country models are based on a very detailed database, which integrate the most important instruments of economic policy implemented in these countries.

In this paper, the analysis is conducted as follows. Section II highlights some background information on the economies and the agriculture sectors in North African countries. Section III evaluates the effects of two proposals of DDA agreement on agricultural trade on North African economies using a global CGE model. Section IV provides more specific analysis on country effects using the top-down approach. Section V draws conclusions and policy recommendations.

2. Background

Trade liberalization is expected to result in relative price changes that will affect each country at the national level according to its pattern of production and trade. The North African countries are characterized by a high dependence on food imports, a situation that may threaten food security if international food prices rise significantly. This section describes the patterns of agricultural trade and

[1] However, Chemingui (2006) provides an empirical assessment of the potential reform of the Commun Agriculture Policy of the European Union on poverty in Tunisia using a regional dynamic CGE model. The approach used in this paper consist of linking sub-regional CGE model developed to Tunisia to world prices changes obtained from a global analysis either using a global CGE or partial equilibrium models.

trade policy in the North Africa's countries so as to provide a background for the discussion of the impact of multilateral trade liberalization in the next sections.

Egypt is the most populous of the North African countries, with more than 70 million inhabitants. Egypt is a net importer of food, and the self-sufficiency ratio in various food crops has declined since the 1960s. The rising dependence on imported food is a major concern among policy makers and has resulted in various attempts to restrict food imports, and stimulate domestic production. Egypt's agricultural exports accounted 5% of total exports in 2002. Cotton is the most important agricultural export. However, agricultural imports represent 20% of total imports of the country in 2002. Wheat is the most important agricultural import. Maize is the second largest agricultural import due to its use in animal feed.

Tunisia is a relatively small economy. Per capita GDP was over US$2,500 in 2002, giving Tunisia the highest income in the North Africa region. Agriculture accounts for about 10% of GDP and employs about 20% of the labor force. The main grain crops are wheat and barley. Olives, dates, and citrus fruits are grown for both exports and domestic consumption. The dominant agricultural export commodity has been olive oil, although the value of olive oil exports fluctuates sharply from year to year. Other important agricultural exports include dates, wheat flour, tomato paste and pasta, reflecting the importance of food processing sector. Agricultural imports represent about 12% of total imports. As is the case with the other North Africa countries, wheat is the most important agricultural import followed by maize, barley, soybean oil and sugar.

Algeria is the second largest economy, in term of GDP, after Egypt. In the 1960s, the agricultural sector satisfied almost all the country's food requirements and accounted for over half of export revenues. The importance of agriculture, however, diminished steadily as oil and gas became driving forces of the economy. Following the "Dutch disease" pattern, oil and gas exports reduced the competitiveness of other exports such as agricultural commodities and facilitated food imports. By 1990, the share of agriculture in GDP had fallen to 11%. Although it is clear that agriculture's role has declined appreciably, agriculture remains important. About 42% of the population lives in rural areas, and 26% depend on agriculture as a means of livelihood. Agricultural imports were roughly 20% of total imports. Wheat imports is about 30% of total food imports in 2002. Wheat production in the country supplies only 10-30% of domestic consumption. Almost all maize and most of the barley consumed in Algeria are imported. Overall, Algeria is a net agricultural importer by a large margin.

Morocco satisfies about two thirds of its grain requirements, growing wheat, barley, and maize in the rainfed areas. Wheat is the main agricultural import, followed by sugar and soybean oil. Food imports have been 7-15% of the total value of exports since the 1990s. Fruits and vegetables dominate agricultural exports. Citrus fruits, tomatoes, olives, potatoes and other horticultural crops are grown, often under irrigation, and exported to Europe. Fruits and vegetable exports account for about 80% of Moroccan agricultural exports.

Table 1 below presents the structure of trade by group of commodity and by country in the region of North Africa.

Table 1: Structure of agricultural trade, 2001-03 average (in % of total agricultural trade)

	IMPORTS							
	Meat and meat products	Dairy and Eggs	Cereals	Fruits and vegetables	Sugar (raw equivalent)	Cotton lint	Olive oil	Other
Algeria	1.6	18.8	37.7	8.2	8.9	0.4	0	24.4
Egypt	6.3	4.2	40.4	7.8	3.2	0.4	0	37.7
Morocco	0.2	5.3	40.7	4.2	7.8	2.6	0.8	38.4
Tunisia	0.2	3	40.9	4.4	7.1	3.1	0.1	51.2
	EXPORTS							
	Meat and meat products	Dairy and eggs	Cereals	Fruits and vegetables	Sugar (raw equivalent)	Cotton lint	Olive oil	Other
Algeria	0.1	2	0.1	45.4	0	0	0.1	52.3
Egypt	0.2	1.7	17.3	24.2	1.5	37.8	0.1	17.2
Morocco	0	4	4.1	74.1	0	0	0.4	17.4
Tunisia	0.2	2	6.2	25.8	0	0	20.4	45.4

Source: Based on trade values from FAO (2005)

Overall, the agricultural trade structure in North Africa reveal similar patterns across countries, characterized by a high dependence on cereal imports and the importance of fruit and vegetable exports. For almost of these countries, the EU is the main trading partner. Tables 2 and 3 summarize the average level of protection among the four countries and other groups computed using MacMap-HS6 database developed by Bouet et al. (2004)[2]. Table 2 indicates, that, relative to other region in the world, the North African countries have high levels of protection. Tunisia and Morocco have the highest rates in the region compared to Algeria and Egypt. Bouet (2006) ranks Egypt, Morocco and Tunisia among the 11 most protectionist countries in the MacMap set of countries. In addition, table 2, which classifies countries as protectors of agriculture if the ratio of the level of agricultural protection to industrial protection is at least 1.4, shows that, on average, countries protect agriculture more than industry and that developed countries do this much more often than developing countries. Tunisia have the higest rate in the region North Africa countries (3.29), than do other developing countries (2.69) and a much higher ratio than the ratio of LDCs.

The North African countries with the highest average tariff rates also have very high tariffs on selected commodities (Table 3). Morocco has a 226% tariff on livestock, 161% on meat and 140% on rice. Tunisia protects fruits and vegetables at an average tariff of 152% and olive oil at 156%. Algeria has a more evenly distributed protection pattern and lower rates, as does Egypt, except for Cotton, which has a tariff rate of 54%. In general, fruits and vegetables and olive oil, the main export sectors in the region, are consistently protected.

Trade reform is sometimes seen as an area where the North African countries have made progress, especially in dismantling non-tariff barriers. However, and despite these initiatives, Morocco and Tunisia, registered a high overall trade restrictive index in 2001 of 25.4 and 24.9 respectively, compared to an average of 10.7 for other developing countries. The index nearly doubled when non-tariff barriers are included in the measure (World Bank, 2005).

[2] The MacMap-HS6 database is a collection of weighted averages of the tariffs or tariff equivalents of applied border protection for 165 reporting countries, 5111 commodities and 208 trading partners. The tariff equivalents reflect all regional agreements and trade preferences, resulting in true measures of the degree of trade discrimination.

Table 2: Applied global and sector-level protection in North Africa4 countries

Regions	Countries	Level of protection			Ratio (2)/(3)
		Overall (1)	Agriculture (2)	Industry (3)	
North Africa	Algeria	14	20	13	1.54
	Egypt	29	16	30	0.53
	Morocco	21	43	19	2.26
	Tunisia	20	56	17	3.29
OECD	Australia	5	3	5	0.6
	Canada	3	13	3	4.33
	EU15	3	15	2	7.5
	United Sates	2	5	2	2.5
	Developed countries average	4	21	3	7
Developing country average		10	22	8	2.75
LDC average		12	17	11	1.55

Source: Minot et al. (2006)

Table 3: Applied protection rates for selected commodities, 2001

	Algeria	Egypt	Morocco	Tunisia
Total agriculture	20	16	43	56
Livestock	13	6	226	51
Meat	28	11	161	92
Dairy	14	16	86	64
Wheat	3	1	29	90
Milled rice	5	20	140	25
Other cereals	13	2	19	22
Fruit and vegetables	24	23	45	152
Sugar (raw equivalent)	18	20	32	85
Sugar (semi-processed)	20	8	35	18
Cotton	30	54	33	31
Olive oil	30	12	54	156
Fishing	29	22	48	41

Source: Minot et al. (2006)

3. The global analysis

3.1. The model and data. The global model used in the present study is MIRAGE. It has been constructed in order to assess the impact of globalization on individual regions in the global economy. The model is a relatively standard neo-classical. It is based on the latest release of the GTAP data set, version 6.0. It is designed for analyzing dynamic scenarios. The scenarios are solved as a sequence of static equilibrium, with the periods being linked by dynamic variables — population and labor growth, capital accumulation, and productivity. Policy scenarios are compared to a baseline, or business-as-usual, scenario. The complete and detailed technical specification of the MIRAGE model can be found in Bchir et al. (2002). Due to the existence of a flexible aggregation facility, the regional and sectoral definitions of the model are easy to modify. While an agricultural version of MIRAGE was developed by Bouet et al. (2004) integrates a detailed modeling of the instruments of domestic support applied by the European and US, this paper is based on an alternative version developed by Bchir et al. (2007), which uses a more

simpler way of modeling domestic support given the non-linearity of Bouet's version. This non-linearity could not allow running the dynamic version of MIRAGE.

To implement a reduction in domestic support in the alternative scenarios, three major steps were followed. The first step consists of computing the new bound domestic support level and then the level of applied support, which is defined as the minimum between the new bound level and the current applied level. This step is justified by the fact that formula cuts have to be applied on the bound support. The second step consists of taking into account the differences existing between the 2001 domestic support level, which is notified to WTO, and the level of support existing in the GTAP database. In order to address this issue, the rate of increase of applied support as notified in the WTO is computed and then applied the rate of cut to the support level given in the GTAP database. Finally, the implementation of the cut is done through endogenizing domestic support and exogenizing the new level of support. Regarding the treatment of market access and rather than using tariff rates estimated directly from GTAP database that are based on trade weighted techniques, the MacMap database is used. This database estimate tariff rates using the technique of Reference Group Weighted (Bouet et al. 2005). Appendix 1 presents the concordance between MIRAGE model and the GTAP6.

3.2. Simulations. After calibrating the baseline scenario that represents the business as usual growth path, two alternative trade scenarios are assessed. Each scenario seeks to provide insights into possible trade deals on agricultural products under the DDA. The main difference between the two scenarios is only on the market access pillar given that the different simulations implement a various level of tariff reductions as well as the scope of the list of sensitive products. Reductions in the domestic support and the export competition pillars are the same in both scenarios. Therefore, the differences seen with respect to economic impacts, have got more to do with the market access pillar than with the other pillars although the economic impacts should be read as the combined outcome of market access, domestic support, and export competition liberalization. The scenarios are defined as follows:

The first scenario has the deepest cuts for developed countries (akin to US proposal) but conservative cuts for developing countries (akin to ACP proposal). The sensitive products are fixed at 1% of agriculture tariff lines for developed countries and at 20% of agriculture tariff lines for developing countries. The sensitive and/or special products were defined for each country to be the percentage of lines representing the highest MFN rates. However, the second scenario has higher threshold for developing countries and slightly lesser cuts for the same. Commitments by developed and developing countries under both scenarios are summarized in table 4 and 5.

Table 4: Market access commitments under the first scenario

Tariff band (%)	Cuts by developed countries	Cuts by developing countries	LDCs
0-20%	65%	20%	No liberalization
20-40%	75%	25%	
40-60%	85%	28%	
Above 60%	90%	30%	

Table 5: Market access commitments under the second scenario

Developed countries		*Developing countries*		LDCs
Tariff threshold	Cuts	Tariff threshold	Cuts	
0-20%	65%	0-50%	25%	No liberalization
20-40%	75%	50-100%	30%	
40-60%	85%	100-150%	35%	
Above 60%	90%	Above 150%	40%	

For both scenarios, we assume that only developed countries will reduce their domestic support pillar. The date of implementation is 2007 over 5 years (see Bchir et al, 2007 for more details on the reduction schedule). Furthermore, the export subsidies will be eliminated in 2013 for developed countries. Finally, and regarding market access commitments, the liberalization of agricultural products is supposed to be implemented starting from 2007 in a linear manner in 5 years for developed countries and 7 years for developing countries for all simulations.

On the basis of the contents of the two scenarios described above, the first one, which includes only 1% of sensitive products and with deep cuts for developed countries, could be considered as the most ambitious scenario. However, the second scenario presents the lower ambition in the market access given the high rate of sensitive products among the agriculture tariff lines for these countries. This scenario is less ambitious than the first one.

3.3. Results. The results of the two scenarios are given in Annex 2. The results indicate deviations from base values. Results for the more ambitious scenario show improvements in GDP levels for Tunisia until the simulation period 2015. However, the phasing out of export subsidies affects negatively all other countries of North Africa. While the magnitude of gains is relatively high for Tunisia mainly in 2015, we can consider that the overall effect of this scenario is negative for the whole region. In this respect, this scenario produce a 1.3 percentage point increase in the overall growth performance of the Tunisian economy but will generates a loses of overall activity by 0.3 and 0.2 percentage point respectively for Morocco and Rest of North Africa. However, this scenario induces only a very small gain for Morocco in respect of GDP changes before the cutting of export subsidies. The rest of North Africa region will be affected negatively by the implementation of the first scenario both before and after phasing out export subsidies. While these results are largely due to the increase of world prices of agricultural products and the ability of each country and region to take advantage of them, the phasing out of export subsidies will clearly have a negative impact on most North African countries and will more than offset the positive impact of the two other pillars (market access and domestic support). Tunisia seems to be the only country that wins even after cutting of export subsidies. This is largely due to the relative decline in the cost of inputs for the food-processing sector in comparison to the European Union, which will be manifested by an improvement of the Tunisian competitiveness level on the European market and will spur increased exports of this sector. Moreover, these results can also be explained by the absence of quota limitation of Tunisian exports on the European market in the model. The current quotas imposed on most Tunisian exports of agricultural and food products are the origin of the high protection offered to the European domestic market and are in a way limiting the expansion of many agro-food sectors in Tunisia.

The implementation of second scenario does not generate a better performance in terms of total economic performance than the first scenario in line with a-priori expectations given their lower levels of ambition. The changes in GDP and welfare are slightly lower than in the first scenario. Of note, for Tunisia, GDP registers almost the same percentage point increase for scenarios 2 and 1 in the year 2007. However, some additional gains are obtained during the years 2010 and 2015 when the second scenario is implemented. With regard to the economy-wide welfare impacts, most of the North African countries experience a significant loses, mainly after implementing export subsidies commitments. In the case of Tunisia, the implementation of both scenarios will generate a positive welfare gain with the highest level in the second scenario. For Morocco, the net effects of welfare will be negative in both scenarios. The rest of North Africa experienced the same welfare changes to Morocco. These is explained by the fact that these countries are considered as net importer of food products and are not able to increase domestic production to a level able to compensate the increase of import bills.

As expected, the overall impact of the two reforms tested in this study is an increase in the international prices of agricultural products and especially the most protected ones, such as cereals and sugar. The increase is much higher when export subsidies are phased out than when only the other reforms are undertaken. The overall gains for each country depends on its capacity to take advantage of

the new situation by increasing domestic production and exports much higher than the increase in import bills for agricultural and food products. The detailed results on sectoral value added changes for each of the simulations showed clearly that those countries that experienced the highest gains are those that succeeded in increasing their domestic production at very high levels.

4. Top-down analysis: Linking global to country CGE models

Knowing the change in the link variables resulting from the two alternative scenarios on implementing agricultural trade liberalization under the DDA, the country models allow a deeper evaluation of the effects of these changes in world prices on the domestic economies. A dynamic country CGE models are developed specially for this study for Tunisia and Morocco. These models take into account the main features of the agricultural sectors as well as the economic policies implemented during the simulation period in both countries.

4.1. The models and database. The economy-wide modeling approach used here is based on a dynamic standard CGE model developed by Robinson & Thurlow (2004). Current economic conditions, such as the availability of capital, are endogenously dependent on past outcomes but remain unaffected by forward-looking expectations. The model is formulated as a simultaneous equation system, including both linear and non-linear equations. The equations define the behavior of the agents, including the equilibrium conditions, macro balances, and dynamic updating equations. The model belongs to the recursive strand of the dynamic CGE literature. All agents (private and public) are myopic, making their decisions on the basis of past and current conditions with no explicit role for the future.

The process of capital accumulation is modeled endogenously, with previous-period investment generating new capital stock for the subsequent period. Although the allocation of new capital across sectors is influenced by each sector's initial share of aggregate capital income, the final sectoral allocation of capital in the current period is dependent on the capital depreciation rate and on sectoral profit-rate differentials from the previous period. Sectors with above-average capital returns receive a larger share of the new capital stock than their current share in capital income. The converse is true for sectors where capital returns are below average.

Population and growth in the number of workers are examples of variables that evolve over time and as such, are given to the model. Thus, population growth is exogenously imposed on the model based on separately calculated growth projections. It is assumed that a growing population generates a higher level of consumption demand and therefore raises the supernumerary income level of household consumption within the LES demand system. Both labor supply and total factor productivity (TFP) growth are updated exogenously based on information obtained from the past studies and different ministerial sources. Labor is also updated on the basis of exogenous trends.

For Morocco, the dynamic model is solved for the period 1998-2015 as a series of equilibrium. However, for Tunisia, the model is solved for the period 2001-2015. Each model solution generates an extensive, economy-wide dataset on the state of the economy in each solution period. By imposing the above policy-independent dynamic adjustments, the model produces a projected or counterfactual growth path. Policy changes can then be expressed in terms of changes in relevant exogenous parameters and the model is re-solved for a new series of equilibriums. Differences between the policy-influenced growth path and that of the counterfactual can then be interpreted as the economy-wide impact of the simulated policy. In our analysis, we summarize this information to a manageable set of policy-relevant indicators, including data on macroeconomic growth, sectoral trade and production, labor demand, and government spending.

One of the main features of the country model is its ability to take into account the economic policy already implemented in the country and the expected reforms in the future. In the baseline scenarios, we assumed that saving driven investment. In addition, the foreign saving is assumed fixed and the exchange rate flexible. For the government account, public savings is assumed flexible and taxes are fixed. However, in the alternative simulations, exchange rate is fixed and foreign savings are flexible. In addition,

The Moroccan model uses the information contained in the Social Accounting Matrix built for the year 1998. It considers 24 activities and 24 commodities along them 18 are related to agricultural and food processing activities. The model includes also 3 categories of labor, five categories of households, one trade partner, and many fiscal instruments. The Tunisian model is calibrated with information contained in Tunisia's social accounting matrix built for the year 2001. It contains 21 productive sectors and their 21 corresponding commodities, 2 types of work, 5 types of capital (physical capital, 3 types of land depending on the type of land used, and one specific factor related to natural resources), ten household categories (10 deciles) and one trade partner (Rest of the World). Appendix 3 presents the structure of the national SAMs.

The national models compared to the global model consider more realistically the structure of the two economies by including individually the main productive activities. In addition, they offer a better understanding of government budget and household welfare through a consideration of the structure of public expenditures and incomes as well as the various categories of households composing the national economies. In this respect, the models include various tax instruments (tariff, income taxes, other indirect taxes…). The national models are also distinguished by a specific treatment of labor market in both countries. Accordingly, for Tunisia, the model assumes tow segments of labor market. The agricultural labor market and the non-agricultural labor market. For the agricultural labor market, farmers and wageworkers are linked with a fixed coefficients function (Leontieff) where farmers are fully employed and wageworkers are partially employed. For farmers, a shift in the real wage induces the equilibrium between supply and demand. However, for wageworkers, they are remunerated at a fixed real wage (indexed to the consumer price), which generate a rate of unemployment. Only at the upper nest of the production function, that substitution between capital and labor is allowed.

For wageworkers in non-agriculture activities, the model assumes a constant elasticity of substitution between capital and labor and labor is remunerated at a real wage assuming the existence of unemployment. The modeling of labor market in Morocco follows the Tunisian case but instead of three labor categories, the Moroccan model distinguishes between two categories: urban and rural.

4.2. Simulations. After calibrating the baseline scenario that represents the business as usual growth path, two alternative trade scenarios are implemented: one for each country. In fact, instead of simulating the effects of the two scenarios analyzed at the global level, we only retained one of them given that both scenarios produce almost the same results both on world prices as well as on country's effects. For each country, the alternative scenario seeks to provide insights into possible multilateral agreement on agricultural trade under the Doha Round. These scenarios are as follows:

Simulation - Tunisia: Implementing Tunisian commitments on tariff reduction under scenario 1 of Doha Round combined with its expected effects on world agricultural prices.

Simulation - Morocco: Implementing Moroccan commitments on tariff reduction under scenario 1 of Doha Round combined with its expected effects on world agricultural prices.

Each of the simulation described above should affect the Tunisian or Moroccan economies through three main channels. The first is related to the expected rise in world prices as result of phasing out of export subsidies and reducing domestic support in developed countries. The second is the tariff reductions to be applied by both countries under their commitments in both scenarios. Finally, exports of both countries should be affected by the changes in the level of market access to the rest of the World. However, and as explained below, Tunisia and Morocco will be mainly affected by the change in world prices as result of multilateral agricultural trade agreement. In fact, with the tarrification of most NTBs in the member countries of WTO after the implementation of Uruguay Round agreement on agriculture, tariffs became increasingly the primary policy instrument for protecting domestic agriculture sectors in most countries.

This section examines both the current structure of tariffs imposed on Tunisian and Moroccan agricultural exports to the rest of the world as well as tariffs that both countries themselves apply on their imports of agricultural products from the rest of the world. In addition, the expected trends in tariffs imposed on agricultural exports from Tunisia and Morocco that will result from the implementation of the modalities for multilateral agricultural liberalization, are analyzed. The objective is to define the expected effects of the agricultural trade liberalization on tariff reductions in Morocco and Tunisia on one side and the level of openness of the foreign markets for their respective exports. In this respect, both defensive as well as offensive interests of Tunisia and Morocco are reviewed by analyzing how the developed countries market will be opened for the two countries exports. In other words, the openness that will occur in the developed countries markets for both Tunisian and Moroccan exports and the level of new protection of the agriculture sector in these two countries are two crucial elements of this analysis.

Rather than using tariff rates estimated directly from GTAP database that are based on trade weighted techniques, we used the MacMap database which estimate tariff rates using the technique of Reference Group Weighted. Tables 6 and 7 give data on import tariffs imposed by Tunisia and Morocco on their imports of agricultural products from their main trade partners around the world. However, table 8 and 9 give data on tariffs imposed by the other countries and regions of the world on their imports of agricultural products from Tunisia and Morocco. The same tables give the expected trends on tariffs; both applied by Tunisia and Morocco on their imports and imposed on their exports, for the different simulations and by the end of the implementation period 2015.

Concerning the initial tariff structure imposed bilaterally between some countries and regions, figures show that tariffs imposed by the rest of the world on Tunisian and Moroccan agricultural exports are mostly very low, except for some products and some regions from the rest of the world. For the two countries, data shows that the G20 countries seem to be the most protective of their domestic agricultural sector. Average tariffs imposed by these countries vary between 18 and 90% with the highest rates applied on plants based fiber and cereals for Tunisia and on vegetables and fruits for Morocco. For the European Union, the tariffs applied are higher for cereals; fishing; and vegetables and fruits imported from Tunisia and on vegetables and fruits and raw sugar from Morocco. The USA seems to be the most opened market, behind the group of Cairns developed, where relatively high tariffs are applied on oil seeds and plants based fibers.

Turning now to the expected trends of tariff structure to be applied on Tunisian and Moroccan exports under the two alternative scenarios, our calculations show that tariffs imposed by developed countries on Tunisian and Moroccan exports will face significant decline which means a high improvement of market access for both countries. However, the degree of openness of the markets of the other regions will be much more smaller than what will be observed for developed countries. It is clear that the implementation of the alternative scenarios will improve the level of market openness for Tunisia and Morocco, mostly those for developed countries.

From a defensive point of view, Tunisia and Morocco impose very high tariffs on all their imports of agricultural products from all origins. However, the tariff reduction schema adopted in the different alternative scenarios will not improve the level of openness of these two countries to imported agricultural products given that reduction schemas are applied on bound tariffs and not applied tariffs. Tables 6 and 7 present the current tariff structure applied by Tunisia and Morocco on their imports of agricultural products from the rest of the world as well as the expected trends in tariffs expected from implementing each one of the two scenarios.

It is noteworthy that these figures give a good and clear view about the bilateral tariff applied among countries and regions, but it is important to clarify that tariff structures are losing their importance in trade regulation. In fact, with the implementation of many FTAs between Tunisia and Morocco and their main partners from the developed world, tariffs are no more the main obstacle of trade between these partners. Tunisia and Morocco realize more than 90% of their agricultural exports free of duties in the context of tariff quota and other regulations. At the same time, most of European exports to these countries are realized also under a tariff quota offered by Tunisia and Morocco for most of their imported products under their respective commitments in the context of GATT agreement. It is then crucial to note that economic effects of phasing out or reducing these tariffs may not enhance trade between such regions

given that trade is already regulated by bilateral agreements than multilateral agreements for most countries and mainly for agricultural products. In deed, the issue of trade facilitation and sanitary and phyto-sanitary norms are currently playing a major obstacle in reducing trade flows. Accordingly, the analysis of the effects of multilateral agricultural trade liberalization will be mostly seen as an external chocks on world prices resulting from the removal of exports subsidies and reduction of domestic support paid by developed countries to their agricultural sectors.

Table 6: Tariffs Imposed by Morocco on its Agricultural Imports

	CairDd				EU 25				ReG20				USA			
Sectors	Bound	Base	Sim1	Sim4	Bound	Base	Sim1	Sim4	Bound	Base	Sim1	Sim4	Bound	Base	Sim1	Sim4
Sugar cane. sugar beet					34	32.5	25.5	25.5	34	32.5	25.5	25.5	34	32.5	25.5	25.5
Cattle.sheep.goats.horses	195.6	195.4	195.3	195.3	175.5	174.0	173.7	173.7	198.4	197.5	197.2	197.2	39.9	23.6	23.4	23.4
Forestry	39.9	25.0	25.0	25.0	39.5	8.1	8.0	8.0	38.3	23.9	23.3	23.3	39.3	24.8	24.6	24.6
Fishing	39.4	39.2	38.9	38.9	39.8	38.4	38.4	38.4	39.0	38.9	37.7	37.7	39.4	39.3	38.9	38.9
Cereal grains nec	48.8	23.6	23.6	23.6	60.1	23.0	23.0	23.0	103.0	16.5	16.5	16.5	119.0	17.5	17.5	17.5
Animal products nec	34.0	21.0	19.4	19.4	32.4	17.2	14.7	14.5	32.3	27.1	23.1	23.0	33.1	20.5	19.0	19.0
Crops nec	28.7	22.5	19.7	19.5	30.5	20.1	18.0	17.9	33.4	23.4	20.5	20.4	31.1	17.3	16.5	16.4
Oil seeds	88.0	16.5	16.4	16.4	76.8	22.5	22.1	22.1	63.3	11.8	11.1	11.2	64.9	9.4	9.4	9.4
Paddy rice	98.0	94.6	94.6	94.6	98.0	96.7	96.7	96.7	98.0	96.8	96.8	96.8	98.0	94.9	94.9	94.9
Plant-based fibers	19.0	2.5	2.5	2.5	19.4	0.0	0.0	0.0	19.6	2.5	2.5	2.5	19.0	2.5	2.5	2.5
Vegetables. fruit. Nuts	34.0	32.9	26.2	26.2	34.0	33.9	27.8	27.8	34.0	33.1	29.6	29.6	34.0	33.9	28.2	28.2
Wheat	88.2	28.3	28.3	28.3	92.6	29.4	29.4	29.4	93.6	29.7	29.7	29.7	92.3	29.3	29.3	29.3
Wool. Silk-worm cocoons	23.0	2.5	2.5	2.5	27.9	0.2	0.2	0.2	25.3	3.8	3.8	3.8	33.5	2.8	2.8	2.8

Source: authors' calculations using MacMap database

Table 7: Tariffs Imposed by Tunisia on its Agricultural Imports

	CaiDd				EU25				ReG20				USA			
Sectors	Bound	Base	Sim1	Sim4	Bound	Base	Sim1	Sim4	Bound	Base	Sim1	Sim4	Bound	Base	Sim1	Sim4
Sugar cane. sugar beet					30.0	22.0	22.0	22.0	30.0	22.0	22.0	22.0	30.0	22.8	22.8	22.8
Cattle.sheep.goats.horses	10.3	7.4	7.4	7.4	12.2	8.0	8.0	8.0	11.8	8.2	8.2	8.2	21.3	10.9	10.7	10.6
Forestry	20.5	5.0	5.0	5.0	19.8	5.1	5.0	5.0	18.6	6.5	6.3	6.2	20.7	6.6	6.5	6.5
Fishing	49.3	28.1	28.1	28.1	33.1	21.7	21.7	21.7	23.6	18.8	18.8	18.8	33.4	22.4	22.3	22.3
Cereal grains nec	9.6	6.0	6.0	6.0	9.0	5.9	5.9	5.9	5.3	5.3	5.3	5.3	5.1	5.7	5.7	5.7
Animal products nec	26.5	8.8	8.7	8.7	30.4	14.7	14.5	14.5	22.7	17.0	16.6	16.6	27.9	9.0	8.9	8.9
Crops nec	27.8	14.3	14.0	13.9	33.1	15.9	15.6	15.5	41.2	28.3	27.6	27.5	45.9	18.6	18.4	18.4
Oil seeds	5.7	5.7	5.2	5.1	8.0	5.9	5.6	5.5	11.6	4.7	4.7	4.7	10.0	3.8	3.8	3.8
Paddy rice	20.0	14.2	12.1	11.5	20.0	14.2	12.1	11.5	20.0	14.2	12.1	11.5	20.0	14.2	12.1	11.5
Plant-based fibers	5.0	4.4	3.9	3.7	5.0	4.4	3.9	3.7	5.0	4.4	3.9	3.8	5.0	4.4	3.9	3.7
Vegetables. fruit. Nuts	15.0	12.0	11.8	11.8	34.2	22.4	22.1	22.0	37.5	26.1	25.9	25.8	43.4	27.5	27.4	27.3
Wheat	5.0	3.2	3.2	3.2	5.0	3.2	3.2	3.2	5.0	3.2	3.2	3.2	5.0	3.2	3.2	3.2
Wool. silk-worm cocoons	15.3	10.5	10.0	9.9	15.3	8.4	7.9	7.8	15.3	10.3	9.7	9.6	15.3	6.0	5.5	5.4

Source: authors' calculations using MacMap database

Table 8: Tariffs Imposed by Trade Partners on their imports of Agricultural Products from Morocco

	CairDd				EU25				ReG20				USA			
Sectors	Bound	Base	Sim1	Sim2	Bound	Base	Sim1	Sim2	Bound	Base	Sim1	Sim2	Bound	Base	Sim1	Sim2
Sugar cane. sugar beet	0.0	0.0	0.0	0.0	49.2	72.5	22.9	22.9	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0
Cattle.sheep.goats.horses	0.2	0.0	0.0	0.0	8.4	2.6	1.6	1.6	17.3	8.0	6.9	6.6	0.0	0.0	0.0	0.0
Forestry	0.2	0.0	0.0	0.0	0.4	0.0	0.0	0.0	22.8	8.6	7.4	7.2	0.0	0.0	0.0	0.0
Fishing	0.3	0.2	0.2	0.2	12.0	0.0	0.0	0.0	28.2	16.4	16.2	16.1	0.5	0.0	0.0	0.0
Cereal grains nec	1.3	0.0	0.0	0.0	1.8	1.5	0.8	0.8	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Animal products nec	0.0	0.0	0.0	0.0	1.2	0.1	0.1	0.1	21.9	2.7	2.3	2.2	1.2	0.0	0.0	0.0
Crops nec	2.5	1.0	0.7	0.7	4.7	1.6	0.9	0.9	42.3	15.9	14.9	14.7	2.4	0.5	0.5	0.5
Oil seeds	0.4	0.2	0.1	0.1	0.9	0.0	0.0	0.0	18.2	8.4	6.9	6.7	13.8	9.9	1.4	1.4
Plant-based fibers	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	37.0	21.9	21.9	21.9	14.6	2.4	2.4	2.4
Vegetables. fruit. Nuts	3.3	2.7	1.1	1.1	26.8	10.5	5.6	5.6	32.7	11.4	11.4	11.4	4.0	4.5	2.0	2.0
Wool. silk-worm cocoons	0.2	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.9	0.3	0.3

Source: authors' calculations using MacMap database

Table 9: Tariffs Imposed by Trade Partners on their imports of Agricultural Products from Tunisia

	CairDd				EU25				ReG20				USA			
Sectors	Bound	Base	Sim1	Sim2	Bound	Base	Sim1	Sim2	Bound	Base	Sim1	Sim2	Bound	Base	Sim1	Sim2
Cattle.sheep.goats. horses	0.2	0.0	0.0	0.0	3.6	1.0	0.9	0.9	9.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0
Forestry	0.3	0.1	0.0	0.0	0.6	0.1	0.1	0.1	18.0	9.3	7.7	7.4	0.1	0.0	0.0	0.0
Fishing	0.3	0.2	0.2	0.2	14.3	0.0	0.0	0.0	22.3	6.5	6.5	6.5	0.3	0.1	0.0	0.0
Cereal grains nec	0.8	0.0	0.0	0.0	56.0	21.5	6.8	6.8	58.1	19.3	19.1	19.1	1.1	0.0	0.0	0.0
Animal products nec	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	17.8	5.7	4.8	4.6	4.2	0.0	0.0	0.0
Crops nec	2.0	0.5	0.3	0.3	6.6	1.7	1.3	1.3	37.8	14.1	13.1	13.0	4.6	0.8	0.6	0.6
Oil seeds	0.4	0.2	0.1	0.1	0.9	0.0	0.0	0.0	23.1	14.1	11.6	11.2	20.0	14.7	14.7	14.7
Plant-based fibers	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	89.7	4.5	4.5	4.5	14.9	2.5	2.5	2.5
Vegetables. fruit. Nuts	0.4	0.3	0.1	0.1	11.7	3.9	3.3	3.3	29.2	17.8	14.9	14.4	9.5	9.2	3.3	3.3
Wool. Silk-worm cocoons	0.2	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	4.3	1.5	1.5

Source: authors' calculations using MacMap database

4.3. Results. The results of the simulations using the top-down approach are given in Annex 2

To be completed

5. Conclusion

To be written

6. References

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Appendix 1: Concordance for the MIRAGE Model with GTAP 6.0

Regions

	MIRAGE	GTAP 6.0
1	EUR25	Austria, Belgium, Denmark, Finland, France, Germany, United Kingdom, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden, Cyprus, Czech Republic, Hungary, Malta, Poland, Slovakia, Slovenia, Estonia, Latvia, Lithuania.
2	USA	The United States
3	Japan	Japan
3	Developed Cairns Group POE (CairDd)	Australia, New Zeland, Canada
4	Tunisia	Tunisia
5	Morocco	Morocco
6	Rest of North Africa	Algeria, Libya, Egypt
7	South Africa	South Africa
8	Rest of SADAC	Botswana, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe, Rest of SADAC
9	Rest of SACU	Rest of South African Customs Union
10	Rest of sub-Saharan Africa (RSSAHAF)	Madagascar, Uganda, Rest of sub-Saharan Africa
11	ReG20	China, Indonesia, Malaysia, Philippines, Thailand, India, Argentina, Brazil, Chile, Uruguay, Rest of South America, Central America, Venezuela
12	Rest of the World	Rest of Oceania, Hong Kong, Korea, Taiwan, Rest of East Asia, Singapore, Vietnam, Rest of Southeast Asia, Bangladesh, Sri Lanka, Rest of South Asia, Mexico, Rest of North America, Colombia, Peru, Rest of Andean Pact, Rest of FTAA, Rest of Europe, Albania, Bulgaria, Croatia, Romania, Russian Federation, Rest of Former Soviet Union, Turkey, Rest of Middle East

Sectors

	MIRAGE	GTAP 6.0
1	PDR	Paddy Rice
2	WHT	Wheat
3	GRO	Cereals grains nec
4	V_F	Vegetables, fruits, nuts
5	OSD	Oil seeds
6	C_B	Sugar cane, sugar beet
7	PFB	Plant-Based Fibers
8	OCR	Crops nec
9	CTL	Cattle, sheep, goats, horses
10	OAP	Animal Products nec
11	RMK	Raw milk
12	WOL	Wool, silk, worm cocoons
13	FRS	Forestry
14	FSH	Fishing
15	AgroInd	Meat, cattle sheep, goats, horse; Meat products nec; Vegetable oils and fats; Dairy products; Processed rice; Sugar; Food products nec; Beverages and tobacco products.
16	TexVet	Textiles, Wearing apparel
17	IndBasTe	Leather products; Wood products; Paper products, publishing
18	IndMovTe	Petroleum and coal products; Chemical, rubber, plastic prods; Mineral products nec; Ferrous metals; Metals nec; Metal products; Manufacture nec.
19	IndLourd	Motor vehicles and parts, transport equipment nec, Electronic equipment, Machinery and equipment nec.
20	Services	Electricity, Gas manufacture and distribution, Water, Construction, Communication, Financial services nec, Insurance, Business services nec, Recreation and other services, Public administration/defense/health/education, Dwellings
21	Trt	Transport nec, Sea transport, Air Transport

Appendix 2: Detailed simulation results: Global Analysis

Table 1: Variation of the GDP (in volume)

Year	2007		2010		2015	
Region	***sim1***	***sim4***	***sim1***	***sim4***	***sim1***	***sim4***
Tunisia	0.2	0.2	1.18	1.19	1.32	1.34
Morocco	0.01	0.01	0.06	0.06	-0.29	-0.29
Rest of North Africa	0	0	0.03	0.03	-0.22	-0.22

Note: Relative Variation according to the baseline scenario
Source: Bchir et al. (2007)

Table 2: Welfare impacts

Year	2007		2010		2015	
Region	***sim1***	***sim4***	***sim1***	***sim4***	***sim1***	***sim4***
Tunisia	12,15	12,28	113,17	113,73	168,35	169,38
Morocco	-6,37	-6,37	-12,98	-12,98	-105,38	-105,39
Rest of North Africa	-35,71	-35,59	-65,60	-65,18	-320,79	-320,38

Note: Absolute variation according to the baseline scenario
Source: Bchir et al. (2007)

Table 3: Trade balance impacts

Year	2007		2010		2015	
Region	***sim1***	***sim4***	***sim1***	***sim4***	***sim1***	***sim4***
Tunisia	2,21	2,23	13,99	14,07	28,00	28,18
Morocco	-1,38	-1,38	-4,59	-4,61	-10,07	-10,13
Rest of North Africa	-14,28	-14,25	-37,19	-37,06	-68,35	-68,18

Note: Absolute variation according to the baseline scenario
Source: Bchir et al. 2007

Table 4: Sectoral world price variation

	2007		2010		2015	
	sim1	sim4	sim1	sim4	sim1	sim4
Agricultural Products						
Paddy rice	-1,52	-1,52	-2,52	-2,53	-2,16	-2,18
Wheat	0,42	0,42	1,68	1,69	2,56	2,56
Cereal grains nec	0,31	0,31	1,39	1,39	3,81	3,81
Vegetables. fruit. nuts	0,19	0,19	0,66	0,66	1,26	1,26
Oil seeds	-0,58	-0,58	-0,07	-0,07	0,69	0,68
Sugar cane. sugar beet	0,20	0,20	0,62	0,62	0,93	0,93
Plant-based fibers	0,20	0,20	0,75	0,75	1,54	1,54
Crops nec	0,24	0,24	0,80	0,80	1,21	1,21
Cattle.sheep.goats.horses	0,90	0,90	2,76	2,76	4,64	4,65
Animal products nec	0,49	0,49	1,27	1,27	1,82	1,82
Raw milk	0,27	0,27	0,85	0,85	2,56	2,56
Wool. silk-worm cocoons	0,24	0,24	0,77	0,77	1,19	1,19
Forestry	0,00	0,00	0,19	0,19	0,44	0,44
Fishing	-0,07	-0,07	-0,04	-0,04	0,09	0,09
Industrial Products						
AgroInd	0,17	0,17	0,48	0,48	1,84	1,84
TexVet	0,06	0,06	0,22	0,21	0,45	0,45
IndBasTe	0,04	0,04	0,18	0,18	0,32	0,32
IndMoyTe	0,02	0,02	0,10	0,10	0,22	0,22
IndLourd	0,01	0,01	0,07	0,07	0,19	0,19
ResNat	0,03	0,03	0,16	0,16	0,36	0,36

Table 5: Sectoral value added for Rest of Tunisia

	2007		2010		2015	
	sim1	sim2	sim1	sim2	sim1	sim2
Agricultural Sectors						
Paddy rice	-0,51	-0,49	-4,16	-4,09	-2,78	-2,66
Wheat	-1,79	-1,79	-9,75	-9,73	-16,43	-16,39
Cereal grains nec	0,35	0,35	-0,62	-0,61	4,93	4,95
Vegetables. fruit. nuts	0,04	0,04	0,46	0,46	1,38	1,37
Oil seeds	1,56	1,55	6,21	6,19	12,34	12,30
Sugar cane. sugar beet	1,31	1,31	9,62	9,58	18,06	17,99
Plant-based fibers	-0,15	-0,15	-1,42	-1,41	-2,69	-2,68
Crops nec	0,34	0,34	0,25	0,25	0,55	0,56
Cattle.sheep.goats.horses	1,40	1,39	9,88	9,84	18,33	18,27
Animal products nec	0,79	0,78	5,81	5,76	11,07	10,97
Raw milk	1,00	0,99	6,79	6,77	11,96	11,92
Wool. silk-worm cocoons	-0,09	-0,09	-1,65	-1,63	-3,25	-3,23
Forestry	-0,09	-0,08	-1,35	-1,31	-2,17	-2,07
Fishing	0,12	0,12	1,05	1,05	2,31	2,30
Industrial Sectors						
AgroInd	1,61	1,60	11,39	11,35	20,07	20,00
TexVet	-0,13	-0,13	-1,18	-1,17	-2,25	-2,24
IndBasTe	-0,12	-0,12	-1,00	-0,99	-1,93	-1,92
IndMoyTe	-0,16	-0,15	-1,16	-1,15	-1,97	-1,96
IndLourd	-0,36	-0,36	-2,45	-2,44	-4,59	-4,57
ResNat	-0,09	-0,09	-0,80	-0,80	-1,72	-1,71

Table 5: Sectoral value added for Morocco

	2007		2010		2015	
	sim1	sim2	sim1	sim2	sim1	sim2
Agricultural Sectors						
Paddy rice	-1,36	-1,36	-9,28	-9,28	-13,33	-13,32
Wheat	0,52	0,52	1,83	1,84	4,61	4,61
Cereal grains nec	0,13	0,13	0,23	0,23	2,08	2,08
Vegetables. fruit. nuts	0,27	0,27	1,10	1,10	1,44	1,44
Oil seeds	1,57	1,57	3,44	3,45	4,74	4,76
Sugar cane. sugar beet	-0,23	-0,23	-0,97	-0,97	-0,25	-0,25
Plant-based fibers	0,20	0,20	0,38	0,38	0,52	0,52
Crops nec	0,44	0,44	1,22	1,21	0,52	0,49
Cattle.sheep.goats.horses	-0,01	-0,01	-0,03	-0,03	0,15	0,16
Animal products nec	-0,05	-0,05	-0,20	-0,20	-0,18	-0,18
Raw milk	-0,11	-0,11	-0,46	-0,46	0,37	0,37
Wool. silk-worm cocoons	-0,04	-0,04	-0,10	-0,10	-0,50	-0,50
Forestry	0,00	0,00	0,07	0,07	-0,09	-0,08
Fishing	0,05	0,05	0,15	0,15	-0,07	-0,06
Industrial Sectors						
AgroInd	-0,29	-0,29	-1,14	-1,14	0,22	0,22
TexVet	-0,04	-0,04	-0,07	-0,07	-0,71	-0,71
IndBasTe	-0,06	-0,06	-0,19	-0,19	-0,64	-0,64
IndMoyTe	-0,06	-0,06	-0,18	-0,18	-0,49	-0,49
IndLourd	-0,11	-0,11	-0,34	-0,34	-0,95	-0,95
ResNat	-0,05	-0,05	-0,14	-0,15	-0,65	-0,65

Table 5: Sectoral value added for Rest of North Africa

	2007		2010		2015	
	sim1	sim2	sim1	sim2	sim1	sim2
Agricultural sectors						
Paddy rice	0,34	0,30	0,23	0,05	0,75	0,27
Wheat	0,50	0,50	1,72	1,73	3,31	3,31
Cereal grains nec	0,45	0,45	1,14	1,14	2,26	2,25
Vegetables. fruit. nuts	0,04	0,04	0,16	0,16	0,49	0,49
Oil seeds	1,61	1,61	3,99	3,99	5,98	5,97
Sugar cane. sugar beet	0,01	0,01	0,11	0,10	1,60	1,58
Plant-based fibers	0,56	0,56	1,30	1,30	1,70	1,70
Crops nec	0,22	0,21	0,61	0,55	0,62	0,48
Cattle.sheep.goats.horses	0,05	0,05	0,25	0,24	1,02	1,02
Animal products nec	0,01	0,01	0,08	0,08	0,64	0,64
Raw milk	0,03	0,02	0,14	0,14	1,24	1,23
Wool. silk-worm cocoons	0,07	0,07	0,27	0,27	0,18	0,19
Forestry	0,00	0,00	0,06	0,06	0,03	0,03
Fishing	-0,02	-0,02	-0,02	-0,03	0,02	0,02
Industrial Sectors						
AgroInd	0,00	0,00	0,09	0,08	2,01	1,99
TexVet	-0,07	-0,07	-0,23	-0,23	-0,78	-0,77
IndBasTe	-0,04	-0,04	-0,11	-0,11	-0,28	-0,28
IndMoyTe	-0,06	-0,06	-0,21	-0,21	-0,51	-0,51
IndLourd	-0,11	-0,11	-0,38	-0,37	-0,93	-0,92
ResNat	-0,02	-0,02	-0,10	-0,10	-0,33	-0,33

Appendix 3: dimension of the country CGE models

Appendix 2: Detailed simulation results: Top-down Analysis

Note: In the INITIAL column, figures are in value at base-year prices. For baseline a and alternative simulation, figures are average annual growth rate over the period 2007-2015.

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Table 1.1: Exports

	Baseyear	BASE	SIM1
C-Wheat	0.013	-8.535	-3.203
C-Legumes	8.000000E-4	1.988	4.859
C-Foragecrops	0.002	-9.198	-4.654
C-Olives	1.000000E-4	-12.317	-5.818
C-Otherfruit	0.125	-8.167	-3.795
C-Vegetables	0.006	-10.012	-5.261
C-Otheragri	0.006	-13.968	-6.401
C-Livestock	0.019	7.351	9.539
C-Forestry	1.000000E-4	0.324	6.143
C-Fisheries	0.021	19.404	20.707
C-Meat	0.001	7.013	8.450
C-Milk-dairy	0.007	8.549	8.881
C-FlourMill	0.049	-1.885	-0.949
C-Oils	0.192	-3.141	1.870
C-Cannedagrpro	0.118	3.819	7.498
C-Sugar-prod	0.007	11.182	11.302
C-Otherfoodprd	0.080	2.755	3.209
C-Beverages	0.029	8.061	8.569
C-Manuf-NonManuf	8.873	7.478	9.798
C-Services	1.606	0.299	1.033

Table 1.2: Imports

	Baseyear	BASE	SIM1
C-Wheat	0.311	5.439	3.098
C-O-Cereals	0.343	4.761	3.636
C-Legumes	0.010	9.512	6.999
C-Foragecrops	0.141	6.821	5.146
C-Otherfruit	0.013	16.167	9.748
C-Vegetables	0.022	22.293	14.434
C-Otheragri	0.014	13.182	9.248
C-Livestock	0.025	5.068	-3.500
C-Forestry	0.007	19.268	3.085
C-Fisheries	0.024	5.903	3.484
C-Meat	4.000000E-4	5.980	-8.826
C-Milk-dairy	0.057	5.169	-5.718
C-FlourMill	0.034	6.164	4.010
C-Oils	0.188	8.827	5.552
C-Cannedagrpro	0.028	6.790	2.714
C-Sugar-prod	0.120	7.424	3.642
C-Otherfoodprd	0.176	8.742	5.724
C-Beverages	0.058	5.899	4.057
C-Manuf-NonManuf	13.962	4.774	4.558
C-Services	0.850	6.742	5.706

Table 1.3: Macroeconomic Results

	Baseyear	BASE	SIM1
QABSTOT	31.8	4.5	3.2
QHTOT	19.7	6.6	4.8
QINVTOT	7.6		
QGTOT	4.5		
QETOT	11.2	6.4	8.6
QMTOT	16.4	5.2	4.6
REXR	100.0	-1.0	
NEXR	100.0	-1.3	
PWEIND	100.0		
PWMIND	100.0		
PWIND	100.0		
PDIND	100.0	-0.3	
CPI	100.0		0.4
TOFT	100.0		
INVGDP	27.4	-1.4	-1.3
PRVSAVGDP	20.7	-1.5	-0.1
FORSAVGDP	5.4	-0.3	-1.6
TRDDEFGDP	18.9	-0.6	-1.9
GOVSAVGDP	-0.6	0.4	0.4
IMPTAXGDP	6.0		
DIRTAXGDP	5.6	-0.1	-0.1

Table 1.4: Disaggregated EV

	Baseyear	BASE	SIM1
Decile1	0.4	18.1	11.0
Decile2	0.6	13.4	8.4
Decile3	0.8	11.5	7.3
Decile4	1.0	10.6	6.9
Decile5	1.3	8.3	5.5
Decile6	1.6	9.5	6.5
Decile7	1.9	8.4	5.8
Decile8	2.4	8.3	5.7
Decile9	3.3	8.2	5.6
Decile10	6.4	7.9	5.3

Table 1.5: Disaggregated activity production levels

	INITIAL	BASE	SIM1
i-Wheat	0.4	-0.9	0.5
i-OCereals		2.9	3.6
i-Legumes	0.1	8.0	6.7
i-Foragecrops	0.1	1.2	1.9
i-Olives	0.2	2.2	3.5
i-Otherfruit	0.9	2.3	2.1
i-Vegetables	0.9	3.4	3.1
i-Otheragri		-2.9	0.2
i-Livestock	1.6	6.6	5.7
i-Forestry	0.1	4.6	6.0
i-Fisheries	0.4	10.3	9.5
i-Meat	1.3	6.6	5.4
i-Milk-dairy	0.5	7.3	6.2
i-FlourMill	1.3	2.5	2.0
i-Oils	0.5	1.8	3.4
i-Can-pro	0.3	5.0	6.0
i-Sugar-prod	0.3	9.1	7.8
i-Otherfoodprd	1.4	6.0	4.8
i-Beverages	0.6	6.5	5.4
i-Man-Nman	25.1	6.2	7.4
i-Services	16.2	4.5	4.1
TOTAL	52.4	5.5	5.9

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Table 2.1: Exports

	Baseyear	BASE	sim1
COCER	1.773	6.828	7.392
COIND	78.315	7.511	8.009
CTOMA	1011.602	7.570	8.377
COVEG	595.925	4.173	4.831
CCITR	2376.099	6.033	7.122
COFRU	963.689	6.220	6.913
CBSPO	3.668	8.109	8.296
COAGR	81.884	6.226	6.821
CFORE	525.769	7.208	8.406
CDAII	86.392	8.556	8.793
COILI	509.984	8.145	8.456
COFOO	2217.860	6.983	7.094
CFISH	6509.981	3.717	4.716
CSERV	23542.100	5.997	6.586
CPETR	866.072	6.292	6.208
CCHEM	4887.000	7.589	9.767
CADMI	46345.087	6.833	7.455

Table 2.2: Imports

	Baseyear	BASE	sim1
CWHEA	5880.315	7.416	6.166
CBARL	174.401	6.119	5.039
COCER	1132.195	7.884	7.257
COIND	1094.195	8.099	7.385
COVEG	33.017	12.100	9.896
COFRU	110.362	7.137	4.736
CBSPO	795.274	8.373	5.176
COAGR	466.831	7.719	7.191
CFORE	3030.639	7.250	6.498
CDAII	761.175	7.813	5.775
CSUGI	2945.456	5.535	5.031
COILI	2629.071	8.286	7.365
COFOO	5736.855	8.282	7.269
CFISH	198.135	9.550	8.688
CSERV	16425.100	6.612	6.408
CPETR	12277.035	6.908	6.601
CELWA	118.157	7.589	7.060
CCHEM	4822.803	5.892	5.809
CADMI	61011.139	4.826	4.532

Table 2.3: Macroeconomic Results

	Baseyear	BASE	sim1
QABSTOT	334422.8	5.7	5.3
QHTOT	210700.9	8.1	7.6
QINVTOT	66066.5		
QGTOT	57655.4		
QETOT	90603.2	6.4	7.2
QMTOT	119642.2	6.0	5.5
REXR	100.0	-0.3	
NEXR	100.0	-0.1	
PWEIND	100.0		
PWMIND	100.0		
PWIND	100.0		
PDIND	100.0	0.2	
CPI	100.0		-0.1
TOFT	100.0		
INVGDP	20.4	-1.0	-1.0
PRVSAVGDP	12.1	-1.6	-1.2
FORSAVGDP	3.8	-0.2	-0.5
TRDDEFGDP	9.0	-0.1	-0.5
GOVSAVGDP	4.5	0.8	0.7
IMPTAXGDP	5.7		
DIRTAXGDP	6.7		

Table 2.4: Disaggregated EV

	Baseyear	BASE	sim1
HWALA	15664.9	14.9	13.0
HSMAF	16979.8	11.6	10.5
HMEDF	17967.8	10.6	9.7
HLARF	14298.7	11.0	10.1
HURBA	145789.8	11.8	10.9

Table 2.5: Disaggregated activity production levels

	Baseyear	BASE	sim1
AWHEA	12235.8	7.7	7.5
ABARL	4288.3	6.3	6.0
AOCER	497.1	7.7	7.4
ASUGA	1387.5	5.0	4.9
AOIND	4810.1	7.9	7.7
ATOMA	1639.2	7.5	7.8
AOVEG	7563.0	7.5	7.1
ACITR	2479.4	6.6	7.5
AOFRU	9767.0	6.5	6.3
ABSPO	26134.2	8.4	7.9
AOAGR	889.8	6.9	6.9
AFORE	1698.7	7.2	8.0
ADAII	4004.4	8.3	8.0
ASUGI	6739.7	5.0	4.9
AMILK	11177.1	8.4	7.7
AOILI	8882.8	8.5	8.2
AOFOO	33701.1	7.7	7.4
AFISH	6841.7	4.3	5.1
ASERV	128052.1	6.3	6.5
APETR	23882.7	6.8	6.5
AELWA	26666.9	7.3	7.0
ACHEM	5633.0	7.4	9.5
AOACT	132602.3	5.6	5.7
AADMI	62899.9	0.8	0.7
TOTAL	524473.7	6.1	6.0