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Trade and agricultural policies in Malawi: Not all policy reform is equally good for the poor[1]

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Abstract

The reduction of the existing global distortions to agricultural incentives is sometimes stated as a priority to fight poverty worldwide. But the impacts of global trade policy and domestic development policy reforms are rarely, if ever, compared. Despite technical limitations hindering rigorous comparison of the overall growth effects, also hampering cost-benefit analysis, this study contributes at filling this gap by focusing on the comparison of the distributional poverty impacts of both types of policies. It uses the MIRAGE global computable general equilibrium –CGE- model feeding a national CGE model representing Malawi in 2007 linked to household survey to examine how different trade policy reforms by Malawi and the rest of the world would impact poverty in Malawi. The country's recent agricultural growth history due to the Fertilizer Input Subsidy Program is replicated and compared with a more broad-based sectoral approach. The effects of accelerating growth in agriculture and downstream sectors are compared with those of integrating in the regional and multilateral markets. Non preferential trade policy reforms are found to be less favourable for poverty reduction of the poorest than regional integration or preferential integration. Faster intensification and diversification of agriculture is found to enable targeting the poorest that are less likely to be connected to international markets. Therefore, while policy reforms generating growth in general may be good for some poors, it is found that that not all policy reforms are equally good. Thus, despite the fact that trade policies could help fight poverty in Malawi, there are no substitute to development policies, and if undertaken simultaneously, their coherence should be checked thoroughly.

JEL codes: D58, O55, F13, O47 and Q17.

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1. Introduction

Considering the proliferation of trade agreements concerning poor African countries such as Malawi and the difficulties those countries have to fund domestic development policies, surprisingly there seems to be little academic guidance in either the theoretical or empirical literature to help them set priorities for policy reforms and ensure that the commitments they negotiate with other countries are instrumental to their broader development strategies.

Our concern is that in Malawi, like in many other poor countries, analytical capacity constraints have hindered independent analysis and assessment of the potential implications of multiple policy reforms, while negotiation capacity constraints have limited effective engagement in trade negotiations by local policymakers (UNCTAD 2006). Development economics emphasize the fact that macroeconomic policies in Africa have been insufficiently linked with micro-level realities (Bhorat, Hanival and Kanbur, 2006), while the micro-level policies implemented with no consideration for the macroeconomic context have failed. For instance, supply-side constraints risk to prevent Malawi from seizing new market access opportunities (Chalira 2007). It is thus critical to test trade policy opportunities based on their coherence with Africa's priorities of agricultural growth and broader development objectives of poverty and food insecurity reduction as described by de Janvry and Sadoulet (2010).

The latest major policy reform in Malawi has been the significant upscaling of the fertilizer subsidy program aimed at resource-poor farmers in response to the particularly severe food emergency of 2004. Successful at doubling the production of maize, the main staple of the country from the first year and increasing maize production in the following years according to official estimates (MOAFS 2010a), the Farm Input Subsidy Program (FISP) is now largely financed by foreign aid. But international financing institutions and foreign aid donors were initially reluctant to support such large scale direct policy intervention grounded on past experiences of inefficiencies and capture by political interests. Historically strong drivers of economic reforms in Africa since the 1980s (Jones, Morrissey and Nelson 2010), they have rather recommended beneficiary countries to follow prescriptions from public economics literature that find that any policy intervention leads to dead-weight losses, is subject to "government failures" and rent seeking (Krueger, 1990). In the case of Malawi, diverging views have appeared on whether to respond to the problem of deficient markets for inputs and financial services for poor smallholders with purely market

based promotion of the development of private agro-dealers or through direct state intervention with input subsidies (Chisinga 2012). Evaluations have find that subsidizing inputs has been an effective short term answer to low profitability of the maize activity linked to the very high prices of inputs, but that it has tackled the core problem of the lack of accessibility of maize for the poor deficient families only to the extent that it has increased their self sufficiency in maize, their income (through other crops such as tobacco) or reduced the hunger season peak in prices by expanding the market. It has also appeared that further integrating the private sector in the scheme to spur the growth of the seed producers, fertilizer retailers and financial institution remains a challenge (Dorward and Chirwa, 2011). But success of Malawi in terms of maize yields growth (20 percent per year) and GDP growth (almost 8 percent per year) since 2005 have also been attributed to favorable weather conditions, increased world demand for the tobacco exported and macroeconomic stability (World Bank 2009).

Nowadays, debates on the FISP include its governance and displacement of private sector (World Bank 2011), options for beneficiaries to graduate out of such a scheme (Chirwa, Dorward and Matita 2011), and its cost (Buffie and Atolia 2009) which has peaked at 16.2% of the national budget in 2008/9 because of the increased volume of inputs supplied and the spike in the price of imported fertilizers (Dorward and Chirwa 2011 *op. cit.*). In fact, with a cost of less than 10 percent of GDP each year (*ibid.*), it has barely met the political commitments made at Maputo[2]. Nevertheless, the main challenge is to decrease its opportunity cost by transitioning to the more broad-based agricultural sector wide approach (ASWAp) that was designed by the government of Malawi together with International Financing Institutions (IFI) and donors in 2010 (MOAFS 2010b) which costs is double that of the FISP but includes a much broader range of agricultural, commercial and agro-industrial as well as service development. Considered one of the most ambitious and expensive programs in Malawi's history, in light of the fiscal constraints of Malawi, the ASWAp will depend on the availability of foreign aid.

Even though the donor community and international institutions have committed to increase spending in agriculture[3], our concern is that in the wake of the economic and financial global crisis restricting their financial capacities, the debates on which policy

[2] See the African Union Maputo Declaration on Agriculture and Food Security of 2003.

[3] See the G8 l'Aquila Food Security Initiative in 2009 and the G20 "Action plan on food price volatility and agriculture" in 2011.

reforms should be set as priorities might tend to focus on the relative costs of the proposed policy reforms rather than on the comparison of their impacts. Indeed, despite the absence of any empirical comparison of the impacts of trade policy and poor countries domestic development policy reforms, we find many statements in the literature that trade policy reforms could be cost-effective pro-poor policies. For instance, Winters, McCullogh and McKay (2004) conclude an empirical survey where they state that the evidence between trade liberalization and reduction in poverty are context specific stating that "*although trade liberalization may not be the most powerful or direct mechanism for addressing poverty in a country, it is one of the easiest to change. […]. While many pro-poor policies are administratively complex and expensive to implement, the most important bits of trade reform -tariff reductions and uniformity and the abolition of nontariff barriers-are easy to do and will frequently save resources. Thus trade reform may be one of the most cost effective anti-poverty policies available to governments*." Another more recent empirical study on the effects on trade policy reforms on poverty also concludes that trade liberalization should be a priority to foster growth and reduce poverty in the poorer countries because *"[domestic development strategies] generally represent a greater net drain on the treasury, which may be a challenge in low-income countries that still rely heavily on trade tax revenue [even though they would be] more efficient than trade policies in this effort"* (Part I Introduction and Summary p41 of Anderson, Cockburn and Martin, 2010). In those studies, the focus on trade liberalization is justified by the potential gains from the removal of global distortions. Indeed, the historical poor performance of the agricultural sector and slow economic growth in Malawi as in the rest of Africa has been linked to the adverse effects on incentives of producers and consumers of tradable of the global and domestic distorsionist policies (Anderson and Masters 2009).

Malawi is already considered one of the most liberalized countries in Southern Africa (WTO 2011). Since 1981, it has implemented at least seven successive Structural Adjustment Programmes supported by the International Monetary Fund and the World Bank. A member of World Trade Organization since 1995, it has also gradually reformed its trade policies towards more liberalization. Today it benefits from many preferential agreements such as African Growth and Opportunity Act (AGOA) with the United States, the "Everything but Arms" (EBA) with the EU and free trade agreements with South Africa, Zimbabwe, Mozambique and Bostwana. Ongoing negotiations include the Doha Development Round at the multilateral level, the Economic Partnership Agreement (EPA) with the European Union

(EU) and further regional integration within the Common Market for Eastern and Southern Africa (COMESA), and the Southern African Development Community (SADC). According to a report by UNCTAD Malawi's motivations to engage in those trade arrangements have been mostly driven by political rather than economic imperatives, with almost no local in-depth analyses of their possible economic impacts, and insufficient attention paid to developing the institutional capacity necessary to be able to take full advantage of the arrangements (UNCTAD 2006 *op. cit.*). Furthermore, a recent global study focusing on trade policy reforms that would affect Sub-Saharan Africa (SSA) showed that an hypothetical ambitious regional integration within SSA, which is now high on the political agenda of many African countries and development agencies[4], could deliver similar gains to SSA than the multilateral alternative currently under negotiation at the WTO (Douillet 2011). National level results for Malawi showed important implications for Malawi (Douillet and Pauw, 2012).

But to our knowledge none of the existing empirical studies compare the distributional impacts of different trade arrangements on Malawi nor are there comparable estimates of the impacts of the agricultural investments policies with those of trade policies. This study aims at contributing to fill that gap.

From an analytical point of view, CGE models, traditional tools of economic policy analysis, are convenient to capture the linkages effects of all types of policy reforms and thus adequate to undertake comparative policy analysis (Sadoulet and De Janvry 1995). Despite new data and analytical tools gradually enabling to investigate macro-micro linkages (Bourguignon, Bussolo and Cockburn, 2010), some challenges remain to compare the impacts of domestic and rest of the world policy reforms hampering any rigorous cost-benefit comparison. This study will thus rather focus on distributional impacts of policies. Drawing from previous country case-studies which demonstrated that "not all growth is equally good for the poor" (Thurlow and Wobst 2006), it is based on the hypothesis that the choices of trade and development policy reforms will affect differently the structure of growth and thus of poverty reduction in Malawi.

A national CGE model linked to household survey data representing the economy of Malawi in 2007 is used to simulate the economy-wide impacts of various domestic policy reforms by Malawi. The two development policies considered are a policy concentrated on

[4] See the Outcome Statement of the "Joining up Africa: Regional Integration" conference agreed in London, United Kingdom on March 4th 2010 by representatives from the African Development Bank, the World Bank, the European Commission, the WTO and the Department for International Development (DFID).

maize and tobacco inspired by the FISP and an hypothetical broad-based agricultural investment policy inspired from the Malawi's ASWAp. Shocks of global trade reforms are modeled with a global computable general equilibrium (CGE) model and then transmitted to the national model as in Anderson, Cockburn and Martin (2010 op. cit.). But this study will go further than was previoulsy done by considering a wide range of trade agreements in which negotiators from Malawi are currently involved, thus including other country policy reforms as sources of shocks for Malawi. Two multilateral trade liberalization agreements are simulated, namely the Doha Development Agenda (DDA) and a Duty Free Quota Free (DFQF) agreement, both currently under negotiation at the WTO. Combined effects of a DDA+DFQF as currently negotiated is also simulated. Regional integration scenarios include a simulation of the combined impact of the hypothetical simultaneous implementation of four regional free trade agreements (FTA) in SSA, as well as a hypothetical subcontinent-wide FTA scenario.

The rest of the paper is structured as follow: The structure of the economy of Malawi is described in section 2. Section 3 will present the national CGE model, the necessary adjustment required by the implementations of the global trade scenarios and the main limitations of such a modeling framework. Section 4 will present the recent agricultural growth history on which are based the two domestic policy reform scenarios, the trade policy reform context, and the eight trade scenario chosen. Section 5 discusses the results and their sensibility to the assumptions of the modeling framework. Section 6 concludes.

2. The economy of Malawi

Malawi is one of the poorest countries in the world, and agriculture and the processing of agricultural products are major sources of income, employment, an essential part of foreign exchange earnings, and of government fiscal revenues (World Bank 2010). After decades of erratic growth performance, the country has started a successful growth path since 2005. Following, some drivers of the recent growth of the country are presented. Then structure of the economy in 2007 based on the new available Social Accounting Matrix for the country is described, with a specific focus on households.

2.1. The recent growth success in the historical context of Malawi

According to statistics from the Ministry of agriculture and food security of Malawi, the agriculture sector is the most important sector in the country since it employs about 80% of

the country's total workforce, accounts for 39% of GDP, and contributes more than 80% of foreign exchange earnings (MOAFS 2010b op. cit.). The agricultural sector is divided into a smallholder sub-sector and an estate sub-sector. Little is known about the estate sector since most surveys focus on the smallholder sector and but according to estimates from the Ministry of Economic Planning and Development (MEPD, 2006), they respectively contribute about 70% and 30% to agricultural GDP The smallholder sub-sector is primarily subsistence-oriented with the main staple being by far maize followed by cassava, and sweet potatoes. Land holdings are small, highly fragmented and managed by customary land tenure. In contrast, the estate sector focus on exportable, high-value cash crops, such as tobacco, tea, sugar, and to a lesser extent coffee and macadamia nuts, and their land is managed under freehold and leasehold tenures.

Drivers of the historical growth in Malawi have been analyzed in details in the Country Economic Memorandum (World Bank 2009 *op. cit.*). It appears that in the last 30 years growth has been strongly influenced by the maize and tobacco subsectors which contributed in 2007 respectively 25 per cent and 14,5 per cent to agricultural GDP. Since combined they amount close to 15 percent to national GDP, it explains why growth volatility can be traced directly back to either volatility of maize production or of tobacco export prices (*ibid.*).

Dependence on rain fed agriculture for households income, employment, and foreign exchange earnings explains the country's sensibility and vulnerability to climatic shocks. The increased frequency of those shocks in the last 25 years and the punctual poor management of grain stocks following the reforms of maize markets since the 90s have caused a history of recurrent food crisis in Malawi (Devereux 2007, Pauw, Thurlow and van Seventer 2010).

Malawi's growth performance between 2005 and 2010 represents a marked improvement over the previous one and a half decades. Preliminary estimates suggest that national growth averaged more than 8 percent (MODPC 2009), driven largely by strong growth in agriculture, which in turn was driven by maize yield growth of about 20 percent per annum (MOAFS 2010a *op. cit.*). Official figures also show a much improved nonagricultural growth performance, with growth exceeding 5 percent in the mining and industry sectors (5.5 percent) and construction and services sectors (5.9 percent).

The main policy change in 2005 was the introduction of the FISP promoting maize production through seed and fertilizer subsidies with the aim of achieving food self-sufficiency. The FISP has also benefitted tobacco, the country's major export crop, through

fertilizer subsidies. Implemented in an innovative way through "smart subsidies" (Minot and Benson 2009), it is considered to have been successful in increasing maize yields, almost tripling production in the first two years according to official statistics (MOAFS 2010a *op. cit.*) and increasing calorie intake from maize, the primary staple in Malawi (Ecker and Qaim 2011). But according to the analysis of the Country Economic Memorandum (World Bank 2009 *op. cit.*) it is also thanks to a stabilized macroeconomic environment since 2003 leading to the investment recovery and resumed growth of domestic credit to the private sector since 2004, that the growth of the smallholder agriculture has diffused out through to financial services, distribution, manufacturing, transport and communication and eventually through to construction.

Considering the risk of further concentrating its economy on maize and tobacco, the government of Malawi and its main aid partners designed the Malawi's Agriculture Sector Wide Approach (ASWAp) (MOAFS 2010b) as the new priority policy reform to diversify out of the narrow focus of the FISP on those two crops. The ASWAp draws on elements of the Malawi Growth and Development Strategy (MGDS) in setting a priority investment strategy for the agricultural sector, but include agro-industrial and services development and also incorporates elements such as infrastructural development and rehabilitation, land administration and environmental management, technology development and dissemination, institutional development and capacity building, agro-processing and marketing development. The largest single component of ASWAp is the Greenbelt Initiative (GBI), a large-scale irrigation scheme motivated by the fact that Lake Malawi constituting one of world's largest bodies of fresh water, is an abundant source of unutilized water. Despite an apparent consensus on the importance of implementing the ASWAp as a priority in Malawi, political economy reasons have hampered the transition from the FISP to the ASWAp (Chisinga 2012 *op. cit.*).

2.2. Malawi's economic structure in 2007

In order to be able to analyze the impacts of various policies on Malawi, a new Social Accounting Matrix (SAM) has been recently built (Douillet, Pauw, Thurlow, forthcoming, *op. cit.*) representing Malawi in the year 2007. It is therefore the most up-to-date representation of Malawi's economic structure.

2.2.1. *Technical steps to build the SAM*

A 'macro SAM' was constructed using the latest available aggregate information from national accounts and other macroeconomic databases, and then disaggregated across sectors, including aggregate factors and households to derive a more detailed 'national SAM'. One of the major advances of the 2007 SAM over previous SAMs for Malawi (in particular Thurlow, Dia and McColl, 2008) is that the Input Output table was updated and additional agricultural and agroindustrial sectors were added. The SAM now identifies 54 sectors (presented in Table III.A.2), of which 23 are in agriculture. Agricultural production is divided into crop agriculture (19 subsectors), livestock (2), fisheries and forestry. Industrial sectors are separated into mining, manufacturing (16) of which 7 agro-industrial sectors, utilities (2) and construction. Finally, the SAM also contains information on 11 different service sectors, including private services (8 subsectors) and public or government services (3).

As expected, the prior national SAM built was inconsistent (i.e., there were inequalities between receipts and payments). Data had to be reconciled so that row and column totals were equal (i.e., 'balancing' the SAM) using cross-entropy estimation techniques inspired from Robinson et al., 2001 and presented in details in Douillet, Pauw, Thurlow, 2012 (op. cit.). In summary, the balancing was done in two stages. First, based on the observed inequalities between row and column accounts and the reliability of the various data sources used to build the prior national SAM, the confidence in each of the cells of the prior SAM was assessed. This prior SAM provided the initial 'best guess' for the estimation procedure. A balanced SAM was then estimated by minimizing the entropy 'distance' measure between the final SAM and the initial unbalanced prior SAM, taking into account additional information, including knowledge about aggregate values from national accounts and technology coefficients. After balancing the national SAM, it was then disaggregated across factors and households. Since at that stage the aggregate national SAM was already balanced, this resulted in imbalances for the household accounts only. These household accounts were again balanced using cross-entropy, but holding all other non-household-related entries of the national SAM constant. Given the imbalances in the household survey between incomes and expenditures, the target household income/expenditure total for the final balanced SAM was the expenditure totals in the unbalanced prior SAM. Various constraints were imposed on the model according to the perceived reliability of the data. Certain values that appeared in the supply-use table and national accounts were maintained in order to remain consistent with the

overall macro structure of the economy. Table III.A.1 presents the final macrostructure of the SAM.

2.2.2. *Sectoral production and trade structure*

Table III. 1. shows the sectoral structure of gross domestic product (GDP) according to the SAM. In 2007, agriculture accounts for 32.3 percent of total GDP in Malawi, most of which is generated by crop agriculture, particularly maize. One of the advantages of this new SAM is that it includes more details on the links between agricultural production and the downstream agro-industrial processing sectors. For example, it shows that while Malawi exports some raw tobacco, most tobacco is passed downstream to the tobacco curing and processing sector. Although this sector contributes relatively little to national GDP (only 0.71 percent), it generates a disproportionate amount of the country's export earnings (16.2 percent). Not all sectors have this strong "forward production" linkages. For example, we see from the table that there is very little processing of the other domestically-produced exports crops such as sugar, groundnuts and other export crops. While those crops generate 6.3 percent of total GDP, much of this is exported directly without being passed to the downstream agro-industrial processing sector. Accounting for these kinds of upstream and downstream production linkages will allow us to determine how changes in the performance of a sector will affect other sectors of the country, as well as the external balance and overall availability of foreign exchange.

TABLE III. 1 – SECTORAL PRODUCTION AND TRADE STRUCTURE

Sectors	Share of total (%)			Import
	GDP	Imports	Exports	Tariffs
Total	100.00	100.00	100.00	4.82
Agriculture	32.29	1.80	43.05	3.74
- Crops	26.38	1.69	42.95	3.91
'-- Maize	6.81	0.23	11.75	0.01
'-- Rice	0.76	0.05	0.18	7.53
'-- Other cereals	0.43	0.81	0.08	0.92
'—Cassava	1.56			
'-- Other roots	1.37			
'-- Pulse and oilseeds	5.10	0.12	6.31	7.65
'—Horticulture	6.09	0.06	0.02	12.95
'—Tobacco	2.22	0.38	15.78	9.18
'—Coton	0.80	0.00	1.04	2.01
'—Sugar	0.55	0.00	4.50	1.01
'-- Other export crops	0.69	0.04	3.29	8.00
- Livestock	3.84	0.06	0.05	1.37
- Fisheries	0.97	0.05	0.03	0.78
Industry	20.05	84.14	34.28	5.65
- Mining	1.26	0.00		1.08
- Manufacturing	13.27	84.14	34.28	5.65
'-- Agro-industrial processing	7.89	4.79	25.01	5.72
'--- Meat processing	0.29	0.04		4.31
'--- Grain milling	1.59	0.82	0.51	4.89
'--- Sugar refining	1.18	0.03	0.44	2.39
'--- Tea processing	0.52	0.02	6.45	14.49
'--- Other food processing	1.98	3.05	1.17	3.01
'--- Beverages	1.60	0.09	0.29	11.06
'--- Tobacco curing and processing	0.71	0.74	16.14	17.15
'-- Textiles and clothing	1.29	6.67	1.77	11.59
'-- Wood and paper	0.97	4.94	1.94	1.65
'—Chemicals	2.34	24.12	3.52	4.64
'--- Petroleum		10.57		5.50
'--- Fertilizer	0.06	6.72	0.04	
'--- Other chemicals	2.28	6.83	3.48	7.88
'-- Non-metals	0.46	1.98	0.09	2.97
'—Metals	0.02	16.09	0.11	8.54
'-- Machinery	0.17	25.41	1.39	4.17
- Construction	3.54			
- Utilities (electricity & water)	1.98			
Services	47.67	14.06	22.67	
- Trade, hotels and catering	16.78	1.11	13.56	
- Transport and communications	6.05	3.08	3.06	
- Private business services	9.08	9.87	6.05	
- Public administration and services	11.58			

Source: 2007 Malawi social accounting matrix v1.

2.3. Households in Malawi

At the time of writing the new Integrated Household Survey (IHS3) has not been released yet, so households characteristics in our new Social Accounting Matrix of Malawi for 2007 are still based on the on the 2004-05 Integrated Household Survey (IHS2) (NSO 2005).

i) Main characteristics

According to the IHS2 data, 90 percent of the households in Malawi were dependant on agriculture for part of their income and 52.4 percent of them fells under the poverty line of US$115 per person per year. Based on the estimates of the Malawi demographic and health survey (NSO and ICF Macro 2010), we assume that the poverty headcount had dropped to 40 percent in 2007[5].

Households in Malawi are divided in 70 household groups according to the size of land they farm (small-scale, medium-scale, large scale), where they live (rural/urban areas, in the North, Center or South regions) and to which expenditure quintiles they belong. In depth analysis of the livelihood profiles of households in Malawi (MVAC 2005) have shown that indeed location and size of land cultivated and asset holdings such as livestock are important discriminating factors between households. Malawi being the third most populous country in SSA, with 2.3 rural people per hectare of agricultural land compared to 0.4 people for the sub-continent as a whole, it is explainable that the size of land cultivated, the location and the agro-ecological conditions of the farm would be important determinants of the cropping patterns and hence the opportunities of farmers. Ideally more complex factors explain differential responses to exogenous change, such as the seasonality of access to paid labor outside of agriculture, and access to cash, credit and inputs, proximity to markets, and occurrence of hazards (*ibid.*). Nevertheless, integrating the diversity and complexity of those livelihoods at the country level in the tools of policy analysis such as national CGE models is difficult because of data constraints and of current technical limitations in developing country-wide adequate representative farm/household typologies (Dorward et al. 2004). The main characteristics of households in the SAM are summed up in the following Table III.2.

Although all farm households dedicate part of their land to grow food for they own consumption, and most are almost self sufficient in maize, all of them complement with some food from the market. According to the Malawi Baseline Livelihood Profiles (MVAC 2005 *op. cit.*) almost one third of the population in Malawi cannot rely on its farm and must rely on *ganuy* (casual agricultural labour) for between two to six month per year to earn enough income to buy food. The share of expenditure dedicated to food is different across groups as is

[5] As explained in more details later, in our poverty analysis rather than assume that poverty remained unchanged, we artificially set our poverty line so as to find the Malawi demographic and health survey (NSO 2010) poverty level.

apparent in Table III.2, but it is also true across quintiles with the poorest spending on average 67 percent of their expenditure on food items, and the richest quintile only 44 percent.

According to the IHS2, close to all farmers allocate some land to maize foremost for their own consumption since it is the main staple crop of the country and can be grown anywhere. Thus although the pattern of crops differs by farm groups, all farm groups in the SAM dedicate part of their land to maize. Tobacco is the most widespread cash crop among smallholders, although it tends to be geographically concentrated in regions with higher agronomic potential for cash crops which are concentrated in the central region (World Bank 2009 *op. cit.*). Hence in the SAM farm households groups living in the Central region use a larger share of their land to grow that crop.

ii) Urban farms

Specific urban conditions in Malawi justify singling out urban farms. In the SAM, they appear in 15 farm groups (5 expenditure quintile groups for each of the three regions of Malawi). They account for 6 percent of harvested land, and 6 percent of the population. Urban farm households tend to be much more heavily engaged in off-farm activities than rural households with 52 percent of their income coming from enterprise earnings, thus, at similar sizes and agricultural revenues they earn a higher average per capita income than the rest of farm households and dedicate a much lower share of their expenditure to food items. Only 2 percent of the poors are assumed to belong to that group in 2007 (3 percent in 2005 according to IHS2).

iii) Rural farms

The remaining farm population is divided in 45 groups (5 expenditure quintiles for each of the three size groups in each of the three regions of Malawi, see regional map in Appendix A).

The majority of the population of Malawi belongs to the households group farming between 0.5 and 2 hectares of land. They tend to cultivate rather diverse cropping patterns, with maize, non-maize food crops, and export-oriented crops, particularly tobacco. They dedicate more than half of their expenditure to food items and self produce almost all the maize they eat. Their income comes primarily from labor and land. In 2007, 47 percent of them is estimated to fall below the national poverty line, which is above the national poverty

incidence of 43 percent (respectively 56 and 52 percent according to ISHN2 in 2005). In 2007, 64 percent of all the poors in Malawi are assumed to belong to that category.

The small-scale farmers (under 0.5 ha harvested) are specific in the sense that they dedicate most of their land to staple crops including horticulture for self consumption and they are the only one not usually producing tobacco (on average this group dedicate 5% of its land to tobacco against 23 percent on average nationally), and almost not producing other types of cash crops. In terms of localization, more than half of rural small-scale farmers are concentrated in the southern region. Their poverty rate is estimated to reach 52 per cent in 2007 (against 61 in 2005 according to the ISH2). In 2007, they are estimated to account for one quarter of the poors in Malawi.

On the contrary, large-scale rural farmers (with more than two hectares of land) have higher-than-average per capita expenditure, and their incidence of poverty is lower than other size groups with 30 percent of poors estimated in 2007 (31 in 2005 according to the ISH2). Only 4 percent of Malawi's poor people live on large-scale farms. They tend to be more heavily engaged in export-oriented crop production which, are even more concentrated than tobacco within very limited agro-ecological zones. For example, tea production takes place mainly within the Blantyre district in the Southern region, while sugar production occurs mainly in Salima district in the Center region. Their average size is 8 hectares in size, although this is biased upward by a small number of very large farms, such that the median farm size for this group lies well below the mean.

iv) Non-farm households

The remaining urban and rural nonfarm households account for only 9 percent of the population, and 6 percent of the poors in 2007 (5 percent in the ISH2). They are very distinct from the farming households in the way they generate their incomes, earning more than half of their incomes from nonfarm enterprise profits, and another third from secondary and tertiary-educated labor wages and salaries.

v) Differences across quintile

What is not apparent in the table is that within each of the household types described in Table III.2., income and expenditure profiles vary depending on the quintile. Farm households in lower-income quintile (Quintile 1) rely heavily on lower-skilled labor incomes and on agricultural profits as captured by land earnings. Capital, especially non agricultural is also

less important for lower-income households. For example, while households in the top expenditure quintile receive a 41,4 percent of their income from capital, this accounts for only 19.9 percent of incomes for households in the lowest quintile.

TABLE III.2 –. SUMMARY STATISTICS BY REGIONS AND FARM HOUSEHOLDS IN THE ECONOMYWIDE MODEL OF 2007

	National (estimates)	Urban		Rural						
		Urban farming	Urban non-farm	Rural farming by region			Rural farming by farm size (hectares / ha)			Rural non-farm
				North	Center	South	Small (<0.5ha)	Med. (0.5-2ha)	Large (>2ha)	
Population (1,000)	12,865	786	673	1,235	4,715	4,898	2,568	7,576	713	558
Quintile 1	2,569	62	35	288	666	1,429	699	1,595	89	89
Quintile 2	2,572	74	74	270	909	1,163	535	1,708	98	82
Quintile 3	2,574	107	109	248	1,058	959	531	1,619	114	94
Quintile 4	2,576	154	162	232	1,122	793	469	1,506	173	112
Quintile 5	2,575	277	406	195	960	554	358	1,122	230	182
Poverty incidence (%)	40	14	17	46	34	53	48	44	28	34
National poverty share (%)	100	2	2	11	31	50	24	65	4 0	4
Average per capita expenditure ($US)	151	387	361	127	145	115	48	127	177	180
spend on food	52%	32%	27%	67%	58%	63%	64%	62%	46%	62%
maize own produced	92%	82%	0%	99%	98%	98%	98%	98%	99%	0%
Income share from land (%)	13	3	5	24	21	20	31	18	18	0
from labor educated primary or less(%)	12	3	1	15	19	26	10	23	27	7
from more educated labor (%)	34	30	51	31	30	24	29	29	24	34
from capital (incl. livestock) (%)	6	2	0	13	11	12	14	12	5	0
from enterprise (%)	29	54	37	12	13	12	11	12	19	52
from transfers (%)	7	9	6	5	6	5	5	6	6	6
Average farm land (ha)	1.13	1.31	-	2.93	4.12	3.58	0.69	1.44	8.02	-
Maize	0.27	0.31	-	0.44	0.96	1.12	0.30	0.36	1.21	-
Pusles	0.08	0.09	-	0.14	0.34	0.19	0.06	0.11	0.36	-
Other staple food	0.07	0.07	-	0.23	0.18	0.29	0.07	0.10	0.18	-
Horticulture	0.17	0.16	-	0.22	0.38	1.14	0.17	0.26	0.42	-
Tobacco	0.26	0.33	-	0.94	1.08	0.36	0.04	0.28	2.86	-
Other export crops	0.28	0.36	-	0.97	1.17	0.48	0.05	0.32	2.99	-

Source: Malawi 2007 Social Accounting Matrix (Douillet, Pauw and Thurlow op. cit.) and author's calculations using official agricultural production data (MOAFS 2010a) and the Integrated Household Survey (IHS2) of 2004/05 (NSO 2005 op. cit.).

Note: Population in 2007 was estimated based on population growth rates from Malawi Demographic and Health Survey (2010). Per capita expenditure is mean expenditure unadjusted for adult equivalence from IHS2; all poverty figures were obtained by changing the national poverty line to reproduce poverty figures from the Malawi Demographic and Health Survey (2010).

3. Modeling policy reforms

As in Anderson, Cockburn and Martin (2010 op. cit.), we rely on a macro-micro CGE framework linking the global and the household levels. Following the main characteristics of this framework is presented, the scenarios modeled are detailed and the main limitations of this framework are assessed.

3.1. The modeling framework

The methodology we use is to implement the domestic policy reforms in a national computable general equilibrium model representing Malawi that is linked to household survey data to produce estimates of change in poverty. For the global trade policy reforms, after being simulated in a global general equilibrium model, border shocks are transmitted to the national model linked to the household data.

3.1.1. *The main features of the national CGE model of Malawi*

The national CGE model we use is based on the standard IFPRI static single country CGE model initially developed by Löfgren (2001) on Malawi and later version developed in Pauw, Thurlow and van Seventer (2010 *op. cit.*). Main equations can be found in Appendix B.

i) Production side

Producers in each sector s and region r produce a level of output Q by employing the factors of production F under constant returns to scale (exogenous productivity α) and fixed production technologies (fixed factor shares δ) (equation 1). Factors are combined with fixed-share intermediates using a Leontief specification. Profit maximization implies that factor payments W are equal to average production revenues (equation 2). Under profit maximization, the factors receive income such that marginal revenue equals marginal cost based on endogenous relative prices.

In the main simulations, labor supply l, land supply n, livestock supply s and capital supply k are fixed and fully employed at flexible real wages with some exceptions. Unskilled laborers are unemployed at fixed nominal wages to capture the underemployment of lower-skilled workers in Malawi. Land for rice, sugar and other export crops and capital in the mining, metals and electricity sectors, are immobile and earning sector-specific returns. The former captures the specificity of those crops in terms of agro-ecological zones while the

latter reflects a dependence on foreign direct investment. By default under a long-run specification, labor market equilibrium is defined at the national level as mobile across both sectors and regions meaning wages are equalized nationally (equation 10). Regional land, livestock and capital market equilibrium implies that there are mobile across sectors but assumed immobile across regions meaning rental rate varies by regions (equation 11, 12).

ii) Modeling international trade

International trade is determined by comparing domestic prices to world prices. A world demand for Malawian export function is defined as presented below. The decision of producers is governed by a constant elasticity of transformation function that distinguishes between exported and domestic goods to capture any time or quality differences between the two types of products. Profit maximization drives producers to sell in the markets in which they are able to achieve the highest returns. If the ratio domestic prices on world export prices falls, then exports X increases (equation 4).

Conversely, imported and domestic final or intermediate goods are substitutable under a constant elasticity of substitution Armington specification. Under the small country assumption, Malawi faces an infinitely elastic world supply at fixed world prices. If the ration domestic prices on world import prices wm (adjusted by exchange rate E) falls, then the quantity of imports M increases (equation 3). Trade elasticities are taken from the Global Trade Analysis Project (Dimaranan 2006).

iii) Institutions

The model distinguishes among various institutions, including enterprises, the government, and the 70 representative household groups that were presented above. Households and enterprises receive incomes in payment for the use of their factors of production by producers. Households and enterprises pay direct taxes to the government (based on fixed tax rates), save (based on marginal propensities to save), and make transfers to the rest of the world. Enterprises pay their remaining incomes to households in the form of dividends. Households use their incomes to consume commodities under a linear expenditure system of demand which elasticities were estimated using the ISH2 as in King and Byerlee (1978).

Factor incomes are distributed to households in each region using fixed income shares θ based on the households' initial factor endowments (equation 5). Total household incomes Y

are then either saved (based on marginal propensities to save υ) or spent on consumption C (according to marginal budget shares β) (equation 6). The government receives income through imposing activity, sales and direct taxes, and import tariffs and then makes transfers to households, enterprises, and the rest of the world. The government also purchases commodities in the form of government consumption expenditures. The remaining income of government is (dis)saved. All savings by households, enterprises, government, and the rest of the world (foreign savings) are collected in a savings pool from which investment I is financed (meaning savings-driven investment closure) (equation 7). Finally, a national price P equilibrates product markets, thus avoiding the necessity of modeling interregional trade flows (equation 8).

The model includes three broad macroeconomic accounts: the government balance, the current account, and the savings and investment account. To bring about balance among the various macroaccounts, a set of macroclosure rules must be specified. Consistent with Anderson, Cockburn and Martin (2010 *op. cit.*) in both the global and national model, we assume a savings-driven closure to balance the savings and investment account. Under this closure, the marginal propensities to save of households and enterprises are fixed, while investment adjusts to changes in incomes to ensure that the level of investment and savings are equal. But the national saving rates varies when income distribution varies. For the current account, we assume that a flexible exchange rate adjusts to maintain a fixed level of foreign savings (so as to avoid foreign debt considerations). Thus, the external balance is held fixed in foreign currency terms. This assumption implies that government cannot simply increase foreign debt but instead must generate export earnings to pay for imported goods and services. In the case of Malawi this assumption realistically underlines the importance of the export sector in generating foreign exchange. Finally, in the government account, we assume that the fiscal deficit remains unchanged and that government revenues and expenditures are balanced through changes in the direct tax rates on households and enterprises.

The model's variables and parameters are calibrated to data from the regional social accounting matrix (Douillet, Pauw and Thurlow op. cit.).

3.1.2. ***Modeling the policy reforms***

i) Domestic agricultural policy reforms

Domestic agricultural policy reforms are modeled very basically through an increase in aggregate productivity of the activities targeted, as described in details in section 3 below. Productivity growth is imposed on the model by adjusting the parameters π and λ (equations 1 and 12). Increasing the value of these parameters to more than one increases production and decreases product prices and the returns to factor resources. This may then change allocation of factors depending on their mobility, production patterns and international trade flows and affect households' real income and consumption depending on their income and expenditure patterns.

ii) Rest of the world and domestic trade policy reforms

Trade policy reforms are modeled by simultaneously imposing exogenous world market shocks resulting from other countries trade policy reforms onto the national model together with the change in Malawi domestic trade policy that are directly implemented in the national model.

There are various ways to transmit the results derived from a global CGE model such as MIRAGE to a single-country CGE model. Like Hertel and Winters (2006) and Anderson, Cockburn and Martin (2010 *op. cit.*), we adopt the approach developed by Horridge and Zhai (2006). The aim is to use a global CGE model to determine the changes in world demand implied by the rest of the world policy reform, and allow the single country model to determine the export supply behavior of Malawi as a consequence.

In our case, all the exogenous shocks to border prices and export demand are based on the results provided by the Modeling International Relationships in Applied General Equilibrium (MIRAGE) global model initially developed by the Centre d'Études Prospectives et d'Informations Internationales (CEPII), described in Decreux and Valin (2007). To transmit those exogenous shocks onto the national model, the small country assumption of infinite world demand for Malawi's export standard in the IFPRI national models has to be relaxed. Instead following Horridge and Zhai (2006, *op. cit.*), we specify an export demand function, based on its slope—approximately equal to the elasticity of substitution among imports— and the shift (*fp*) of the world demand, where *fp* is computed as follows:

$$fp = p * q^{Tradelas(C,'SIGMAT')} \quad \text{(A.1)}$$

while *p* is the percentage change in export prices, and *q* is the percentage change in export quantities and *Tradelas(C,'SIGMAT')* is the slope of the demand curve, considered equal to the GTAP elasticity of substitution among imports as in Horridge and Zhai (*idib.*).

In the end, the global model already takes into account Malawi's reaction to rest of the world policy reform through a change in the composition of exports which impacts the change in world demand for Malawi's exports, but it does not include potential domestic policy reforms. Horridge and Zhai show by comparing the results between the same policy reforms implemented in the global model and in a national model based on the exact same data and parameters that the results are bound to be different. Their working assumption which we will adopt is that this difference is desirable as long as we assume that the Malawi single-country model represents the Malawian economy better than the Malawian part of the global model.

3.1.3. *Measuring poverty impacts*

The results of the CGE model are passed back down to the household survey on which the model is based and in which the poverty measures are calculated. More specifically, the changes in the real commodity expenditures of each representative household in the CGE model are applied to the expenditures of the corresponding household in the survey. Total expenditures are compared to real expenditure poverty lines, and standard poverty measures are recalculated.

In 2005, the poverty headcount was 52.4 percent at the poverty line of US$115 per person per year (IHS2). But since the latest Malawi demographic and health survey (MDHS, NSO 2010 *op. cit.*) estimates that between 2005 and 2007 poverty dropped to 40 percent of the population, and despite uncertainties on those figures (Mussa and Pauw, 2011), in our poverty analysis rather than assume that poverty remained unchanged, we artificially set our poverty line so as to find the MDHS poverty level. Our reported national poverty headcount rate for 2007 therefore differs from official estimates. However, since our analysis will focus on changes in poverty rather than absolute levels, this should not hamper its scope.

3.2. The trade and development policy reforms scenarios

Our agricultural policy scenarios are inspired from the results of Benin et al. (2008) and Ecker, Breisinger and Pauw (2011) that have modeled past growth trends of Malawi and potential options, trade policy reforms scenarios are taken from a recent global study

comparing the impacts of various trade policy reforms available for Sub-Saharan Africa at the regional and multilateral level (Douillet 2011, *op. cit.*).

3.2.1. *The agricultural growth scenarios: replicating the success of the Fertiliser Input Subsidy Program and beyond*

In reproducing national accounts growth statistics (as reported by NSO 2010, *op. cit.*) in a dynamic framework, Ecker, Breisinger and Pauw (2011, *op. cit.*) closely approximated reported crop production statistics (as reported by MOAFS 2010a, *op. cit.*). They assume a slightly more conservative growth trajectory than what preliminary national accounts estimates suggest and find a 7.2 percent GDP growth, driven by strong growth in the cereals subsector (16.5 percent).

i) Scenario 1 "FISP": the productivity growth of the Fertiliser Input Subsidy Program

Our first scenario will be to roughly replicate the productivity shocks in the agricultural subsector experienced by the country in 2007 due to the FISP, as in Ecker, Breisinger and Pauw (2011 *op. cit.*). It is the outcomes of the agricultural policy in terms of productivity growth that are directly modeled without modeling the way through which such a productivity growth is obtained. This straightforward framework is chosen for simplicity in this paper which focuses on the downstream distributional impacts of sectoral growth, but would need to be refined if we wanted to evaluate the cost-benefit of such a policy. As shown in Table III. 3 we assume that smallholder maize productivity improves by 20 percent, smallholder tobacco by 3 percent and horticultural crops 3 percent.

ii) Scenario 2 "ASWAP": the productivity growth of the Agriculture Sector Wide Approach

Similarly to Ecker, Breisinger and Pauw (*ibid.*), we implement a broad-based productivity growth path in which cereals productivity growth slows down, but overall agricultural growth is maintained through promotion of a larger range of subsectors. Thus the "broad based" agricultural growth scenario considers rapid expansion of other agricultural and non agricultural sectors. Smallholder maize and smallholder root crops productivities increase by 10 percent, followed by a 8 percent productivity increase of other cereals, and 5 percent productivity increase of estate maize, horticulture and smallholder tobacco. The focus on infrastructure translates in an increase by 4 percent in retail and transports sectors productivities.

TABLE III. 3 – EXOGENOUS TOTAL FACTOR PRODUCTIVITY (TFP) GROWTH IMPOSED ON THE NATIONAL MODEL TO SIMULATE AGRICULTURAL POLICIES

	TFP growth from agricultural policy	
Activities	1FISP	2ASWAp
Maize (smallholder)	20.0	10.0
Maize estate	2.0	5.0
Other cereals	0	8.0
Root crops (smallholder)	0	10.0
Root crops (estate)	0	2.0
Pulses and oilseeds (smallholder)	0	5.0
Pulses and oilseeds (estate)	0	2.0
Horticulture	3.0	5.0
Tobacco (smallholder)	3.0	5.0
Tobacco (estate)	0	1.0
Cotton	0	2.0
Sugarcane	0	1.6
Other export crops	0	1.6
Seed production and distribution	0	2.0
Livestock	0	1.0
Forestry	0	1.0
Fisheries	0	1.0
Mining	0	0.0
Agroindustries	0	3.0
Retail and wholesale trade	0	4.0
Transport and storage	0	4.0
Communication, financial and business services	0	2.0
Government administration	0	2.5
Other public and privates services	0	2.0

Source: Author's calculation from the model, inspired from Ecker, Breisinger and Pauw (2011 op. cit.)

3.2.2. *Modeling global trade liberalization*

We chose to illustrate the diversity of trade policy options available to Malawi, both hypothetically or closely following current negotiating texts. The shocks imposed from the different trade scenarios are presented in Table III. 4 and Table III. 5 below.

i) Scenario 3"Regional FTA": Four Regional Free Trade Agreements in SSA

As this scenario we designed foremost for the purpose of a global modeling the constraint was to choose a combination of regional economic communities that covered all SSA countries with no overlap. Hence, the four groups used were the Economic Partnership Agreement regional groups in Africa, in which Malawi belongs to the southern African group named the Southern African Development Community (SADC) group, based on the Southern

Africa Customs Union (SACU) members plus Malawi, Mozambique, Zambia, Zimbabwe and Angola. All the other countries in SSA were grouped either in the Western African region, the Central African region or the Eastern African region.

This scenario is hypothetical because in reality Malawi is pursuing in parallel two regional integration processes, one with the SADC but also with the Common Market for Eastern and Southern Africa (COMESA).

In the regional FTA scenario, for each SSA country, all *ad valorem* equivalent tariffs applied to imports from other countries of the same region are set to zero, creating four FTAs. Malawi thus liberalizes trade with the other countries from SADC. We can see in Table III. 4 that export and import prices decrease as prices in the regional market decrease, and that demand for Malawian exports mostly rise except for maize, as according to the GTAP7 database underlying the global model the country is not competitive for maize at the regional level.

ii) Scenario 4 "SSA FTA": Sub African Free Trade Agreement

In this very hypothetical scenario, all countries in SSA liberalize. For each country in SSA, *ad valorem* equivalent tariffs applied on imports from other SSA countries are set to zero. Price and demand shocks on Malawi are similar to those from the regional FTA scenario except that demand is lower for sugar but higher for pulses, food processing, beverage and tobacco and textile.

TABLE III. 4 – CHANGES IN THE TARIFFS APPLIED BY MALAWI IN THE TRADE SCENARIOS

	Tariff Applied by Malawi		
	Initial tariff	Change with agreement	
Commodity	(2007)	1.Reg	2.SSA
Maize	0%	0%	0%
Rice	11%	-7%	-7%
Other cereals	1%	-18%	-18%
Cassava	9%	-11%	-100%
Other roots	5%	-96%	-96%
Pulses and oilseeds	11%	-21%	-28%
Horticulture	19%	-42%	-43%
Tobacco	13%	-97%	-98%
Cotton	8%	-99%	-99%
Sugarcane	0%	0%	0%
Other export crops	9%	-43%	-65%
Livestock	5%	0%	0%
Poultry	0%	-16%	-16%
Forestry	0%	0%	0%
Fisheries	1%	-68%	-87%
Mining	1%	0%	0%
Meat processing	1%	0%	0%
Grain milling	8%	-23%	-29%
Sugar refining	0%	0%	0%
Tea processing	18%	-83%	-90%
Other food processing	10%	-29%	-33%
Beverages	13%	-42%	-45%
Tobacco curing and processing	7%	-83%	-90%
Textiles and clothing	28%	-5%	-13%
Wood and paper	8%	-29%	-31%
Petroleum	4%	-79%	-80%
Fertilizer	0%	0%	0%
Chemicals	7%	-23%	-27%
Non-metals	6%	-19%	-35%
Metals	8%	-33%	-37%
Machinery and vehicles	8%	-16%	-20%
Other manufacturing	14%	-16%	-19%
Construction	20%	-22%	-23%

Source: Author's calculation from MAcMap-HS6 2007, trade weighted average

iii) Scenario 5 "DDA": Multilateral Liberalization in the Form of a "Doha Development Round"

The DDA scenario is based on the December 2008 modalities (Bouët and Laborde 2010) widely accepted by WTO members as the basis for further negotiations. Detailed formula[6] used in this paper are available upon request. Malawi like other LDCs is exempted from tariff reduction but benefits from increased market access in other countries. Trade preferences the country already benefits particularly in the EU and the United States are nevertheless eroded since other countries experience an improved market access to those

[6] Thanking David Laborde for making his list of sensitive and special products defined using the Jean, Laborde, and Martin (2010) available.

same markets, thus Malawi experiences an increased competition on those markets, which is apparent in Table III. 4 by the large negative demand volume shocks except for traditional export crops for which Malawi is competitive which are raw tobacco, beverage and processed tobacco and tea.

iv) Scenario 6 "DFQF": Preferential Multilateral Liberalization for Least Developed Countries

A rather ambitious DFQF scenario is implemented (Bouët *et al*. 2010): 100 percent DFQF market access by OECD countries and Brazil, China, and India to all LDCs including Malawi.

DFQF is very favorable to Malawi for which the equivalent average tariff cuts are much higher than from DDA. Very large export price and demand shocks are induced by this agreement as Malawi finally gets a free access for its tobacco exports to the very protected markets of the USA and the UE. It also benefits from a very large demand shock for horticulture coming from India. Compared with DDA, Malawi earns a very large price premium thanks to the preferential access. The corollary is an increase competition and large negative volume shocks for exports for which Malawi is not competitive with the Asian LDCs.

v) Scenario 7"DDA+DFQF"

This scenario assumes that both DDA and DFQF are concluded jointly.

In Malawi like for the rest of SSA, while the DFQF brings additional tariff cuts of interest to SSA compared to the DDA scenario alone, the joint scenario is less favorable than the DFQF alone, because Malawi is not able to fully take advantage of the increased market access for lack of competitiveness with other countries of the world. This traduces by smaller price and demand shocks for all sectors than in the DFQF scenario.

TABLE III. 5 – EXOGENOUS DEMAND AND PRICE SHOCKS TRANSMITTED FROM MIRAGE TO THE NATIONAL MALAWI MODEL

	Exports	Imports	Per cent change														
			1.Reg			2.SSA			3.DDA			4.DFQF			5.DDA+DFQF		
			Exports		Imp	Exports		Imp	Exports		Imp	Exports		Imp	Exports		Imp
	(Millions of Malawian Kwacha)		Price	Vol	Price	Price	Vol	Price	Price	Vol	Price	Price	Vol	Price	Price	Vol	Price
Agriculture	75,502	5,683	-1.2	4.6	0.0	-1.1	6.5	0.0	0.8	7.0	0.0	5.9	25.8	0.1	4.7	22.3	0.0
Maize	12,457	164	-0.8	-10.0	-1.5	-0.8	-5.8	-0.8	1.1	-3.7	0.0	8.8	-13.9	0.8	7.0	-11.3	0.6
Rice	195	101	-1.1	5.1	0.0	-1.1	7.4	0.0	0.9	-13.4	-1.1	7.8	-40.6	0.0	6.1	-38.0	-1.1
Other cereals	57	3,804	-0.3	4.2	0.2	-0.1	5.9	0.1	0.6	-6.4	-0.2	5.2	-34.2	0.6	4.0	-29.2	0.4
Root	0	0	-0.4	0.0	-0.5	-0.2	5.0	-0.4	0.8	-3.2	-0.6	7.9	-22.5	0.0	6.1	-18.2	-0.2
Pulses and oilseeds	6,796	222	-0.4	0.0	-0.5	-0.2	5.0	-0.4	0.8	-3.2	-0.6	7.9	-22.5	0.0	6.1	-18.2	-0.2
Horticulture	26	106	-0.9	2.9	-0.5	-0.9	2.9	-0.3	1.0	-4.8	0.0	9.1	8.1	0.8	7.4	12.6	0.7
Tobacco	42,513	710	-1.7	11.2	-0.3	-1.7	12.5	0.0	1.0	14.4	0.1	6.0	55.3	1.5	4.9	47.4	1.2
Cotton	2,789	0	-0.6	0.0	-1.5	-0.6	-0.7	-0.7	0.6	-5.5	0.0	6.6	-23.0	0.7	5.0	-20.5	0.6
Sugarcane	7,646	2	-1.3	11.0	-0.5	-1.3	6.0	-0.7	0.7	-6.3	0.1	5.9	-20.0	0.8	4.6	-20.1	0.7
Other export crops	2,722	85	-0.6	4.0	-0.7	-0.6	4.4	-0.1	0.3	5.1	0.2	2.1	19.6	3.0	1.7	16.8	2.4
Livestock and poultry	50	109	-1.2	8.9	-0.4	-1.2	8.5	0.0	0.9	-14.9	0.2	7.7	-39.5	0.5	6.1	-38.5	0.5
Forestry	25	2	-1.4	-1.2	0.0	-1.3	0.3	0.2	0.8	-3.8	0.0	6.3	-27.0	0.0	5.0	-21.8	0.0
Fisheries	33	90	-1.0	3.7	0.0	-1.0	3.8	0.0	1.2	-5.8	0.0	9.6	-28.8	0.0	7.6	-24.8	1.4
AgroIndustries	21,305	10,033	-1.3	7.3	-0.2	-1.3	8.5	0.1	0.7	8.4	-0.2	4.7	30.9	0.5	3.8	26.6	0.2
Meat processing	0	68	-1.4	5.8	-1.5	-1.3	6.2	-0.9	0.9	-13.6	-0.1	7.5	-29.9	0.2	5.9	-30.5	0.1
Grain milling	1,384	964	-1.5	2.9	0.0	-1.7	8.1	-0.1	0.6	-3.5	-2.4	6.0	-20.9	0.0	4.7	-17.6	-2.3
Sugar refining	477	64	-1.3	11.0	-0.5	-1.3	6.0	-0.7	0.7	-6.3	0.1	5.9	-20.0	0.8	4.6	-20.1	0.7
Tea processing	6,999	37	-0.6	3.6	-0.3	-0.5	4.0	0.0	0.3	4.7	0.1	1.9	17.8	1.5	1.6	15.3	1.2
Other food processing	1,262	5,739	-1.4	-1.2	0.0	-1.3	0.3	0.2	0.8	-3.8	0.0	6.3	-27.0	0.0	5.0	-21.8	0.0
Beverages	317	167	-1.4	4.4	-1.4	-1.4	10.6	-1.1	0.6	8.0	0.1	5.7	16.9	0.2	4.5	18.1	0.3
Tobacco curing and processing	10,866	2,995	-1.7	11.2	-0.3	-1.7	12.5	0.0	1.0	14.4	0.1	6.0	55.3	1.5	4.9	47.4	1.2
Textiles and clothing	4,760	7,841	-2.1	48.6	0.0	-2.1	51.5	0.1	0.8	-25.0	-0.4	6.4	-36.6	0.3	5.0	-44.1	-0.2
Other Industries and manufacturing	8,077	144,139	-1.6	4.5	0.0	-1.5	7.4	0.2	0.7	-3.1	0.0	5.6	-25.6	0.1	4.4	-20.2	0.0

Source: Author's calculation from the model

3.3. Discussion on the assumptions of the modeling framework

From an analytical point of view, CGE models, traditional tools of economic policy analysis, are convenient to capture the growth linkages effects of all types of policy reforms. Until recently they had been developed either to analyze global trade policy reform or domestic policy reform but rarely compare both.

Analysis of global trade reforms other than unilateral liberalization by a given country require by scope global models because the outcomes of trade policy reforms on each country depend on the relative impacts on competitors (Low, Piermartini and Richtering 2005 and Carrere and de Melo 2010). But most global models rely on the GTAP database (Global Trade Analysis Project of Purdue University), the only available database representing the global economy in equilibrium. However, there are three main limitations when using this database for poverty analysis, first many developing countries are not individually represented in the database (although the number of countries is gradually increasing with each new version released), second data availability for developing countries being scarce, many social accounting matrix from developing countries are ten years of older (Malawi's data in the GTAP 7 version used in the global modeling of this study dates back from 1994) and third it does not encompass household level disaggregated data within regions. As a result, by default, most global CGE models are built with one representative agent which hinders the analysis of distributional impacts of policy reforms.

Since domestic policy analysis requires high level of sectoral and household disaggregation, it is mostly done at the national level. But thanks to the growing availability of detailed household surveys and new analytical tools (either directly integrating the households in the global models such as the Global Income Distribution Dynamics GIDD, described in Chapter 3 in Anderson, Cockburn and Martin, 2010 *op. cit*.- or the MIRAGE Households developed by, Bouët, Laborde and Estrades -2011-, or by linking macro and micro models) a new empirical literature on the prospects of trade policy reforms on growth and on poverty reduction in developing countries has recently emerged (Hertel and Winter, 2006 *op. cit.*, Cling et al. 2009, Anderson, Cockburn and Martin, 2010 *op. cit.*). But some challenges remain to compare the impacts of domestic and rest of the world policy reforms. The main ones limiting the scope of our study are presented below.

First because it is the outcomes of the agricultural policy in terms of productivity growth that are directly modeled without modeling the way through which such a productivity growth is obtained, this framework is not able to capture the financial costs of the agricultural policies. Thus no cost-benefit analysis can rigorously been undertaken with such a simple framework.

Both the global and the national CGE model used in this study are applied in the comparative static mode, and they assume constant returns to scale and perfectly competitive markets. This application of a standard set of assumptions derived from Anderson, Cockburn and Martin (*ibid.*) further increase the possibility to compare the results with other country case studies but sensibility analysis on their impacts on the results still are needed. Furthermore, as opposed to the productivity growth generated by the agricultural policy, no account is taken of any dynamic gains arising from the opening of trade. These assumptions are imposed because of insufficient empirical evidence, technical limits or lack of consensus on how to model investment behavior, trade induced productivity growth, firm heterogeneity, economies of scale, or other type of responses to changes in policy. Anderson, Cockburn and Martin (*ibid.*) argue that the absence of dynamics implies that the results of such study "*grossly underestimate the potential poverty-reducing consequences of liberalization and might, in some situations, indicate poverty increases when, in fact, they would be decreases had the growth consequences been incorporated*" (Part I Introduction and Summary, p13).

Although, we agree that many of the previously cited specifications tend to lower impacts of the reforms, on the contrary the factor market assumptions, which have been shown to be crucial determinants of the income distributional effects of trade policies (Gérard and Piketty, 2008) are too optimistically flexible to reflect Malawian reality of imperfect credit, output, land and labour markets and adjustment costs of economic policy reform. Furthermore, both the national and global models assume "*unrealistically*"(Dorward et al. 2004 *op. cit.*) that farmers are able to respond to any price incentives they receive by substantially increasing their supply, since they do not capture other constraints such as liquidity constraints on purchasing inputs when credit is not available, risk and uncertainty, which induce farmers to keep their scarce land and other resources spread across a "portfolio" of income activities rather than concentrate them in activities that may be more profitable.

Furthermore, the choice of a form for the world demand for Malawian exports is far from trivial. The most commonly used form for domestic policy reforms analysis is a small open country assumption which implies that demand for Malawian exports is infinite and increase in Malawian supply would not depress world prices. In fact, the small country assumption might not be well suited in the case of Malawian burley tobacco exports, since it is a major actor on international market, the burley tobacco market is very tight and according to experts, it might be affected by unfavorable trends in the future (World Bank 2009 *op. cit.*).

Thus, we consider that the overall effect of all those specifications is not straightforward, and that sensibility of our results to those specifications is needed.

4. Results and discussion

All the scenario considered in this study are presented in Table III.6. First macroeconomic impacts of the different scenario are compared, then the analysis focuses on the sectoral and production impacts. Eventually sensibility analysis are run.

TABLE III.6 – THE SCENARIOS MODELED

Scenario	Description
Domestic Sectoral Investment in Agriculture in Malawi	
1. FISP	Replication of national accounts growth statistics (as reported by NSO 2010) for Malawi
2. ASWAP	Broad-based agricultural growth path in Malawi
Regional integration	
3. Reg FTA	Constitution of four sub-continental FTAs in SSA: Complete elimination of applied tariff barriers between countries of the same FTA.
4. SSA FTA	Constitution of one sub-continental FTA in SSA: Complete elimination of applied tariff barriers between SSA countries.
Multilateral liberalization	
5. DDA	Successful conclusion of the Doha negotiations: Multilateral reduction of bound tariff barriers of all countries except LDC according to the December 2008 modalities.
6. DFQF	Complete elimination of all applied tariff barriers imposed by OECD countries, Brazil, China, and India on imports from all LDCs.
7. DDA+DFQF	Combined tariff reductions of the DDA and the DFQF scenarios.

4.1. Main macroeconomic results

All the scenario modeled bring some real GDP growth to Malawi according to **Erreur ! Référence non valide pour un signet.**

Comparing impacts of similar policies, it appears that a broad based productivity increase as in "ASWAp" bring twice as much real GDP growth as a productivity increase concentrated on maize and tobacco as in the "FISP". Under ASWAp trade deficit decreases more than with the FSIP especially thanks to a larger exports of processed agricultural products, food but also tobacco, and decreasing manufactures and industrial deficit. World price index decreases more as a result of a larger export increase and real exchange rate appreciates more, while terms of trade deteriorate also more. Overall consumer price index increases slightly contrary to FISP where it increases.

TABLE III.7 – MACROECONOMIC RESULTS

	Initial (Mn MKW)	Change from base						
		1FISP	2ASWAp	3RegFTA	4SSaFTA	5DDA	6DFQF	7EDDA
GDP	494,833	1.40	3.34	0.06	0.05	0.05	0.11	0.08
- Consumption	429,592	2.05	3.59	-0.15	-0.31	0.44	2.46	1.95
- Investment	103,458	-2.61	-2.33	0.96	1.01	0.64	2.89	2.41
- Trade balance	-80,385	-0.96	-4.29	0.03	-0.70	2.88	16.12	12.98
-- Raw food crops	17,451	16.87	15.93	-6.62	-5.78	-6.68	-24.61	-20.92
Maize	10,399	25.68	17.72	-10.84	-10.62	-6.93	-23.68	-20.06
-- Processed food	-5,384	-2.10	-7.85	4.97	3.42	12.67	57.86	48.65
-- Raw exports crops	25,715	1.41	8.54	4.51	3.56	3.03	8.48	7.93
-- Processed export crops	23,316	0.12	0.35	-0.61	-0.72	-0.32	-1.42	-1.18
Processed tobacco	15,988	-1.34	2.14	-11.05	-11.01	3.53	5.77	6.92
-- Other manufactured goods	-112,197	-0.73	-2.00	-1.25	-1.32	-0.71	-4.23	-3.19
-- Industrial goods	-27,097	-3.52	-7.53	-4.91	-4.79	-4.88	-22.90	-18.85
Consumer price index		0.35	-0.07	-0.09	-0.10	-0.04	-0.11	-0.09
Real EXR		1.77	3.38	-0.65	-0.20	-2.63	-11.24	-9.39
Terms-of-trade		-1.56	-3.54	0.18	-0.25	2.78	13.55	11.06
World price index		-0.57	-1.29	-0.16	-0.02	0.98	5.58	4.49

Source: Author's calculation from the model

Additionally, by comparing trade scenarios, we find that a continental wide regional integration "SSA FTA" does not bring more than a Southern African regional integration to Malawi "RegFTA" in terms of GDP growth, it rather creates trade diversion leading to terms of trade loss while slightly decreasing trade balance deficit thanks to trade creation. In both case world price and consumer price index decrease. Both regional integration policies are equivalent to a multilateral integration in the form of a "DDA" in terms of GDP growth, promoting raw traditional exports crops, at the expense of food crops. They differ by the fact that regional

integration mostly decreases international price index, when DDA rather increases it leading to an appreciation of terms of trade. Comparatively a "DFQF", with a twice larger world price index increase and substantial increase in terms of trade, brings twice as much real GDP growth to Malawi. Interestingly a "DFQF" alone is more beneficial than an extended "DDA" ("EDDA") combining a "DDA" and a "DFQF", as additional preferences granted with the "DFQF" are eroded by the "DDA".

4.2. Sectoral growth results

The policy reform considered have distinct impacts on the growth of agricultural production as is apparent in Table III.8.

TABLE III.8 – INITIAL PRODUCTION (1000 MT) AND PERCENT CHANGE WITH SCENARIO

		Base	1FISP	2ASWAp	3RegFTA	4SSaFTA	5DDA	6DFQF	7EDDA
Maize	smallholder	3,226	12.3%	7.4%	-2.4%	-2.5%	-1.4%	-4.3%	-3.8%
	Estate	206	-30.4%	-6.4%	-3.9%	-3.7%	-3.1%	-8.5%	-7.8%
Rice		113	1.9%	2.7%	6.3%	-0.2%	-0.4%	-0.3%	-0.1%
Other cereals		101	1.5%	2.1%	8.4%	0.1%	0.2%	-0.9%	-3.5%
Cassava		3,285	1.8%	2.4%	7.6%	0.2%	0.1%	0.2%	1.1%
Other root crops		2,901	1.9%	2.5%	7.2%	0.1%	-0.1%	0.1%	0.7%
Pulses and oilseeds		696	1.8%						
Horticulture		1,354	2.8%	2.4%	6.0%	-0.1%	0.3%	-1.7%	-6.9%
Tobacco	smallholder	117	3.9%	4.8%	0.1%	-0.1%	0.3%	1.4%	1.1%
	estate	28							
Cotton		63	0.8%	3.7%	10.6%	8.1%	8.7%	10.0%	32.2%
Sugarcane		2,500	-1.0%	-1.6%	1.6%	6.0%	7.0%	6.3%	17.4%
Other export crops		52	-0.2%	1.0%	4.0%	0.9%	1.0%	-2.5%	-4.8%

Source: Author's calculation from the model

Comparing trade reform scenarios (2 to 10), we find that regional integration induces a larger spread increase in the production of the cash-crops (cotton and tobacco, and sugarcane), than multilateral integration, which is favourable only for tobacco. Indeed, at the global level Malawi is considered competitive only for tobacco (see Poulton *et al*. 2009, World Bank 2009 op. cit.).

As described in section 3 above and coherently with what was observe in National Accounts, in our simulation 1, the FISP delivers a growth foremost on smallholder maize and tobacco which is favorable to all other crops through reallocation of factors of production, except maize grown by estate which are excluded from the subsidies and sugarcane and other export

crops with are mostly grown in plantations away from the land receiving the subsidized fertilizer. In scenario 2 ASWAp, the broader agricultural growth brings a production increase more widely distributed across crops, much less focused on smallholder maize, and includes export crops.

4.3. Poverty results

According to the results presented in the following table, poverty reduction is higher with agricultural policies than with most trade policies, except surprisingly for "DFQF" (and thus "EDDA") which reduces poverty more than the agricultural policies. The elasticity of poverty reduction to GDP growth is thus much higher for trade policies than agricultural policies. But distributive impacts among households differ.

TABLE III.9 – INITIAL POOR HEADCOUNT AND CHANGE IN INCIDENCE WITH SCENARIOS

	Pop (1000)	Poors (1000)	1FISP	2ASWAp	3 Reg FTA	4 SSA FTA	5DDA	6DFQF	7EDDA
National	12,865	5,193	-5.3	-9.4	-1.7	-1.7	-2.4	-13.2	-11.2
Rural	11,406	4,945	-5.1	-9.2	-1.7	-1.7	-2.3	-12.9	-11.0
Non-farm	558	176	-11.0	-13.4	-3.2	-2.7	-3.9	-16.0	-13.4
Farm	10,848	4,769	-4.9	-9.0	-1.6	-1.6	-2.3	-12.8	-10.9
North	1,235	568	-4.5	-10.0	-2.4	-2.4	-2.7	-12.9	-10.9
Center	4,715	1,589	-5.5	-11.4	-1.9	-1.9	-2.9	-16.9	-14.6
South	4,898	2,612	-4.6	-7.3	-1.3	-1.3	-1.8	-10.3	-8.7
Large-sc.	713	199	-0.2	-5.6	-1.1	-1.1	-3.4	-24.5	-22.8
Med-sc.	7,576	3,338	-5.0	-9.6	-1.9	-1.9	-2.4	-12.6	-10.7
Small-sc.	2,568	1,242	-5.2	-7.8	-1.1	-1.0	-1.6	-11.5	-9.5
Urban	1,459	248	-9.2	-14.4	-1.8	-1.6	-3.3	-19.2	-15.0
Farm	786	113	-13.3	-17.2	-3.4	-2.8	-6.7	-23.5	-20.2
Non-farm	673	135	-5.7	-12.0	-0.5	-0.5	-0.5	-15.6	-10.6
Quintile 1	2,569	2,569	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Quintile 2	2,572	2,572	-8.7	-17.0	-1.4	-1.4	-2.7	-24.6	-20.6
Quintile 3	2,574	53	-96.4	-100.0	-100.0	-98.3	-100.0	-100.0	-100.0
Quintile 4	2,576	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Quintile 5	2,575	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Author's calculation from the model

In the multilateral trade scenarios poverty reduction tends to be larger for larger scale households which is logical since the larger the households, the more they are linked to markets and grow the export crops demanded. Due to the concentration of exports crops in certain parts

of the country, poverty reduction is also concentrated in the central region where poverty incidence was already smaller than in the rest of the country. Of all the trade scenarios, DFQF is particularly effective in reducing poverty for all types of households considered, because it drives a very large increase in demand for tobacco which in turns increases tobacco production and tobacco is grown by all farm households. Nevertheless poverty reduction for large scale households is more than twice that of other types of households. Regional integration drives a more evenly distributed poverty reduction, with the poverty incidence of medium and small-scale farmers groups decreasing more than large-scale farmers group. Poverty reduction is also more evenly distributed towards the Southern region.

On the contrary, thanks to the targeting of maize subsidies on poor households, the effects of the FISP are more important on smaller scale farm households and have almost no effect on large scale ones. The focus of the ASWAP on staple crops also enables a decrease in poverty more important for medium and small scale farmers than on large ones. Both agricultural policies bring a more evenly spread poverty reduction across the country. Furthermore since both agricultural policies increase the production of staples also consumed by poor nonfarm households, the poverty decrease for nonfarm households is much larger than in the trade scenario (except the ones with DFQF).

TABLE III.10 CHANGE IN POVERTY GAP

	Initial base	Change in poverty gap 1FISP	2ASWAp	3RegFTA	4SSaFTA	5DDA	6DFQF	7EDDA
National	11.99	-7.40	-12.66	-2.71	-2.63	-3.65	-17.78	-14.61
Rural	12.98	-0.93	-1.62	-0.35	-0.34	-0.47	-2.27	-1.87
Non-farm	9.40	-1.67	-1.71	-0.17	-0.06	-0.38	-1.79	-1.47
Farm	13.16	-0.89	-1.62	-0.36	-0.36	-0.47	-2.30	-1.89
North	13.78	-0.74	-1.81	-0.40	-0.39	-0.53	-2.54	-2.10
Center	8.84	-0.55	-1.20	-0.26	-0.27	-0.37	-1.75	-1.45
South	17.17	-1.26	-1.97	-0.44	-0.42	-0.55	-2.77	-2.26
Farm (large-scale)	7.74	-0.01	-0.83	-0.31	-0.33	-0.48	-1.91	-1.64
Farm (medium-scale)	12.82	-0.83	-1.59	-0.34	-0.35	-0.46	-2.24	-1.84
Farm (small-scale)	15.77	-1.31	-1.91	-0.41	-0.37	-0.51	-2.59	-2.10
Urban	4.30	-0.56	-0.72	-0.16	-0.12	-0.23	-1.02	-0.85
Farm	3.26	-0.51	-0.62	-0.15	-0.11	-0.22	-0.96	-0.80
Non-farm	5.52	-0.62	-0.83	-0.16	-0.13	-0.23	-1.10	-0.90
Q1	45.12	-1.97	-3.32	-0.64	-0.62	-0.86	-4.62	-3.72
Q2	14.92	-2.46	-4.27	-0.98	-0.95	-1.32	-6.04	-5.04
Q3	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01

Source: Author's calculation from the model

4.4. Sensibility analysis [7]

All other things being equal, changing the form of the export demand as described above is found to decrease by 30% the overall poverty effects of the agricultural policies modeled in section 3 than compared with a small country assumption for export demand. This assumption is required to be able to take into account the impacts on the volume of Malawian exports demanded by other countries additionally to the change in world prices from rest of the world trade reforms. Eventually, while the changes in world prices represent the evolution of the market opportunities, it is the changes in the volume exported that really captures how Malawi is able to take advantage of those opportunities. Unfortunately, they are highly dependent on the economic data underlying the representation of Malawi in the global model, based on the GTAP 7 database in which Malawian data are from 1994. Nevertheless, retaining the small country assumption for Malawi and only shocking price and tariffs appears problematic in the case of the regional integration scenarios. Indeed since they bring decreasing export prices and losses of tariff revenue, they have mostly a negative impact on real GDP, and poverty. In the case of "DDA", the price increase leads to a smaller but still positive real GDP growth and a much smaller poverty decrease, and for the "DFQF", the GDP growth is similar but the poverty reduction is only half that of the base simulation.

We also test the impact of changing the mobility of the factors. Since initially mobility is already pretty high, making all factors fully mobile does not have a big impact. The biggest changes in results are driven by the unemployment assumption, which when released leads to a lower real GDP growth in all cases, but especially lower for the "DFQF" where it is reduced to a level similar to the GDP growth of the regional integration scenarios. The impact on changes in poverty is more mixed.

Compared to results when factors are fully mobile, introducing rigidities in the factor market has divergent impacts on the real GDP change of the trade and agricultural policies: for agricultural policies, real GDP growth with fixed factors is higher than with mobile factors. On

[7] Additionnal sensitivity analyses were run on the macroeconomic closures. Alternative closures mainly change the strength of GDP impact, sometimes even the sign, but have very little impact on sectoral growth and the distribution of poverty. Hence we rather concentrate on the sensitivity analysis of the other elements of the model.

the contrary, in the case of the trade scenarios, introducing fixities reduces the real GDP growth. Additionally, poverty reduction is found to be always lower when factors are fully mobile, except in the case of the FISP where it is the opposite. In the case of the FSIP, mobility of factors brings additional maize growth with leads to higher decrease in maize prices and thus higher poverty reduction effects on the urban and non-farm households.

A common feature is that introducing rigidities increases the differences in impacts across quintile groups and land holding sizes, leading to higher gains for poorer households, and small-scale farmers than richer households and larger scale farmers. On the contrary, when factors are allowed to move freely as a consequence of changes in the returns, poverty reduction is more homogenous across types of households.

Elasticities of substitution are known to be very important parameters that drive the results of the models. Unfortunately due to lack of data, there are among the least robust data of the model. We test increasing and decreasing by a factor of four the elasticities of substitution between inputs in the production functions, and increasing fourthfold the elasticities of substitution between domestic goods and imports (Armington).

For all types of policies, decreasing the elasticity of substitution among inputs, decreases the relative real GDP increase, since it is harder for producers to adjust to the shocks, and vice versa. But impacts on poverty diverge: in the case of agricultural policies, higher elasticities of substitution bring both higher GDP gains and poverty reduction. In the case of trade policies, higher elasticities of substitution among inputs will rather decrease poverty reduction, despite leading to a higher increase in GDP than lower elasticities. Conversely a lower elasticity of substitution will lead to a lower GDP increase and higher poverty reduction for all types of households except small-scale farmers. This negative effect on small-scale producers is larger for multilateral liberalization than regional integration. Interestingly, changing the elasticities of substitution for inputs reduces in all case the high gains from DFQF which are similar to those of regional integration.

Increasing the Armington elasticities, brings slightly higher GDP increase for agricultural policies and higher poverty reduction, lower GDP increase for trade integration, except for "DFQF" where the half lower increase in the trade deficit leads to a almost double GDP increase.

Poverty reduction is lower for all trade scenarios. In all cases nevertheless, poverty reduction becomes much higher for large scale farmers compared to small scale farmers.

TABLE III.11 – SOME RESULTS OF THE MAIN SENSITIVITY ANALYSIS

			Change from base						
				Model with infinite demand for exports	Factor mobility		Elasticities of substitution of inputs		Armington elasticities
	Initial	Scenario	Main simulation		Fully mobile	Fixed	divided by 4	multiplied by 4	multiplied by 4
Real GDP	494,833	1FISP	1.40	1.42	1.31	1.36	1.35	1.64	1.51
		2ASWAp	3.34	3.41	3.25	3.25	3.28	3.59	3.40
		3RegFTA	0.06	0.00	0.06	0.04	0.05	0.08	0.05
		4SSaFTA	0.05	0.00	0.05	0.03	0.04	0.07	0.04
		5DDA	0.05	0.03	0.04	0.03	0.04	0.07	0.05
		6DFQF	0.11	0.11	0.06	0.03	0.06	0.07	0.20
National poverty headcount (percent)	40	1FISP	-5.28	-7.72	-5.62	-5.13	-5.72	-7.59	-8.35
		2ASWAp	-9.41	-13.04	-9.81	-9.99	-8.20	-11.69	-12.93
		3RegFTA	-1.70	-0.09	-1.69	-2.24	-2.66	-1.65	-0.27
		4SSaFTA	-1.67	0.02	-1.55	-2.13	-2.66	-1.50	-0.20
		5DDA	-2.36	-0.57	-2.30	-2.83	-3.16	-1.50	-0.86
		6DFQF	-13.21	-6.88	-12.99	-15.02	-14.95	-2.54	-8.74
National poverty gap (percent)	12	1FISP	11.1	10.7	11.0	11.0	11.0	10.7	10.7
		2ASWAp	10.5	9.8	10.4	10.3	10.6	10.0	9.9
		3RegFTA	11.7	12.0	11.7	11.6	11.5	11.7	11.9
		4SSaFTA	11.7	12.0	11.7	11.6	11.5	11.7	11.9
		5DDA	11.6	11.8	11.6	11.5	11.5	11.7	11.8
		6DFQF	9.9	10.9	9.9	9.5	9.6	11.5	10.7
Small-scale poverty headcount / large-scale poverty headcount	1.74	1FISP	1.65	1.70	1.64	1.51	1.50	1.64	1.89
		2ASWAp	1.69	1.89	1.70	1.62	1.70	1.77	1.93
		3RegFTA	1.74	1.73	1.73	1.72	1.77	1.73	1.75
		4SSaFTA	1.74	1.74	1.74	1.72	1.77	1.74	1.75
		5DDA	1.77	1.75	1.77	1.75	1.95	1.74	1.75
		6DFQF	2.03	1.95	2.03	1.95	2.28	1.72	2.15

Source: Author's calculation from the model

In the end there are indeed parameters and specifications that have diverging effects on agricultural policies and trade policies and thus impact our conclusions.

We see for example that the standard model is not adequate to simulate impact of regional integration since by only considering the decrease in price and not the increase in demand, it drastically underestimate the potential of GDP growth and poverty reduction.

Furthermore, if labor is fully employed then the specificity of "DFQF" in bringing a much higher real GDP increase than the rest of the trade policies is dampened, but "DFQF" still brings much more important poverty reduction effects than other trade reforms.

Changing the elasticities of substitutions between inputs and the elasticities of substitution between domestic and imported goods (Armington elasticities) has an important impact on the relative size of poverty reduction brought by agricultural and trade policies and the distribution of poverty reduction among household groups. Lower elasticities of substitutions between inputs tend to accentuate the difference between the types of policies, agricultural policies reducing primarily poverty reduction of the smaller scale farmers, regional trade reducing slightly more poverty reduction of the smaller but bringing the smallest poverty reduction effects and multilateral integration reducing more poverty of the larger-scale famers with "DFQF" bringing the highest poverty reduction effects. If elasticity of substitution among inputs is higher, then the overall poverty reduction effects of trade policies decrease, especially for "DFQF" which brings much lower poverty reduction effects than the agricultural policies modeled. Similarly if Armington elasticities are higher, then the overall effects of agricultural policies is increased both in terms of GDP growth and poverty reduction as compared to the effects of trade policies, even "DFQF"brings less poverty reduction. When those elasticities of substitution are higher the poverty effect of growth of trade policy decreases and the one of agricultural policy increases.

In light of those elements, we consider that such modeling framework has several limitations that we have to keep in mind when comparing the overall growth and poverty reduction effects of trade and agricultural policies. Nevertheless, it is useful to represent the distributional structure of those policies within the economy because even though changes in the specifications and parameters value have an impact on the strength of distributional effects, the general implications we have drawn from our analysis are robust according to our sensibility analysis.

In terms of policy implications, this sensitivity analysis reveals first that the much higher GDP gains from "DFQF" than from other trade integration policies is critically linked to the assumption that there is excess unskilled labor in Malawi, and that "DFQF" will decrease unemployment by making them start working for the "tobacco activity". In reality like in all agricultural countries, the excess labor in Malawi is highly seasonal, and thus the extent of the

engagement of this extra labor considered unemployed in a new activity will depend on whether this new activity is itself highly seasonal, and if so whether it fits with their current agricultural calendar. Tobacco is a very labor intensive crop, especially at the picking and processing stage, which requires the most attention, but in most of Malawi happens at the same time when other crops, mostly staple crops, need weeding, fertilizing, and bunding. Therefore, competition for labor is a real issue in tobacco producing regions, and thus we might consider that the gains from "DFQF" linked with the employment of extra labor in the tobacco activity is unlikely to occur in Malawi.

Secondly, if we consider that "real life" factors market in Malawi are less flexible than modeled and that producers have a harder time accessing the knowledge, the finance, the technologies, the inputs to substitute between inputs as a result of policy shocks, then it is likely that the differences in the distributional impacts between agricultural policies, reaching all households which increase their productivity and trade integration policies, reaching the larger ones that are connected to the markets more, is even higher.

Third, interventions aimed at facilitating producer substitute more easily between inputs, such as access to training, credit, technologies, and markets for the inputs themselves, will increase the economic activity spurred by increasing productivity of some crops through agricultural policies and trade integration policies, but they will lower the poverty reducing impact of trade policies while increasing the poverty reducing impact of agricultural policies. This can be explained by the fact that the productivity increase from the agricultural policies is modeled as reaching all producers, and a higher elasticity of substitution between inputs will enable all of them to be even more efficient, whereas trade policies transmit to producer that are the most linked to the markets (the larger scaled ones) and if enabled to switch inputs they might be able to capture even higher parts of the markets using the cheapest inputs, putting pressure on the ones less linked to the market that might be hurt by the change in input prices.

5. Concluding remarks

In the current economic context, the view that trade policy reforms could be more cost-effective pro-poor policies than costly subsidization policies promoting local agricultural production is gaining momentum. The reduction of the existing global distortions to agricultural

incentives is sometimes stated as a priority to fight poverty worldwide. In particular, Malawi, a small participant in international market, benefits from a rather large import markets for its main export crop, tobacco, in which it is very protected. But despite the consensus that growth can lead to very distinct poverty outcomes, with different parts of the population being able to grasp the opportunities that are presented to them, and the development of a dynamic macro-micro literature, the impacts of global trade policy and domestic development policy reforms are rarely, if ever, compared.

In this study we have used the MIRAGE global computable general equilibrium –CGE-model feeding a national standard CGE model representing Malawi in 2007 thanks to a preliminary version of new Social Accounting Matrix, linked to data from the 2004 household survey to examine how different policy reforms by Malawi and the rest of the world would impact the distribution of poverty reduction in Malawi.

The country's recent agricultural growth history due to the productivity impact of the Fertilizer Input Subsidy Program is replicated and compared with the effects of a broader productivity growth including the upstream and downstream sectors of the agricultural value chains and those of integrating in the regional and multilateral markets.

A broader based agricultural productivity growth scenario is found to have more favorable impacts on both real GDP growth and poverty reduction than the current policy concentrated on a few crops. The overall growth and poverty effects of agricultural policies are found to be generally higher than those of trade integration policies. But interestingly trade policies are found to have much larger growth elasticities of poverty reduction, particularly the preferential 100% duty free quota free market access.

Distribution of the poverty reduction effects of policy reforms is found to be very different between the agricultural and trade policies.

Among trade policies, the preferential 100% Duty Free Quota Free market access and the multilateral integration in the form of a successful Doha Development Agenda are found to be more favourable for poverty reduction than regional integration within Sub-Saharan Africa, but regional integration offers a relatively more balanced poverty reduction of the poorest and smaller scale farmers. Indeed Malawi is comparatively more likely to take advantage of the new market access to expand a larger range of goods at the regional level than at the global one.

Multilateral integration rather induces Malawi to further specialize in the production and exports on tobacco since it is one of the only good for which it is competitive at the global level. The "Duty Free Quota Free" scenario is found to systematically have the larger GDP growth and poverty reduction effect, but the relative strength of the impacts of the other trade reforms on overall GDP growth and national poverty incidence are found to be significantly dependent on the assumptions of the model.

If faster intensification and diversification of agriculture, induces a similar productivity increase by all households, then the poorest and smaller-scale households that are less connected to international markets, and thus benefit relatively less from new trade opportunities, will benefit relatively more from agricultural policies, whatever the assumptions of the model.

It is expected that the differences in the distributive impacts found between trade and agricultural policies would widen if we consider that factors are less mobile and producers adjust less in real life than in the main simulation. Furthermore accompanying policies aiming at enabling factors to move more freely or producers to adjust more easily will tend to change the strength of the policies on poverty reduction, increasing the effect of agricultural policies and dampening the effects of trade policies.

Therefore, in the case of Malawi where the main export crop, tobacco, for which the country is competitive at the global level is grown by all types of farmers, some trade policy reforms are found to be efficient at generating large poverty reduction effects from growth. But since their overall growth effects depends on the capacity of Malawi to take advantage of the new market access brought by trade integration, it is found lower than policies directly aimed at increasing productivity, and their distributive impacts are bound to favor the households more linked to the markets, which are the larger-scaled ones. Hence, not all policy reform is equally good to reduce the poverty of the poorest medium and smaller scale farmers which make up most of the poor in Malawi.

But if we consider both types of policies as complementary to spur GDP growth while reducing poverty of the poorest, the question changes to which trade integration policy is the most coherent with the broad-based agricultural policy? From our analysis, it seems that despite bringing higher GDP and poverty reduction impacts at the national level, multilateral integration, even preferential, also brings the risk for Malawi to specialize further on tobacco. On the

contrary, regional integration policies open opportunities to export a larger range of agricultural products, especially processed ones, and seem more coherent with the broad based agricultural vision of the country.

APPENDIX A

TABLE III.A.1 – 2007 MACRO SAM FOR MALAWI (MWK BILLIONS)

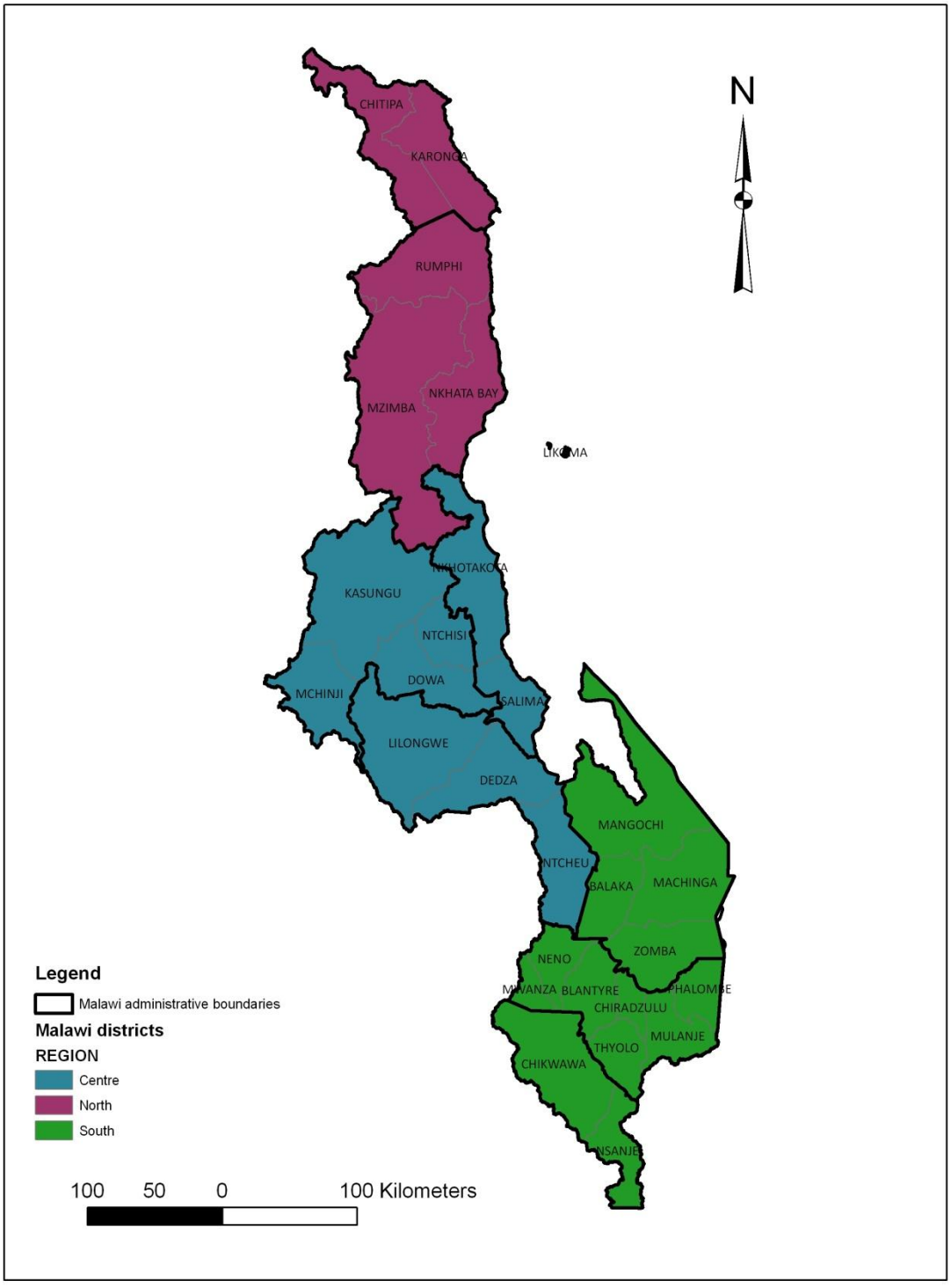
	Activities	Commod-ities	Factors	Enterprises	Households	Government	Investment	Rest of the World	Total
Activities		718,026			181,222				899,247
Commodities	450,498	124,874			248,370	42,167	103,458	107,741	1,077,109
Factors	448,749							564	449,313
Enterprises			145,665			1,871			147,536
Households			300,053	126,416		21,185		9,485	457,139
Government		46,084		20,601	25,385	81,093		70,767	243,929
Savings				519	585	75,361	2,443	26,993	105,901
Rest of the World		188,126	3,595		1,577	22,252			215,549
Total	899,247	1,077,109	449,313	147,536	457,139	243,929	105,901	215,549	

Source: 2007 Malawi social accounting matrix.

TABLE III.A.2 – SECTORS IN THE 2007 MALAWI SAM

No	Code	Description	No	Code	Description
Agriculture					
1	mloc	Maize (smallholder local)	13	hort	Horticulture
2	mcom	Maize (smallholder composite)	14	tobs	Tobacco (smallholder)
3	mhyb	Maize (smallholder hybrid)	15	tobe	Tobacco (estate)
4	mest	Maize (estate)	16	cott	Cotton
5	rice	Rice	17	sugr	Sugarcane
6	ocer	Other cereals	18	oexp	Other export crops
7	cass	Cassava (smallholder)	19	seed	Seed production and distribution
8	case	Cassava (estate)	20	live	Livestock
9	pots	Other roots (smallholder)	21	poul	Poultry
10	pote	Other roots (estate)	22	fore	Forestry
11	puls	Pulses and oilseeds (smallholder)	23	fish	Fisheries
12	pule	Pulses and oilseeds (estate)			
Industry					
24	mine	Mining	35	fert	Fertilizer
25	meat	Meat processing	36	chem	Chemicals
26	gmll	Grain milling	37	nmet	Non-metals
27	sref	Sugar refining	38	metl	Metals
28	ptea	Tea processing	39	mach	Machinery and vehicles
29	food	Other food processing	40	oman	Other manufacturing
30	beve	Beverages	41	cons	Construction
31	ptob	Tobacco curing and processing	42	elec	Electricity
32	text	Textiles and clothing	43	watr	Water
33	wood	Wood and paper			
34	petr	Petroleum			
Services					
44	trad	Retail and wholesale trade	50	real	Real estate
45	hotl	Hotels and catering	51	gsrv	Government administration
46	tran	Transport and storage	52	educ	Education
47	comm	Communication and post	53	heal	Health
48	fsrv	Financial services	54	osrv	Other private services
49	bsrv	Business services			

FIGURE III.A.1 – AGRICULTURAL DEVELOPMENT DISTRICTS AND REGIONS IN MALAWI



Source

APPENDIX B: The national computable general equilibrium model

Table B.1. Main equations and variables

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