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Does Multilateral Trade Liberalization Matters for Poverty Reduction in Africa[1]

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Abstract

The link between trade liberalization and poverty reduction is more or less ambigious. For the case of African countries, this study tries to answer the following questions: Will multilateral trade liberalization under the Doha Development Agenda reduce poverty in Africa? To what extent will households be affected by changes in global trade liberalization?

Results of simulations using the MIRAGE global dynamic computable general equilibrium linked to household measures suggest that trade liberalization has only modest effects in reducing poverty in most of the African countries covered by this study. However, the effect on poverty is not homogeneous across countries, as some of them will experience an increase in poverty rates rather than a decline. Moreover, the adoption of alternative fiscal policies to compensate for the loose in trade revenue for the government will amplifies the effects on poverty without changing its direction.

Keywords: Africa, multilateral trade liberalization, general equilibrium model, poverty.

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1. Introduction

Economic performance in Africa improved sensibly during the past few years. The continent recorded a high level of growth, improved fiscal and current account balances, a relatively stable macroeconomic environment and increasing domestic savings and investment rates. However, these improvements, mainly driven by exports of mining products, remain insufficient for Africa to meet the MDGs. The continent needs to sustain high levels of growth in order to achieve the required economic and social development, mainly for the purpose of poverty reduction.

These improvements need to be widened, deepened, and sustained if Africa is to accelerate and sustain growth beyond the ongoing commodity boom. The continent also needs to promote high-quality growth that is broadly shared in terms of generating decent employment and helping to reduce poverty. In fact, the recorded real per capita income growth rate (0.3 per cent during 1990-2002 and 3.0 per cent in 2003-2007) still insufficient for most African countries to make any significant progress in reducing poverty. The role of trade in accelerating economic growth and development is widely defended (McCulloch et al. 2001) while adjustment costs linked to trade liberalization represent a real challenge for some countries and activities. With the current economic crisis affecting all countries around the world, the role of trade liberalization may be viewed as an engine for economic recovery and poverty reduction. Prior to the economic crisis affecting the world economy since the fourth quarter of 2008, Africa's trade position was marginal at the global level[4] and it is declining much more as result of the drops in the world demands of primary products, which represent the bulk of African exports. Conjured with decreasing world commodities' prices, income generated from exports for most African countries are now declining faster than many other regions in the world. The challenge for African countries is how to exploit the potential of trade for growth and poverty reduction to counter the negative effects of the global economic crisis.

This paper contributes to this debate by providing a comprehensive analysis of the poverty impacts on a panel of African countries of the latest proposal of agreement under the Doha Round. The central scenario analyzed in this paper is built up from the most newly available tariff line data on bound and applied tariff rates and the expected reductions over the globe[5]. It also takes into account the latest proposal on reducing the domestic support for agriculture provided by rich countries (mostly the US and the EU) to their farmers.

Compared to the previous analyses of DDA using global CGE model, this study presents two main advantages. First, it takes into account various options for fiscal compensation linked to trade liberalization given that most African countries relay heavily on duties for their budgets. Second, this study analyzes the impact of trade on poverty for a higher number of African countries than any of the past assessments of DDA. Thus, the focus countries are Egypt, Tunisia, Morocco, South Africa, Botswana, Malawi, Tanzania, Zambia, Zimbabwe, Nigeria, Senegal, Madagascar, and Uganda.

The results of the central scenario of DDA show that most of African countries will gain from the global trade liberalization scenario in terms of poverty reduction, except Nigeria, Zambia and Morocco where poverty is expected to increase. The sensitivity analysis carried out on the government fiscal closure rules show that there are no effects on the directions of the impacts across all countries but only their amplifications. More generally, while an agreement under the DDA seems to reduce poverty in most of African countries, the effects are too small to argue that multilateral trade liberalization is pro-poor. It is only when the governments adopted more appropriate policies for fiscal compensation that the overall impacts on poverty become much pro-poor for most countries.

The paper is organized as follows. Section 2 discusses the link between trade and poverty in theoretical view. Section 3 presents the recent economic and social performances in Africa. Section 4

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[4] In 2006, its share of global merchandise exports was 2.8 per cent and its share of global export of services was 2.4 per cent (ECA, 2008)

[5] It should be noted that the proposals of multilateral trade liberalization analyzed under this paper are those available at the date of end January 2008. However, the latest proposals made available in May 2008 and July 2008 are not analyzed in this paper. While, we recognize the importance of carrying out a specific impact analysis of these two packages of proposals, we believe that the difference in terms of impact on poverty in Africa is not so much between the various proposals as they differs slightly in terms of domestic support and tariff reduction. Thus, the results of the present study should be viewed as an approximation for all the recent proposals under the DDA.

analyzes the links between growth and poverty reduction in Africa. Section 5 describes the main features of the global model used in this study. Section 6 analyses the results of the central scenario of DDA on African economies with a special focus on poverty. Section 7 displays the results of the sensitivity analysis on the government account closure rules. Section 7 concludes.

2. Background on the African Economic and Poverty Profiles

2.1. Recent Economic Performances[6]. Economic performance in Africa improved sensibly during the past few years. It has maintained the strong growth momentum of the last few years and achieved a 5.8 per cent growth rate in 2007, up from 5.7 per cent in 2006 and 5.2 per cent in 2005 (UN-DESA, 2007). However, these improvements remain insufficient to meet the MDGs in Africa as a whole given the high disparities in growth achievements across the continent. Whereas growth performance slightly decelerated in North Africa, all other sub-regions experienced higher growth in 2007 compared with 2006 (figure 1). This indicates that growth in Africa is widely shared across sub-regions. East Africa, a non-oil sub-region with limited mineral exports, continued to lead economic performance in Africa, whereas Central Africa lagged behind all other sub-regions over the same period.

Figure 1. Sub-regional growth performance 2005-2007 (%)
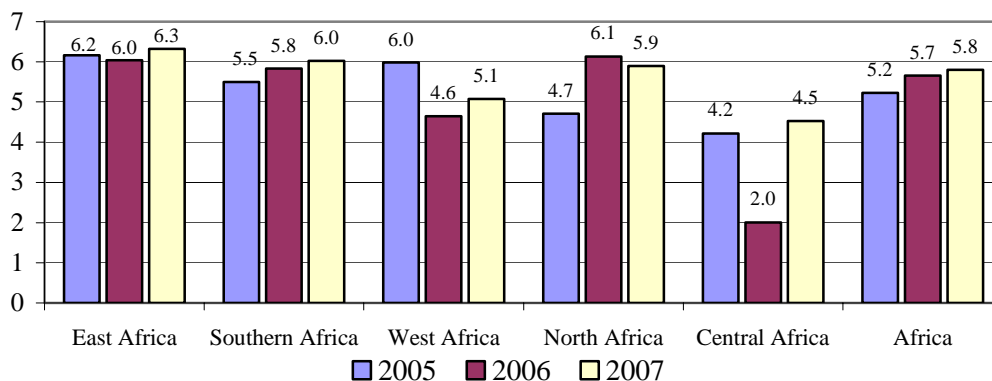
Source:ECA (2008)

Strong commodity demand and continued high world prices until the mid-2008 combined with favorable rainfall and accelerated growth in agriculture boosted economic activity in the industrial and services sectors in most of East Africa. With increasing oil production, Angola continued to lead Southern Africa in terms of real GDP growth (21.0 per cent in 2007) despite its weak physical and human infrastructure and poor legal and regulatory environment. Economic performance in South Africa remains robust (4.8 per cent) as results of the expansion in construction and mining and increased investment in the corporate sector. North Africa's growth remained high (5.9 per cent in 2007) with increased oil and gas production and high oil prices. Egypt recorded the highest growth rate (7.0 per cent) in 2007 followed by Tunisia (6.0 per cent). Real GDP growth rate declined sensibly in Morocco (from 7.9 per cent in 2006 to 3.0 per cent in 2007) due to adverse weather conditions and declining agricultural output. Accelerated growth in Senegal and Guinea-Bissau in 2007 relative to 2006 and sustained recovery in Liberia and Sierra Lone underpinned the rise in GDP growth in West Africa in 2007 (5.1 per cent, up from 4.6 per cent in 2006). Although still lagging behind other sub-regions, real GDP growth in Central Africa jumped from 2.0 per cent in 2006 to 4.5 percent in 2007. Increased oil and gas production and revenue stimulated non-oil activity and pushed growth to 10.0 per cent in Equatorial Guinea and 4.9 per cent in Gabon in 2007. However, owing to lower oil production, growth decelerated from 6.1 per cent in 2006 to 4.0 percent in 2007 in the Republic of Congo and from 0.5 per cent to -0.5 percent in Chad.

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[6] This section is based on figures for the years 2005-2006 and 2007 and do not takes into account the changes in economic performance linked to the recent world economic slowdown initiated mostly since the fourth quarter of 2008.

Even with this recent performance, the continent still needs to sustain a much high levels of growth in order to achieve the required economic and social development, mainly for the purpose of poverty reduction. Exports improvement is behind the better performance of African countries observed during the last years. Its exports of goods and services recorded a 15.2 per cent increase in value in 2007 compared with a 13.2 per cent increase in imports (UN-DESA, 2007).

During the past years, most of African economies experienced a structural shift on the sectoral contribution to growth whereby the service sector is becoming an important driver of growth. However, with the recent world prices for mining products, the contribution of the service sector declined from the average of 47.8 per cent of GDP in 2000-2005 to 44.7 per cent in 2006. The industrial sector contributed 41.5 per cent of GDP in 2006 compared to only 36.5 per cent in the previous six years, while the share of agriculture declined from 15.7 per cent in 2000-2005 to 13.8 per cent in 2006. In 2006, the three sectors experienced a positive growth. The industrial sector recorded the highest growth rate in 2006 (5.7 per cent), but the manufacturing sub sector grew at only 4.3 per cent. At sub-regional level, the contribution of agriculture to GDP is relatively diverse, ranging from a high of more than 32 per cent in East Africa to 8.7 per cent for Southern Africa. However, the importance of the agriculture sector is more pronounced for SSA where it employs some 70 per cent of the work force and generates an average 30 per cent of GDP. Except for few countries such as South Africa, the continent still a net food-importer as a largest share of African imports of products consists of food (cereals, livestock, dairy products, and to a lesser extent, fruits and vegetables). At the same time, exports of agricultural products represent an important source of foreign currencies for several African countries. Its contribution to total merchandise exports is also relatively diverse ranging from more than 80 per cent for Burundi to less than 1 per cent for Gabon and Equatorial Guinea. Their leading export destination is EU. The most important agricultural exports fall within the groups of fish and crustaceans, fruits and nuts, cotton, and vegetables.

2.2. Poverty profiles. The creation of decent jobs is the most effective and sustainable solution to the persistent high levels of poverty and social exclusion in Africa. The problem faced by most of African countries, is that recent growth performance has not yet led to strong employment generation, particularly in the formal sector. Consequently, many Africans continue to work in the informal economy or remain unemployed, surviving on the support of family members (ECA, 2005). Since the 1990s, the unemployment rate in Sub-Saharan Africa has persisted at around 10 per cent, falling marginally to 9.7 per cent in 2006. In contrast, the unemployment rate in North Africa has come down from 14.0 per cent in 1996 to 11.5 percent in 2006 (ILO, 2007).

Overall, the main challenges facing Africans in the labor market are the lack of decent jobs in the formal sector, underemployment, and low wages. The working poverty is a very useful indicator showing the link between wages and poverty lines. It is defined as individuals who are working but nonetheless live in households that are below the poverty line. Recent estimates by ILO (2007) reveal that there is some progress in SSA in terms of the $1.00 a day poverty definition. However, the $2.00 a day working poor share in total employment for the SSA region has decreased very slowly over the last decade from 87.7 per cent in 1996 to 86.2 per cent in 2006. In comparison, the share has fallen much faster in North Africa, from 51.7 per cent to 42.2 per cent (ILO, 2007).

At the aggregate level, 41.1 percent of Sub-Saharan Africans live below the $1 a day poverty line -- a much higher proportion than in any region of the world. However, the North Africa countries are in much better position in term of absolute poverty as less than 2% are living with less than $1 a day. Moreover, Sub-Saharan Africa is the only region where the number of people living in absolute poverty has grown over the past 20 years. Between 1981 and 2004, population living in absolute poverty in the Sub-Saharan region rose from 167.53 million to around 300 million. During the same period, absolute poverty dropped from 40% to 21% in the world as a whole (Chen and Ravallion, 2004).

Four poverty indicators are usually used to analyze poverty profiles and its recent trend. The first measure is the headcount index, given by the percentage of the population living in households with consumption per person below the poverty line. A second measure is the poverty gap index, which gives mean distance below the poverty line as a proportion of the poverty line. The third measure called the squared poverty gap, in which individual poverty gaps are weighted by the gaps themselves to reflect inequality among the poor. The fourth measure is the Gini index.

To compute poverty measures, consumption data are usually preferred to income data for two main reasons. The first is that consumption is likely to be the better measure of current welfare of households. Second, information on consumption are generally much more available than those on income mainly in developing countries. Poverty measures used in this paper are computed using the Beta Lorenz Curve (Kakwani, 1980)[7]. The estimation of the fourth poverty measures for the panel of African countries considered in this study is done using data from the World Bank[8]

Table 1 gives the results for the four poverty indicators using two poverty lines ($1 and $2 per day and per capita in PPP terms) and for various years for which household surveys are available for the selected African countries. It shows that performance in poverty reduction has been far from uniform across African countries over the past years. In the 1980s, Uganda had the highest incidence of extreme poverty in the sample, with almost 90 percent of the population living below $1 a day. Next was Nigeria, followed by Madagascar. North Africa countries had the lowest poverty incidence in the region. More than twenty years later, the picture does not change much and Sub-Saharan African countries still at the bottom-up of the classification of poverty in the continent. Even with the decline in poverty incidence in a few African countries, the situation still very disappointing for most of them. Uganda does not experience any improvement in poverty, where the headcount index remains fluctuating between 80 and 90% of total population. On the contrary, Senegal has swapped places with South Africa, where the headcount index had fallen to 16.8% in Senegal (44.4% in 1991) and increased in South Africa to reach 19.1% (18.6% in 1993). Botswana also experienced an improvement in the headcount index passing from 34.6% in 1985 to 28.5% in 1993. Zambia, Zimbabwe and Tanzania do not achieve any improvement and poverty rates still at their levels of two decades before. In addition and given the high growth rates of populations in African countries, a constant headcount index means a higher number of poor in the corresponding countries.

The ordering of countries does not change when using an alternative poverty line. At the $2 a day poverty line, poverty incidence across African countries follow the same classification as with $1 a day. Using this alternative poverty line, two main observations can be made. First, most of populations of the Sub-Saharan Africa are leaving under the poverty line such as Uganda (95.7%), Nigeria (92.3%), Madagascar (85%), Zimbabwe (83%), Zambia (85%), and Tanzania (91%). Second, poverty incidences for North African countries increase substantially and the highest poverty rate is observed in Egypt, followed by Morocco and than by Tunisia.

The trend in poverty rates across African countries shows that there is less sign of progress against poverty in Sub-Saharan Africa as well as in North African. Only Tunisia seems following the road towards achieving MDG1.For the North Africa region as a whole, it experienced a marked downward trend in the poverty rate during the 1980s, but the rate stabilized in the 1990 at around 2 percent for the $1 a day poverty line and at a little more than 20 percent for the $2 a day line (Chen and Ravaillon, 2004). However, the incidence of poverty in Sub-Saharan Africa has fluctuated around a mean of 45 percent for the $1 a day line (75 percent for the $2 a day line) with no significant trend in either direction. The number of poor people almost doubled over 1981-2001 from 164 million to 316 million. By the $1 a day measure the share of the world's poor living in Africa has risen from 11 percent in 1981 to 29 percent in 2001.

Turning to the poverty gap indices (P1) and the squared poverty gap (P2), countries' rankings follow the same classification as for the headcount index. They also follow the same change in patterns over time. As far as inequality is concerned, performance across African countries is not uniform as well. In North Africa, inequality increased in Egypt from 32 to 34.4% over a period of 9 years. However, in Tunisia, inequality dropped from 43.4 to 40.8% over a period of 15 years while it remains almost the same in Morocco. In Sub-Saharan Africa, trends in inequality were also very heterogeneous across countries. Botswana, Mozambique, Tanzania and Nigeria experienced an increase in inequality while Zambia and Uganda maintain the same level of inequality with some fluctuations across periods of surveys. Only South Africa, Zimbabwe, Madagascar and Senegal reduce their inequality among their

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[7] It can also be estimated using the second form of the Lorenz Curve, the general quadratic, but the first approach is preferred as it generally yields a lower sum of squared errors up to the estimated headcount index.
[8] Detailed information on the original data is available at:
http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp

respective population. In addition, the trends in inequality across countries are not fluctuating as much as variations in economic growth, which indicates that inequality in general tends to remain more stable compared with the other poverty indicators.

Table 1: Poverty Measures

Country	Year of the Survey	Poverty Measures at $1 Poverty Line			Poverty Measures at $2 Poverty Line			Gini Coefficient
		P0	P1	P2	P0	P1	P2	
Egypt	1990	3.97	0.53	0.13	42.73	11.59	4.28	32.00
	1995	3.76	0.45	0.10	46.78	12.59	4.56	32.60
	1999	3.17	0.44	0.12	44.21	11.46	4.07	34.42
Morocco	1984	2.04	0.7	0.5	16.54	4.29	1.84	39.19
	1990	0.14	0.03	0.01	7.53	1.28	0.34	39.2
	1998	0.56	0.08	0.02	14.33	3.1	0.98	39.46
Tunisia	1985	1.67	0.34	0.13	16.13	4.19	1.59	43.43
	1990	1.26	0.33	0.17	11.55	2.95	1.16	40.24
	1995	1.02	0.19	0.07	12.7	3.11	1.12	41.66
	2000	0.32	0.07	0.03	6.64	1.33	0.43	40.81
Botswana	1985	34.63	14.23	7.245	59.74	31.27	19.97	54.6
	1993	28.53	10.14	4.72	56.09	26.88	16.01	60.79
South Africa	1993	18.6	3.65	1.47	33.91	15.24	8.27	59.25
	1995	13.31	1.32	0.33	32.24	12.47	5.87	56.54
	2000	19.09	4.5	1.61	35.21	16.11	8.91	57.7
Malawi	2004	20.76	4.71	1.56	62.95	24.29	11.95	39.04
Mozambique	1996	45.63	16.37	7.91	80.62	41.38	25.33	44.49
	2002	36.18	11.62	5.27	74.14	34.9	20.1	47.11
Tanzania	1991	60.51	22.76	11.31	92.9	52.05	33.25	33.81
	2000	56.27	20.71	10.03	90.7	49.25	30.92	34.65
Zambia	1991	57.8	33.26	23.25	82.58	52.5	39.35	50.06
	1993	72.9	42.18	29.48	90.73	63.4	49.07	52.7
	1996	71.92	37.31	23.63	91.54	60.9	44.93	49.8
	1998	65.37	33.94	21.88	87.84	56.62	41.37	53.42
	2004	59.34	29.6	18.61	84.91	52.34	37.2	50.8
Zimbabwe	1990	52.82	24.37	13.52	77.1	45.57	31.26	56.27
	1995	55.31	24.1	13.25	83.05	47.97	32.19	50.11
Madagascar	1980	51.92	22.2	11.25	77.28	44.24	29.44	51.92
	1993	46.31	17.64	9.02	80.03	41.91	26.24	46.12
	1997	49.55	18.99	9.66	84.68	44.7	28.07	39.22
	1999	64.82	29.22	16.51	90.97	55.18	37.97	41.83
	2001	59.09	27.66	16.06	85.1	51.76	35.81	47.47
Nigeria	1985	64.83	29.44	16.76	92.41	55.73	38.3	38.83
	1992	57.52	29.14	18.64	86.07	51.64	36.59	44.99
	1996	78.21	40.46	25.19	94.61	64.77	48.18	46.5
	2003	70.6	34.49	20.94	92.33	59.66	42.87	43.67
Senegal	1991	44.43	20.25	11.81	72.27	40.19	26.96	54.14
	1994	24.04	6.25	2.4	65.697	26.68	13.76	41.44
	2001	16.82	3.57	1.11	55.93	20.71	9.88	41.31
Uganda	1989	87.67	52.72	36.29	97.13	73.32	58.55	44.36
	1992	90.26	52.08	34.15	98.07	73.83	58.18	42.62
	1996	87.94	47.31	29.21	97.54	70.88	54.21	37.13
	1999	84.92	45.63	28.61	96.58	69.17	52.7	43.11
	2002	82.28	43.3	26.73	95.69	67.2	50.59	45.89

Source: Authors' estimations using World Bank Database

3. Linking Trade to Poverty

3.1. The conceptual framework. Reducing poverty is the most fundamental objective of public policy, while trade liberalization is believed to be an important part of the policy package for growth and prosperity and potentially for poverty alleviation. The link between trade liberalization and poverty matters since the former affects the direct determinants of the latter. Trade liberalization is expected to have direct and indirect effects on poverty. The direct effects occur via the modification of the output prices, which are likely to affect the productive combination of factors and their prices. In fact, in an era

of globalization, participants in local or even regional markets no longer exclusively determine domestic prices. An increase in world prices would be transmitted directly to domestic prices, thus changing terms of trade which are the primary determinants of real output and incomes in both urban and rural areas. The relative prices of goods also exert powerful influence on wages, migration, and consequently the welfare of households in general and of low income-households in particular. On the other hand, trade liberalization affects growth and possibly income distribution, which are widely recognized as key variables determining the poverty level in a given economy.

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

The strong redistribution effects of trade liberalization have been firmly established by economists. Bussolo and Solignac-Lecomte (1999) have shown that a reduction of average tariffs from 40 percent to 10 percent in Sub-Saharan Africa entails real income losses of 35 percent for urban employers and 41 percent for recipients of trade rents, compared with a gain of 20 percent for farmers. The overall net gain to the economy is estimated at 2.5 percent. The relatively small size of this efficiency gain compared to the redistribution effects makes trade liberalization a hard task decision for policy makers who have to seek instruments that could alleviate these burdens. Thus, it is obvious that trade policy reforms will result in some households winning and some others losing (at least in the short run), and this consequently can affect poverty. One view is just to accept these losses as if they were necessary costs to move the economy toward a higher level of efficiency and competitiveness. An alternative view is to argue against any reform that hurts any group, especially if it is poor. These stylized positions sound extreme, but as Harrison, Rutherford and Tarr (2000) have argued, they have prevailed on many occasions. For Richardson (1995), the real question, which brings us back to the old compensation issue, is whether reforms should be implemented only if total benefits exceed total costs, or only if those who lose are fully compensated.

Given the high correlation between trade and poverty on one side and labor segmentation in developing countries on the other, it is important to take into account heterogeneity and labor market segmentation when analyzing the effects of trade liberalization on poverty. The more comprehensive way of modeling the overall impact of policy changes on the economy is CGE modeling, which incorporates many important economic interactions. These models are well suited to explain medium- to long-term trends and structural responses to changes in development policy. An effort to adapt CGE models to the analysis of different adjustment programs and to estimate the costs of other strategies was made in the late 1980's by the OECD, through the work of Bourguignon, de Melo and Morrison (1991). Their "macro-micro" model links the short-run impacts of macroeconomic policies that affect the distribution of income through inflation, interest rates and other asset price changes with the medium-run impacts of structural adjustment policies that affect the distribution of income through relative commodity and factor price changes. To measure distributive impacts, these extended CGE models map factor income to different types of households. The models were then applied to analyze different policy changes in several developing countries. This procedure is a straightforward combination of household surveys, which provide the structure of households' consumption at the moment of simulation, and of simulated or actual price changes. The change in the cost of living by segment of the population is then used to assess the impact on income distribution. It provides an upper bound measurement of the required increase in income for each group to purchase the same quantities of goods as in the base situation.

More generally, Decaluwé, Dumont and Savard (1999) have evaluated the relevance of different types of general equilibrium modeling for measuring the impact of economic policy shocks on poverty and income distribution. Three approaches were identified from the literature and implemented using an archetypal economy. The first is based on a traditional form of the CGE model, which specifies a large

number of households in order to integrate inter group income inequalities. The second uses survey data to estimate the growth elasticity for poverty reduction by household type, which allows for the estimation of poverty measures. The third approach includes individual data directly integrated or linked to the general equilibrium model framework according to the principles of micro-simulations. For Rutherford et al (2004), using 150,000 households or only a few household categories does not change results as much as expected. They consider a micro-simulation CGE model as simply moving from a sample of a few households to a much more important sample. The issue of the relevance of micro-simulation is still not yet established and the cost related to developing a micro-simulated CGE model is too high mostly when many countries are considered. The second approach of having many categories of households inside the model for each country is also an interesting one but does not provides results in terms of poverty changes. The last approach consisting to link estimates on growth elasticity for poverty reduction to the model provides results in terms of poverty measures. While this approach presents much more disadvantages than the previous ones but at least it have the merit to give insights on the likely effects in terms of poverty indicators rather than a simple measure of welfare.

Most economists and policy makers would now agree that economic growth – in the sense of rising per capita incomes or expenditures – reduces poverty in the developing world. The key policy question then becomes: to what extent does trade liberalization manifested by economic growth reduce poverty? Expressed in more technical terms, what is the growth elasticity of poverty that is, how much will poverty decline in percentage terms with a given percentage rise in economic growth expressed in income or expenditure per capita as result of trade liberalization? In their analysis of twenty developing countries, Bruno et al. (1998) found that a 10 percent increase in mean survey income led to a 20 percent drop in the proportion of people living on less than one dollar a day. On a different data set of 26 developing countries, Roemer and Gugerty (1997) found that a GDP growth rate of 10 percent a year is associated with a 9.2 percent increase in mean income for the poorest 20 percent of the population. Provided that there are no major changes in income distribution, faster rates of per capita GDP growth should lead to higher rates of poverty reduction. In their recent paper, Dollar and Kraay (2000), show that the elasticity of the income of the poorest quintile to average income is about one. Hence, the income of the poorest fifth of a country changes on average at the same rate as mean income. This translation of the link between growth and poverty is one way to estimate the effect of policy reforms on poverty. Thus, the so-called growth elasticity of poverty, can be defined as the relative change in poverty induced by a one-percentage change in mean income or expenditures. The more negative the elasticity is the more responsive poverty is to changes in per capita income or expenditure.

During the 1990s the growth elasticity of poverty was usually estimated to be between –2 and –3 (Adams, 2004, Bruno et al., 1998 and Chen, 1997). This mean that a 10% increase in economic growth will lead to a 20-30% decrease in poverty. In other words, in a large enough selection of developing countries in which exactly half of the population lives in poverty, a 10% increase in economic growth will reduce the proportion of the poor population to between 35% and 40%. New estimates made by Bhalla (2002) suggest, however, that these growth elasticities are too low, and the correct growth elasticity of poverty should be about –5.0. In other words, in a large selection of developing countries, the same 10% increase in economic growth will reduce the percentage of the poor to about 25%, rather than to between 35 and 40%.

The difference between these "traditional" and "new" estimates of the growth elasticity of poverty is neither trivial nor academic. When projected into the future, all of these calculations hinge on the central question: how much does the number of poor people, decline with a given rate of economic growth? Thus, using the lower "traditional" growth elasticities of poverty, the World Bank (1999) estimated that there are 1.15 billion people living under the international poverty standard of $1.00 per person per day, while Bhalla (2002), using the "new" higher growth elasticities of poverty found that less than one-third that number of people – 450 million - were living under that poverty standard.

In the past, most traditional estimates of the growth elasticity of poverty have used changes in mean income (consumption) as calculated from household budget surveys as their yardstick of economic growth. There are, however, other measures of economic growth – such as changes in GDP per capita – which can be used to calculate economic growth. Most policy makers certainly think of economic growth in terms of GDP per capita, and studies in the economic growth literature of Bhalla's work (2002) is that

it questions the validity of using changes in survey mean income (consumption) to calculate economic growth. Bhalla's work instead emphasizes the need to use national accounts data (the source of GDP per capita figures) to calculate economic growth. The core of Bhalla's argument is that using the survey mean as the measure of growth has the effect of seriously underestimating the growth elasticity of poverty in the developing world. However, using mean income or mean consumption in estimating the growth elasticity of poverty reduction is also justified by the fact that mean income or mean consumption are more representing welfare than GDP per capita. In many countries, where distribution of capital income is not efficient, using GDP per capita will led to misleading results on the link between growth and poverty. In fact, labor income is always considered more directly linked to household compared to capital income. Using mean consumption allows assessing how much capital income is distributed to household and it has been used to improve welfare of households rather than be transferred to the rest of the world as it is the case in many African countries.

3.2. The growth elasticities for poverty reduction in Africa. There is an abundant literature on the estimation of the growth elasticity of poverty for developing countries but only few for African. Table 2 below provides the estimates carried out by Christiaensen et al. (2003) on few African countries using time series data.

Table 2. Growth Elasticity of Poverty Estimated by Christiaensen et al. (2003)

Country(ies)	Periods/Intervals	Growth Elasticity of Poverty
Ethiopia	1994-1997	-0.56
Ghana	1992-1999	-0.95
Madagascar	1993-1997	-0.27
	1997-1999	-4.5
	1993-1999	-0.11
Mauritania	1987-1995	-0.82
Nigeria	1992-1996	-1.3
Uganda	1992-1997	-1.21
Zambia	1991-1996	-0.58
	1996-1998	0.37

Most of the previous estimations of growth elasticity for poverty reduction have shown that economic growth is robustly correlated with decreasing poverty. Most often, the elasticity of absolute poverty to growth in average incomes is found to be somewhere around –2, implying that a one percent increase in per capita incomes reduces poverty by two percents. Obviously the estimates vary slightly depending on estimation method, the selection of countries used and the measure of income and poverty, but the size order of the elasticity appears to be relatively robust. However, a recent survey carried out by Ravallion (2004) shows that growth elasticity of poverty ranges from –0.6 to a high as –3.5. Although there are differences in the responsiveness of poverty to growth, it has been difficult to determine from what these emanate. Poverty data in developing countries is well known to not always be perfectly reliable, and this source of measurement errors has been given some of the blame for inconclusive results on the determinants of the growth elasticity of poverty. In addition, empirical analysis show that when economic growth is measured by changes in the survey mean, most of the regression coefficients for the growth elasticity of poverty variable are negative and significant at the 1% level for the three poverty measures. However, when economic growth is measured by changes in GDP per capita, all of the regression coefficients for the growth elasticity of poverty variable are negative, only about half of them (6 to 12 coefficients) are significant at 1%. These results suggest that while economic growth does reduce poverty, the actual impact of economic growth upon poverty depends on how growth is being measured. Furthermore, when growth is measured by the survey mean, the point estimate for the growth elasticity of poverty for the headcount ratio for a full sample, the increases in the survey mean have a much larger poverty reducing impact because the survey mean and poverty are far more negatively correlated than GDP per capita and poverty. Again, the actual impact of economic growth upon poverty depends very

much on how growth is being measured or defined. Finally, other empirical analysis shows that economic growth has a greater impact on the more sensitive measures of poverty. Accordingly, the growth elasticities for the poverty gap and the squared poverty gap are higher than that for the simple headcount ratio. For example, while a 10% increase in the survey mean can be expected to lead to a 27.9% decline in the headcount index, it will lead to a 32.2% fall in the poverty gap and a 36.1% decrease in the squared poverty gap. The results are quite similar for a 10% increase in GDP per capita (Chen and Ravallion, 2004). .

However, and for comparative purpose across countries, using the same methodology for the estimation of the growth elasticity for poverty reduction for the panel of selected countries is more appropriate. As time series data is not available for most of the selected African countries, the household survey data is used instead of macroeconomic data. Accordingly, the mean survey expenditure is selected as a proxy of economic growth rather than using GDP per capita. Furthermore, inequality is assumed to be constant over the simulation period given that economic growth does not have much impact on inequality as income distributions generally do not change much over time. According to Deininger and Squire (1996), GDP per capita increased by 26% in the developing world during 1985-95, while the corresponding Gini coefficient changed by only 0.28 percentage points per year over the same period. Since income inequality tends to remain stable over time, economic growth can be expected to reduce poverty at least to some extent. Thus, three elasticities of poverty measures are thus estimated in this study for the panel of selected countries in the same way as Chen and Ravaillon (2004) based on equations derived from Kakwani (1980).

The elasticities for poverty measures are estimated using the following equations:

$$\text{Elasticity of P0} = -z/(\mu P_0 L''(P_0))$$
$$\text{Elasticity of P1} = 1 - P_0 / P_1$$
$$\text{Elasticity of P2} = 2(1 - P_1 / P_2)$$

z is the poverty line, μ is the mean consumption, P is the poverty rate, and L'' is the second derivate of Lorenz Curve.

These elasticities are estimated for the available surveys on household consumption by country. The estimation over time for each country allows measuring their recent trends. The first step in the estimation is the preparation of a database, which directly extracted from the World Bank's service "Povcalnet". Two poverty lines are considered for the estimation of poverty measures. The "one-dollar per day" and the "two-dollar per day"[9]. For the sake of comparability for a one dollar per day poverty line, a consumer in any country is assumed to live in absolute poverty if he or she lives on less than the equivalent of 32.74 dollars per month, adjusted for purchasing power parity (PPP) at the equivalent 1$ per day or 65.28$ per month at 2$ per day. The results of the estimation are presented in tables 3.

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[9] 1.08 $ PER day in constant 1993 PPP dollars is the updated figure of the one dollar per day in constant 1985 PPP dollars. No new estimations are made yet by the World Bank of the new updated poverty line

Table 3. Growth Elasticities for Poverty Measures

Country	Year of the Survey	at 1$ per day poverty line			at 2$ per day poverty line		
		P0	P1	P2	P0	P1	P2
Egypt	1990	-6.08069	-6.48981	-6.23954	-1.75099	-2.68647	-3.41395
	1995	-6.86575	-7.28032	-6.98954	-1.6829	-2.71568	-3.52264
	1999	-6.41192	-6.24561	-5.53831	-1.80632	-2.85692	-3.63712
Morocco	1984	-2.83829	-1.90054	-0.81618	-2.6194	-2.85111	-2.67485
	1990	-5.55219	-4.49327	-3.37412	-3.85517	-4.8909	-5.46486
	1998	-6.38768	-5.72535	-4.80773	-2.64602	-3.61807	-4.33485
Tunisia	1985	-4.25336	-3.89093	-3.19735	-2.21116	-2.85346	-3.26325
	1990	-3.51745	-2.83891	-1.94486	-2.4617	-2.92111	-3.08555
	1995	-4.83375	-4.43229	-3.70994	-2.36458	-3.08213	-3.57187
	2000	-4.29779	-3.34798	-2.3036	-3.36055	-4.00138	-4.23397
Botswana	1985	-0.94502	-1.43374	-1.92808	-0.63577	-0.91026	-1.13266
	1993	-1.26343	-1.81225	-2.29781	-0.72682	-1.08674	-1.3572
South Africa	1993	-1.07722	-4.09097	-2.96832	-0.74062	-1.22525	-1.6855
	1995	-2.01886	-9.0798	-5.92856	-0.93567	-1.58593	-2.24604
	2000	-1.08104	-3.24779	-3.59984	-0.75743	-1.18612	-1.61398
Malawi	2004	-2.50053	-3.4075	-4.02335	-0.94152	-1.59153	-2.06656
Mozambique	1996	-1.25401	-1.7865	-2.13856	-0.45469	-0.9481	-1.2675
	2002	-1.57627	-2.11485	-2.40783	-0.58828	-1.12432	-1.47199
Tanzania	1991	-1.09808	-1.65824	-2.02416	-0.23482	-0.78479	-1.13085
	2000	-1.14715	-1.71743	-2.12726	-0.29761	-0.84181	-1.18597
Zambia	1991	-0.60313	-0.73753	-0.86205	-0.39508	-0.57314	-0.66821
	1993	-0.50096	-0.72844	-0.86176	-0.17724	-0.43098	-0.5843
	1996	-0.5663	-0.92765	-1.15854	-0.17632	-0.50312	-0.71076
	1998	-0.63453	-0.92621	-1.10182	-0.24123	-0.55143	-0.73684
	2004	-0.73238	-1.00491	-1.18053	-0.29887	-0.62215	-0.81405
Zimbabwe	1990	-0.70682	-1.16701	-1.6063	-0.39102	-0.69188	-0.9155
	1995	-0.85152	-1.29464	-1.63934	-0.35111	-0.73112	-0.98026
Madagascar	1980	-0.71744	-1.33864	-1.94566	-0.43045	-0.74688	-1.00542
	1993	-1.17077	-1.62551	-1.91127	-0.45471	-0.90934	-1.19498
	1997	-1.15072	-1.6095	-1.93053	-0.42144	-0.89409	-1.18514
	1999	-0.78001	-1.21831	-1.53974	-0.23833	-0.64856	-0.90643
	2001	-0.75686	-1.1362	-1.44472	-0.28466	-0.64412	-0.89044
Nigeria	1985	-0.80058	-1.20242	-1.51161	-0.23909	-0.6582	-0.91018
	1992	-0.76457	-0.97354	-1.12639	-0.37089	-0.66672	-0.82277
	1996	-0.48936	-0.93305	-1.21209	-0.12084	-0.46061	-0.68889
	2003	-0.66125	-1.04715	-1.2932	-0.17608	-0.54768	-0.78351
Senegal	1991	-0.89448	-1.19371	-1.42982	-0.50779	-0.79822	-0.98136
	1994	-2.20174	-2.84921	-3.1957	-0.8527	-1.46237	-1.8781
	2001	-2.70909	-3.71593	-4.42615	-1.0538	-1.70103	-2.19065
Uganda	1989	-0.27348	-0.66285	-0.90519	-0.06633	-0.32474	-0.50454
	1992	-0.24489	-0.73311	-1.05007	-0.04695	-0.32838	-0.5379
	1996	-0.30461	-0.859	-1.23872	-0.05878	-0.37621	-0.61505
	1999	-0.35989	-0.86097	-1.1897	-0.07735	-0.39624	-0.62496
	2002	-0.40282	-0.90029	-1.24001	-0.09682	-0.42391	-0.65669

Source: Authors' estimations using World Bank Database

The results of the estimation do not take into account any potential change in the distribution. This assumption is justified given that over the past decades while African countries experienced a high fluctuation in GDP per capita across all African countries, inequality does not change much. Moreover, Dollar and Kraay (2000) show that growth is generally distribution-neutral and poverty reduction is driven by growth rather than by changes in inequality. It means that growth is generally accompanied by no change in inequality. Thus, growth reduce poverty at a proportionally increasing rate because, as growth increases the mean expenditure per capita for a given country, the growth elasticity of poverty

reduces in turn poverty at an increasing rate. Even a small growth rate will be able to reduce poverty rapidly in the long run.

When considering a poverty line of $1 per day and per capita, estimates of growth elasticity of P0 are not uniform across countries, for the same country, and over time. For Egypt, estimates do not change much and the value of elasticity varies between -6 and -6.9 over a period of 20years. The estimation is also relatively constants for Botswana, Mozambique, Tanzania, Zambia, and Zimbabwe. However, for Morocco, Madagascar, Nigeria, South Africa and Senegal, the growth elasticity of P0 changes widely over time. For Morocco, it passed from -2.8 in 1985 to -6.4, wile for Botswana it varied from -0.9 to -1.3 and for Zambia from -0.6 to -0.7. Only for Tunisia, Madagascar, Nigeria and Uganda, the changes in the values of the growth elasticities of P0 are much lower than the previous group. For the growth elasticity of P1, the changes over time are much higher than for the growth elasticity of P0. The same conclusion is valid for the growth elasticity of P2. The reason is the same than the changes in poverty indicators described in the section 2 given that P1 and P2 are much more sensitive to changes in mean consumption or mean income.

With a poverty line of $2 per day and per capita in PPP, the same trend as with $1 a day poverty line is observed while the value of the elasticities are much lower than with $1 a day poverty line. The reason is when poverty line increases, the level of poverty as well as the number of poor close to the poverty line declined, which makes growth less pro-poor than with a lower poverty line.

5. The dynamic global CGE model

A modified version of MIRAGE package is used in this study[10]. It takes between the private and the public final demand in order to separate the government account.

The standard version of MIRAGE model is built to assess the impact of globalization on individual regions around the world. The model is a relatively standard neo-classical model of economic activity. It is based on the latest release of the GTAP data set, version 6.0. The model is designed for analyzing dynamic scenarios. The scenarios are solved as a sequence of static equilibrium, with the periods being linked by dynamic variables — population and labor growth, capital accumulation, and productivity. Policy scenarios are compared to a baseline, or business-as-usual, scenario. In what fellows, we present briefly the main features of the standard model followed by the new features in the new version used in this study.

5.1. The standard version. The demand side is modeled in each region through a representative agent, whose utility function is intra-temporal, with a fixed share of the regional income allocated to savings, the rest used to purchase final consumption. Below this first-tier Cobb-Douglas function, consumption trade-off across sectors is represented through a LES-CES function. Each sectoral sub-utility function is a nesting of CES functions, comparable to the standard nested Armington – Dixit-Stiglitz function (see e.g. Harrison et al., 1997), with two exceptions. Firstly, domestic products are assumed to benefit from a specific status for consumers, making them less substitutable to foreign products than foreign products between each other. Secondly, products originating in developing countries and in developed countries are assumed to belong to different quality ranges[11].

Production makes use of five factors: capital, labor (skilled and unskilled), land and natural resources. The first three are generic factors; the last two are specific factors. The production function assumes perfect complementarity between value added and intermediate consumption. The sectoral composition of the intermediate consumption aggregate stems from a CES function. For each sector of origin, the nesting is the same as for final consumption, meaning that the sector bundle has the same structure for final and intermediate consumption. The structure of value added is intended to take into account the well-documented skill-capital relative complementarity. These two factors are thus bundled separately, with a lower elasticity of substitution (0.6), while a higher substitutability (elasticity 1.1) is

assumed between this bundle and other factors. Constant returns to scale and perfect competition are assumed to hold in agricultural sectors.

The capital good is the same whatever the use sector, and capital is assumed to be perfectly mobile across sectors within each region. At the region-wide level, capital stock is assumed to be constant in the core simulations of this paper. Natural resources are also perfectly immobile and may not be accumulated. Both types of labor, as well as land, are assumed to be perfectly mobile across sectors. Production factors are assumed to be fully employed. All production factors are immobile internationally. As to macroeconomic closure, the current balance is assumed to be exogenous (and equal to its initial value in real terms), while real exchange rates are endogenous.

In a typical recursive dynamic framework, the time path of the model is solved as a sequence of static equilibrium in each year. In other words, the solution in any given year is not a function of forward looking variables, though it may be an explicit function of past variables, though known and therefore exogenous. While there are drawbacks in the recursive dynamic framework, particularly in the modeling of saving and investment behavior, its one key advantage is that it is much easier to set up and solve (van der Mensbrugghe, 1998). There are several backward linkages linking one period to another: population growth, productivity increases, and capital accumulation. Most of these linkages can be resolved outside of the modeling framework, or in other words, in between solution periods. One of the exceptions is the capital accumulation function. Before running any policy simulations in a dynamic framework, it is often required to define some sort of reference scenario, or as it is sometimes called, a business-as-usual scenario (BaU). The BaU scenario makes some assumptions about a broad range of dynamic variables — population and labor supply growth rates, the growth rate of factor productivity, and other exogenous variables. If all productivity variables are pre-determined, as well as the population growth rates, the growth rate of real GDP is endogenous. However, the path trend in real GDP growth may be unrealistic, or at least inconsistent with the assumed trend from other studies or prospective outlooks. One way to resolve this dilemma is to make the growth of real GDP exogenous in the reference scenario, and to allow some other variable pick up the slack. In subsequent simulations, i.e. in simulations with policy shocks, the growth rate of capital and labor productivity, are exogenous, and it is the growth of real GDP and the capital-labor ratio, which are endogenous.

5.2. The modified model.
Two main features are introduced to the standard version of MIRAGE model. The first is to separate the government from household account to perform simulations on tax policies while the second to link the model to poverty elasticites to provides results of simulation on poverty.

Government account. Government has two main roles:
- Collecting taxes: 4 types of taxation are taken into account in our modeling framework: direct taxes, indirect taxes, tariffs and a lamp sum taxes that governments punctuate from household revenue.
- Using revenues for expenditures: The collected revenues are used to purchase final public consumption[12]. The choice between goods is defined by a classic program of objective maximization constrained by government revenue. The objective function is a Cobb-Duglass function, which implies that the share in value of public consumption of each good remains constant.

The difference between public revenue and public consumption is supposed to be fixed and to increase over the time at the same rate of the world GDP. This assumption implies that the government has to adjust its revenue or his consumption each year in order to reach the predetermined exogenous public deficit or surplus. In this paper, governments are supposed to adjust their taxation policies in the different ways:
- Closure 1: the government adjusts its tax revenue using the lamp sum taxation. This closure is a neutral one.

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[12] At this stage, we do not take into account public investment

- Closure 2: the government adjusts its tax revenue using the direct taxation.
- Closure 3: the government adjusts its tax revenue using the indirect taxation. This closure could affect households' consumptions.

Once the government module is included separately in the model, the rest of the original account is assumed to reflect the account of the households.

The poverty module. CGE models represent one of the best tools for poverty and incomes distribution analysis. Studies on poverty are often criticized for the choice of poverty or disparity indexes. In general equilibrium framework, we do not try to measure poverty indicators but rather the effects of economic reforms or external shocks on these indicators. Indeed, simulations are based on well-established estimations of poverty indicators (both poverty measures and growth elasticity of poverty measures) in order to connect simulations of economic policies to the poverty measures. Considering this objective, two alternative approaches could be used to measure the effect of economic reforms on poverty: the micro-simulation approach and the growth elasticity of poverty measures approach. In this paper and to have comparative analysis for the panel of African countries selected in this study, the second option is preferred. Accordingly, the relationship between the poverty measure and the level of change in mean consumption is given by:

$$\frac{\Delta P_{i,r,t}}{P_{i,r,t}} = \sigma_{i,r} \frac{\Delta c_{r,t}}{c_{r,t}}$$

Where $P_{i,r,t}$ is the poverty measure i for country r at date t, $c_{r,t}$ is the mean real consumption per capita in country r at date t and $\sigma_{i,r}$ is the growth elasticity of poverty measure i in country r. Having estimations on poverty measures in base year as well as the growth elasticities for all the poverty measures, the new levels of poverty measures from 2001 until 2016 for the BaU scenarios and for the alternative simulation for all countries can be estimated using the equation above.

6. Simulations analysis
6.1. The central multilateral trade liberalization scenario. The multilateral trade simulation is implemented using the MacMAP database. This method consists on implementing the formulas at the HS6 digit level when taking into account the binding overhang effects. For agricultural products, the G20 proposal is implanted with EU reduction coefficients. To take into account the special and differentiated treatment, the reduction coefficients are supposed to be 1/3 less for Middle-Income Countries. The *Ad valorem* equivalents of specific tariffs are calculated on the basis of the 2005 WTO formula. For the implementation of the tariff caps, high-Income Countries are assumed to cap their tariffs at 150% and that the Middle-Income Countries at 300%. It is also assumed that 5% of agricultural tariff lines are exempted as sensitive/special products. Sensitive/special products face 50% less in tariff reduction and no caps, but tariff-rate quotas (TRQs) increased according to the European formula. Sensitive and special products[13] are defined using the Jean, Laborde and Martin (2005) method. For the Non Agricultural products, a Swiss formula is implemented. To consider the special and differentiated treatment, High-Income Countries are assumed to apply a coefficient of 10% and that the Middle-Income Countries a coefficient of 25%. In addition, Least Developed Countries are supposed to do not cut their own agricultural or manufacturing tariffs and to continue beneficiating from a free access to OECD countries market in 2008 excepting 3% of tariff lines. The implementation of these Tariff reforms is supposed to be implemented in 5 years for High-Income Countries and in 10 years for Middle-Income Countries. Finally, export subsidies are supposed to be eliminated in 2013. However, services liberalization or domestic support cuts are not considered in the present study.

Table (4) and (5) provides the macroeconomic impact of the simulated global scenario on the panel of countries and regions defined in this study. They show that the global trade scenario will affect

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[13] And also products exempted from Duty free Quota Free Access (3% rule)

positively most of the African regions and countries. Total GDP will be improved by 1.4% while welfare will increase by 1.3% at the end of the simulation period compared with the baseline scenario. Compared to the other countries and regions of the world selected in this study, Africa seems to be the best winner from the implementation of this global trade scenario. In this respect, USA will improves its welfare level by 0.02% only while the gains in the European Union gains will be around 0.2%. In addition, China and India will see their welfare improved only by 0.1% and 0.02% respectively. However, the high aggregate gain for Africa is not distributed homogenously across African countries and regions. North African region will generates the highest welfare and GDP gains (around 3% for welfare and GDP). These high gains are mainly driven by the significant performance of Egypt compared to the other countries of the region. In fact, Tunisia will achieve a relatively significant gain while Morocco and the Rest of the North African region will be mostly losing. The results show that Egypt will profits from the improvement of its market access on foreign markets to increase its exports by 40% with a limited impact on its imports (an increase of 20%). The improvement of the trade balance affects positively the whole economy and the country register more than 6% of GDP gain and 5.6% of welfare gain.

The South Africa Costumes Union (SACU) presents limited but positive impacts. The total GDP gain reaches 0.3% while the welfare gain is around 0.2%. The impact across countries of this region is not similar to the North African region as the three countries and sub-regions of the SACU realize the same level of gain. Thus, South Africa, the leading economy in the region, achieves a 0.2% GDP gain and 0.2% welfare gain. The global trade liberalization scenario has not significant impact on the South African terms of trade and the trade effects remains weak as its total global exports increases by 4.2% while its total imports grew by 8%. While Botswana and the rest of SACU will also gains from the global scenario, the level is too small to represent a veritable economic improvement as they register only 0.5% and 0.1% of welfare gain respectively. For the Southern African development Community, the economic impact is relatively different than the two previous sub-regions in Africa. In fact, while the aggregate gains attaints 0.4% for the GDP and 0.20% for welfare, the situation within this region is very heterogeneous. While some countries will achieve a very sensitive welfare gains as Malawi (2.7%), Mauritius (0.5%), Tanzania (0.1%) and Zimbabwe (0.8%), many others will be negatively affected. This is the case of Mozambique, Zambia and the rest of SADeC with respectively -0.2%, -0.1 and -0.4% of welfare lose. Finally, the rest of Sub-Saharan Africa is the unique sub-region in Africa who will be negatively affected by the proposed liberalization scenario with a total welfare lose of -0.4% even with a slight improvement in total GDP by 0.13%. This effect is essentially driven by the low performance of Nigeria, who represents the biggest economy of the sub-region. Our results show that the Nigerian economy will face important effective reel exchange rate depreciation (-1.9%) as result of a higher increase of imports (4.2%) compared to exports (3.8%). The depreciation is also manifested by a sensitive deterioration in the level of remuneration of production factors. Accordingly, skilled real wages will declines by -1.6% while unskilled real wages will decreases by -2.6%. In addition, real return to capital will be deteriorated by 1.1% and real return to land will also depressed by 2.4%. This negative trends in factor remunerations explain the biggest part of welfare lose in Nigeria. At the same time, almost all of the countries of this region will gains from the global scenario. In this respect, Senegal will register a 0.2% welfare gain and 0.4% GDP gain. The gains are much lower in Madagascar (0.1% welfare gain and 0.01% GDP gain) and Uganda (0.03% GDP gain).

Table 4: Global macroeconomic effects

	Welfare	GDP (vol)	Exports (vol)	Imports (vol)	Terms of trade
African countries	1.29	1.44			
North African countries	3.07	3.11			
Egypt	5.58	6.17	40.03	19.75	-6.26
Tunisia	0.21	0.77	4.95	3.48	-1.16
Morocco	-0.36	0.65	13.33	9.68	-2.57
Rest of North Africa	-0.33	-0.04	-0.75	-1.80	-0.65
South African Customs Union	0.24	0.27			
South Africa	0.24	0.28	4.15	5.59	-0.04
Botswana	0.49	0.17	-0.18	0.33	0.37
Rest of South African Customs Union	0.13	0.16	0.95	1.01	0.02
Southern African Development Community	0.20	0.35			0.00
Malawi	2.65	0.88	4.13	8.56	3.94
Mauritius	0.53	2.45	15.90	14.84	-2.10
Mozambique	-0.22	-0.02	-0.59	-0.81	-0.40
Tanzania	0.09	0.07	0.66	0.76	0.16
Zambia	-0.09	0.02	-0.34	-0.34	-0.24
Zimbabwe	0.78	0.67	4.24	5.49	0.45
Rest of Southern African Development Community	-0.36	-0.14	-0.61	-0.89	-0.41
Other Sub-Saharan African countries	-0.38	0.13			
Nigeria	-0.83	0.37	4.42	3.78	-1.00
Senegal	0.24	0.44	4.35	2.77	0.98
Madagascar	0.12	0.01	-1.89	-0.66	0.86
Uganda	0.03	0.00	-0.21	0.30	0.19
Rest of Sub-Saharan Africa	-0.30	-0.04	0.96	0.28	-0.68
High income countries	0.11	0.08			0.00
European Union	0.19	0.12	0.36	0.62	0.01
United States of America	0.02	0.01	2.10	1.53	-0.10
Japan	0.27	0.18	2.64	3.29	0.06
Middle income countries	0.12	0.16			
China	0.13	0.12	4.45	5.39	-0.03
India	0.02	0.68	23.49	19.41	-3.20
Thailand	1.08	0.96	5.19	6.44	-0.03
Rest of Asia	0.35	0.20	2.49	2.97	0.10
Rest of Northern and central America	-0.06	0.02	1.23	1.08	-0.32
Rest of Oceania and Free Trade Area of the Americas	-0.03	0.05	1.26	0.85	-0.23
South America	0.06	0.08	2.45	2.52	-0.08
Rest of the World	0.04	0.06	1.64	1.87	-0.13

Source: Author's computation

Table 5: Macroeconomic effects on African countries

	North African countries				South African Customs Union			Southern African Development Community							Other Sub-Saharan African countries				
	Egypt	Tunisia	Morocco	Rest of North Africa	South Africa	Botswana	Rest of SACU	Malawi	Mauritius	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADeC	Nigeria	Senegal	Madagascar	Uganda	Rest of SSA
Macroeconomic effects																			
GDP (vol)	6.2	0.8	0.7	0.0	0.3	0.2	0.2	0.9	2.4	0.0	0.1	0.0	0.7	-0.1	0.4	0.4	0.0	0.0	0.0
Welfare	5.6	0.2	-0.4	-0.3	0.2	0.5	0.1	2.7	0.5	-0.2	0.1	-0.1	0.8	-0.4	-0.8	0.2	0.1	0.0	-0.3
Real effective exchange rate	-4.1	-0.5	-1.5	0.2	0.0	0.5	0.1	4.1	-0.5	-0.3	0.3	0.0	-0.1	0.0	-1.9	2.1	1.2	0.4	-0.2
Terms of trade	-6.3	-1.2	-2.6	-0.7	0.0	0.4	0.0	3.9	-2.1	-0.4	0.2	-0.2	0.5	-0.4	-1.0	1.0	0.9	0.2	-0.7
Tariff revenue (points of GDP)	-0.4	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	-0.1
Employment in agricultural sectors	0.4	0.4	0.8	1.4	1.8	5.9	4.7	1.8	5.5	0.6	0.1	0.5	2.4	0.7	-0.2	2.0	2.3	0.0	0.3
Employment in non agricultural sectors	-0.2	-0.1	-0.3	-0.5	-0.2	-1.1	-0.7	-1.5	-1.1	-0.3	-0.2	-0.3	-1.0	-0.3	0.5	-2.5	-2.7	-0.1	-0.3
Trade effects																			
Exports (val)	31.6	3.9	10.9	-0.7	4.2	0.2	0.9	8.1	13.5	-0.9	0.8	-0.5	4.8	-0.6	3.8	6.2	-1.2	-0.1	0.7
Exports (vol)	40.0	4.9	13.3	-0.8	4.1	-0.2	0.9	4.1	15.9	-0.6	0.7	-0.3	4.2	-0.6	4.4	4.4	-1.9	-0.2	1.0
Imports (val)	19.9	3.5	10.0	-1.2	5.6	0.2	0.9	8.3	14.8	-0.8	0.7	-0.3	5.4	-0.6	4.2	3.5	-0.9	0.1	0.6
Imports (vol)	19.8	3.5	9.7	-1.8	5.6	0.3	1.0	8.6	14.8	-0.8	0.8	-0.3	5.5	-0.9	3.8	2.8	-0.7	0.3	0.3
Effects on labor																			
Skilled real wages	9.8	0.2	-0.8	-0.4	0.0	-0.6	-0.3	2.4	-2.3	-0.8	0.0	-0.1	1.0	-0.6	-1.6	0.0	-1.4	0.1	-0.4
Unskilled real wages	6.4	0.2	-0.4	0.0	0.1	0.1	0.1	3.5	1.6	-0.1	0.2	0.2	1.1	-0.2	-2.6	3.2	1.2	0.1	-0.3
Unskilled real wages in agriculture	6.6	0.4	0.0	0.7	1.0	3.0	2.4	4.4	4.3	0.1	0.3	0.4	2.2	0.1	-2.7	4.2	2.4	0.1	-0.2
Unskilled real wages in non agricultural sectors	6.3	0.1	-0.5	-0.2	0.0	-0.5	-0.3	2.7	1.0	-0.3	0.1	0.0	0.5	-0.4	-2.3	1.9	-0.2	0.1	-0.4
Other factors remuneration																			
Real return to capital	3.4	0.0	-0.6	-0.5	0.1	0.3	0.1	0.4	-0.9	-0.2	-0.1	-0.4	0.1	-0.4	-1.1	-1.0	-1.5	-0.2	-0.5
Real return to land	6.3	0.3	0.5	1.1	1.5	9.8	7.4	5.3	8.2	0.7	0.3	0.7	4.0	0.9	-2.4	5.7	4.2	0.1	-0.1
Real return to natural resources	0.4	-1.6	-2.8	-0.5	3.2	-1.3	-0.8	-3.2	-3.1	-0.1	0.2	0.7	0.3	-0.5	-1.3	-1.3	-0.3	-0.3	-0.6

Source: Author's computation

Prior to analyze the effects of global trade scenario on poverty, a brief description on the impact on households' income is helpful in the comprehension of the poverty impact. Tables 6, A1 and A2 give an overall picture of the change in the structure of the households' revenue both in the BaU scenario and the global trade liberalization scenario. For North African region, almost the structure of the households' income does not change, except for Egypt for whom a decline in the contribution of capital to the household's income to the profit of labor is observed. However for Tunisia and Morocco, the structure of income of households does not change between the two scenarios. For SACU, a small decline in the contribution of labor to the profit of capital is observed. For South Africa, and except a small change in the contribution of natural resources, the structure remains unchanged over both scenarios. For SADEC region, and except a small variation in the contribution of capital to the profit of labor, the contribution of the other sources of income does not change. These results show that multilateral trade liberalization will not affect sensitively the structure of income composition. Even for some countries, where a small level of substitutions is observed between the contribution of labor and capital, the changes remain too small.

For the structure of the households' expenditures, the situation is relatively different as shown in tables 7, A3 and A4. For example, Egypt will observe a decline in the share of income used for final consumption while for Tunisia and Morocco the changes are too small as for revenue side. For SADEC, Mauritius will achieve the highest decline in the share of income used for final consumption. Most generally, the results of the simulations show that for all countries, the shares of income used for final consumption will decline but at different levels and remain too small. Thus, multilateral liberalization is not expected to affect both the structure of income as well as the structure of expenditures.

Another indicator for welfare analysis is the change in real mean per capita expenditure, which is a key variable for assessing the effects of the simulated scenario on poverty. Results in table 8 show that changes in real per capita consumption start to be observed by 2010. However, the changes are not uniform across the regions and the countries given North African countries observed the highest changes. Accordingly, Egypt will experience an increase in real mean consumption by 1.6 percent in 2010 and by 7.2 percent in 2015. However, Morocco will experience a decline in real mean consumption by -0.3 percent in 2010 and –0.4 percent in 2015. Tunisia seems the only country in this region to not be affected by this reform as it relatively improve its level of per capita consumption only in 2015 by 0.2 percent. For SACU region, both South Africa and Botswana will improve their level of per capita consumption but much lower than what Egypt will achieves. For South Africa, the gain is estimated to 0.2 percent in 2010 and 2015. However, for Botswana, the gain in 2015 is almost the same as in 2010 (Table 10). For SADC region, only Malawi seems to be a net winner over the period 2010-2015 with an improvement in real mean consumption by 2.1 and 2.4 percents respectively. Tanzania will not observe any changes while Zambia will become a loser in 2015. As for Zimbabwe, the gain will be observed only in 2015 with 0.8 percent improvement compared to the baseline scenario. Finally, and for the other Sub-Saharan countries, Nigeria will be losing during the whole simulation period, while only Senegal will generate a small improvement in 2015.

Turning now to the effects of the trade scenario on poverty, table 9 displays the effects on changes in poverty measures while the new poverty measures are presented in tables A5 and A10. The changes in poverty measures are estimated for the year 2015, which represents the end of the simulation period and when all expected trade agreements are fully implemented. It is not surprising to observe that the results are very correlated with the changes in real mean consumption. Accordingly, Egypt is the biggest winner in the continent from this reform and poverty rate will decline by 45.5 percent for a poverty line at $1 a day and by 12.8 percent at $2 a day. For Tunisia, poverty will not be affected by this reform while Morocco will experience an increase in poverty rates. For SACU region, both countries (South Africa and Botswana) will observe a sharp decline in poverty measures but at a very small rate. For SADC, Malawi will observe a sensitive decline in poverty measures, mainly at $1 a day poverty line followed by Zimbabwe while Tanzania and Zambia will experience a very small improvement in poverty measures. Finally, and for the rest of Sub-Saharan countries, Nigeria seems to be a loser from trade liberalization while the remaining countries will see poverty declines at both lines ($1 and $2).

Table 6: Effects on the structure of households revenue in 2015[14]

Region	BaU scenario						Simulation					
	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW
North African countries												
Egypt	49.5	45.4	1.6	2.1	0.0	1.4	48.7	46.1	1.6	2.1	0.0	1.5
Morocco	38.9	58.4	2.1	0.7	-0.1	0.0	38.9	58.4	2.1	0.7	-0.1	0.0
Tunisia	41.7	45.8	1.2	1.8	-0.2	9.8	41.7	45.8	1.2	1.8	-0.2	9.7
Rest of North Africa	53.8	36.5	0.9	8.9	0.0	0.0	53.7	36.5	0.9	8.9	0.0	0.0
Southern African Development Community												
Botswana	40.9	57.5	0.9	0.7	0.0	0.0	41.0	57.3	0.9	0.7	0.0	0.0
South Africa	39.6	57.7	0.6	2.2	0.0	0.0	39.6	57.6	0.6	2.3	0.0	0.0
Rest of SACU	35.8	61.9	1.3	0.9	0.1	0.0	35.8	61.7	1.3	0.9	0.1	0.0
Southern African Development Community												
Malawi	40.2	52.8	4.4	1.0	0.5	1.1	40.0	53.1	4.4	1.0	0.4	1.0
Mauritius	45.4	50.7	1.3	0.6	2.0	0.0	45.2	51.0	1.3	0.7	1.7	0.0
Mozambique	39.5	54.5	2.8	0.7	0.0	2.4	39.5	54.5	2.8	0.7	0.0	2.4
Tanzania	38.8	46.9	5.0	1.3	0.0	8.0	38.7	46.9	5.0	1.3	0.0	8.0
Zambia	46.0	49.8	2.7	1.5	0.1	0.0	45.8	49.9	2.7	1.5	0.1	0.0
Zimbabwe	47.5	49.2	2.6	0.4	0.3	0.0	47.3	49.4	2.6	0.4	0.3	0.0
Rest of SADeC	45.1	33.4	1.0	9.1	0.0	11.5	45.1	33.4	1.0	9.1	0.0	11.5
Madagascar	37.4	55.1	3.5	2.8	0.0	1.3	36.9	55.4	3.5	2.7	0.0	1.2
Other Sub-Saharan African countries												
Nigeria	56.0	29.8	2.4	11.8	0.0	0.0	56.1	29.5	2.4	12.1	0.0	0.0
Senegal	45.1	30.6	1.8	1.0	0.0	21.5	44.8	31.2	1.8	1.0	0.0	21.1
Uganda	34.3	56.5	5.9	1.3	0.0	2.1	34.3	56.5	5.9	1.3	0.0	2.1
Rest of Sub-Saharan Africa	37.3	46.8	2.5	2.4	0.0	10.9	37.3	46.9	2.5	2.4	0.0	10.9

Source: Author's computation

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[14] Detailed results are presented in tables A1and A2.

Table 7: Effects on the structure of households expenditure in 2015[15]

Region	Final Cons	Saving	Transfer to ROW	Transfer to GVT	Final Cons	Saving	Transfer to ROW	Transfer to GVT
North African countries								
Egypt	85.0	16.9	0.0	-1.9	81.9	16.3	0.0	1.8
Morocco	67.6	26.4	2.4	3.7	66.0	25.7	2.4	5.9
Tunisia	65.5	29.6	0.0	4.9	64.7	29.2	0.0	6.1
Rest of North Africa	50.3	23.7	29.8	-3.9	50.3	23.7	29.8	-3.9
Southern African Development Community								
Botswana	33.5	21.3	44.9	0.4	33.5	21.3	44.6	0.7
South Africa	66.3	15.7	15.5	2.5	66.0	15.6	15.5	3.0
Rest of SACU	67.8	25.7	12.7	-6.2	67.4	25.5	12.7	-5.6
Southern African Development Community								
Malawi	79.6	10.4	0.0	10.0	79.8	10.4	0.0	9.7
Mauritius	67.8	26.2	0.5	5.6	63.9	24.7	0.4	11.0
Mozambique	61.5	36.4	0.0	2.2	61.5	36.4	0.0	2.2
Tanzania	81.9	16.3	0.0	1.8	81.9	16.3	0.0	1.8
Zambia	75.8	19.7	4.1	0.4	75.8	19.7	4.2	0.4
Zimbabwe	74.4	8.1	24.7	-7.2	73.9	8.0	24.6	-6.5
Rest of SADeC	69.0	22.9	0.0	8.1	68.9	22.9	0.0	8.2
Other Sub-Saharan African countries								
Madagascar	83.2	16.2	0.0	0.6	83.1	16.2	0.0	0.8
Nigeria	51.5	30.2	12.9	5.5	50.0	29.4	13.0	7.6
Senegal	79.5	20.4	0.0	0.2	79.5	20.4	0.0	0.2
Uganda	78.7	19.4	0.0	1.9	78.7	19.4	0.0	2.0
Rest of Sub-Saharan Africa	78.8	19.4	0.0	1.9	78.4	19.3	0.0	2.4

Source: Author's computation

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[15] Detailed results are presented in tables A3 and A4.

Table 8: Consumption per capita

Country	2005			2010			2015		
	Ref	Sim	Relative variation	Ref	Sim	Relative variation	Ref	Sim	Relative variation
North African countries									
Egypt	13.2	13.2	0.0	15.7	16.0	1.6	17.6	18.9	7.2
Tunisia	14.4	14.4	0.0	17.8	17.8	0.0	22.1	22.2	0.2
Morocco	7.4	7.4	0.0	8.8	8.7	-0.3	10.2	10.2	-0.4
South African Customs Union									
South Africa	15.9	15.9	0.0	19.2	19.3	0.2	22.5	22.6	0.2
Botswana	12.2	12.2	0.0	14.7	14.8	0.1	16.5	16.6	0.5
Southern African Development Community									
Malawi	1.2	1.2	0.0	1.4	1.5	2.1	1.7	1.7	2.4
Tanzania	2.7	2.7	0.0	3.3	3.3	0.0	3.9	3.9	0.0
Zambia	2.7	2.7	0.0	3.3	3.3	0.0	4.1	4.1	-0.2
Zimbabwe	3.9	3.9	0.0	3.5	3.5	0.0	3.6	3.7	0.8
Other Sub-Saharan African countries									
Nigeria	1.6	1.6	0.0	1.9	1.9	-0.5	2.1	2.1	-0.9
Senegal	4.2	4.2	0.0	4.8	4.8	0.0	5.4	5.4	0.4
Madagascar	2.3	2.3	0.0	2.6	2.6	0.0	2.9	2.9	0.0
Uganda	2.1	2.1	0.0	2.3	2.3	0.0	2.5	2.5	0.0

Source: Author's computation

Table 9: Relative variation of the different poverty indexes[16]

Country	1$ P0 index	1$ P1 index	1$ P2 index:	2$ P0 index	2$ P1 index	2$ P2 index
North African countries						
Egypt	-45.5	-33.3	0.0	-12.8	-19.8	-25.0
Tunisia	0.0	0.0	0.0	0.0	0.0	0.0
Morocco	0.0	0.0	0.0	1.3	1.6	7.1
Southern African Development Community						
South Africa	-0.3	0.0	0.0	-0.2	-0.2	-0.3
Botswana	-0.4	-0.8	-0.6	-0.3	-0.5	-0.7
Southern African Development Community						
Malawi	-7.1	-9.3	-14.8	-2.6	-4.5	-5.8
Tanzania	-0.1	-0.1	0.0	0.0	-0.1	-0.1
Zambia	0.1	0.1	0.1	0.0	0.1	0.1
Zimbabwe	-0.7	-1.0	-1.3	-0.3	-0.6	-0.8
Other Sub-Saharan African countries						
Nigeria	0.6	0.9	1.2	0.2	0.5	0.7
Senegal	-0.8	-1.0	-4.3	-0.3	-0.4	-0.6
Madagascar	-0.1	-0.1	-0.2	0.0	-0.1	-0.1
Uganda	0.0	-0.1	-0.1	0.0	0.0	0.0

Source: Author's computation

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[16] Detailed results are presented in tables A5 to A10.

6.2. Sensitive analysis on government fiscal policies. In this section, the impacts of two alternative closure rules for the government account are tested. The first alternative scenario assumes that the government adjusts its tax revenue using the direct taxation while in the second; the government adjusts its tax revenue using the indirect taxation. The second closure is the most distorting as it replaces the reduction in tariffs with an increase in other indirect taxes on commodities both produced locally and imported. The macroeconomic effects of the two simulations on the global economy are presented in table 10 while the specific effects on African countries are reported in tables A11 and A12.

Regarding the impact on welfare and compared with the central trade simulation, the direct tax closure improves the African welfare while the indirect tax closure depresses it. However, once again, these effects are not uniform across sub-regions and countries in the continent. For North Africa, the impacts of the alternative fiscal closures on welfare follow the overall impact on Africa as a whole but they are uniform across the countries of this region. For SACU region, the aggregate effect is also the same as for North Africa but with differences across the countries. Only South Africa will gains from closure 1 and loses from closure 2 while Botswana will wins with closure 2. However, the rest of SACU region will not observe any change. The importance of the economy of South Africa in the SACU sub-region explains the aggregate effects of both closures on the whole sub-region's welfare. For SADC, the overall impact follow also the one for whole Africa with a much higher disparities across countries compared with the two previous sub-regions. Accordingly, Malawi is the only country where welfare is not affected by alternative government closure rules while Mauritius wills experiences an improvement in its welfare in closure 1. However, for the remaining countries, the adoption of the first closure will induces either a lower increase in welfare compared to the central scenario or an acceleration in the decline of welfare. Finally, and as the rest of Sub-Saharan countries are concerned, Nigeria will be a winner in closure 1 compared with a situation of losers in the central scenario while with the closure 2 the welfare loose is even intensified. For Senegal, the situation does not change much and the country seems to be not sensitive to the nature of government closure. For the other countries of this region, they will be impacted following the same ways as for whole Africa.

The results of the two alternative closure rules on poverty measures in Africa are presented in table 11. With $1 a day poverty line, Egypt is the only affected country in North Africa by the two alternative closures rules. The first closure will not change the level of impact while the second will induce a lower reduction in poverty measures. However, with a $2 a day poverty line, the first closure will allows Egypt to improve slightly its performance in poverty reduction while the speed of poverty reduction will be reduced by closure 2. For Tunisia, a reduction in poverty rate by 1.2 percent is observed with the closure 1 compared with neutral effects of both the central scenario and closure 2. For Morocco, the first closure represents the best option given that poverty will not increase. For SACU countries and with $1 a day poverty line, closure 1 will not change much the poverty profile while closure 2 will reduce more rapidly poverty incidence both for South Africa and Botswana. However, for P1 measure, South Africa will become winner in poverty reduction while the situation does not change for Botswana. At the same time, closure 2 will be neutral for South Africa in terms of P1 and much positive for Botswana. For the SADC region, the overall impact of both alternative closure rules does not change the direction of the effects on P0, P1 and P2 for both poverty lines but only will affect the magnitude of these effects. For all countries of this region, the effects of alternative closure rules of the government account does not matter as the effects on all poverty measures remains relatively too small. Finally for the rest of Sub-Saharan Africa, the directions of the effects does not also change but the magnitudes of these effects change much more as for the previous region. For Nigeria for example, closure 2 will increase poverty incidence while closure 1 does not affects poverty measures for both poverty lines. It is important to note that the magnitude of the effects on P0 is intensified with closure 1 for all poverty measures and for both poverty lines. For the remaining countries of this region, the same conclusion is valid but with negative trends, which indicates improvement in poverty reduction.

Thus, the changes in poverty measures at country level as result of alternative government closures are relatively small compared with the central scenario of global trade liberalization. Three main factors can explain the nature of these results. First, fiscal receipts does not represent much for the budget incomes for most African countries as governments rely mostly on the exploitations of natural resources as well as on grants and loans from the rest of the world to finance their budgets. Second, for most

African countries, the level of real mean consumption is already too low to be affected by any additional shocks as most of their populations still leaving with less than $2 a day per person. Third, the structures of the African output and trade are not very sensitive to the nature of the taxation policy as result of a very low level of diversification of these economies.

Table 10: Global macroeconomic effects of the scenarios[17]

	Welfare			GDP (vol)		
	Lump sum Tax	Direct Tax	Indirect Tax	Lump sum Tax	Direct Tax	Indirect Tax
African countries	1.29	1.45	0.91	1.44	1.62	3.27
North African countries	3.07	3.26	2.58	3.11	3.29	5.53
Egypt	5.58	5.79	5.02	6.17	6.40	9.80
Tunisia	0.21	0.23	0.02	0.77	0.80	1.08
Morocco	-0.36	0.08	-1.37	0.65	1.09	4.72
Rest of North Africa	-0.33	-0.33	-0.34	-0.04	-0.04	-0.04
South African Customs Union	0.24	0.32	0.16	0.27	0.34	0.93
South Africa	0.24	0.32	0.15	0.28	0.35	0.99
Botswana	0.49	0.48	0.80	0.17	0.15	-0.01
Rest of South African Customs Union	0.13	0.13	0.13	0.16	0.17	0.16
Southern African Development Community	0.20	0.19	0.03	0.35	0.34	0.57
Malawi	2.65	2.56	2.65	0.88	0.80	-0.01
Mauritius	0.53	1.27	-1.53	2.45	2.91	10.38
Mozambique	-0.22	-0.23	-0.18	-0.02	-0.02	-0.12
Tanzania	0.09	0.08	0.09	0.07	0.06	-0.22
Zambia	-0.09	-0.07	-0.11	0.02	0.04	0.32
Zimbabwe	0.78	0.32	0.84	0.67	0.24	-3.54
Rest of Southern African Development Community	-0.36	-0.37	-0.37	-0.14	-0.14	-0.14
Other Sub-Saharan African countries	-0.38	-0.14	-0.88	0.13	0.46	2.62
Nigeria	-0.83	0.03	-2.64	0.37	1.26	6.92
Senegal	0.24	0.22	0.25	0.44	0.42	0.23
Madagascar	0.12	0.16	0.09	0.01	0.07	1.09
Uganda	0.03	0.14	-0.08	0.00	0.11	1.73
Rest of Sub-Saharan Africa	-0.30	-0.30	-0.30	-0.04	-0.04	-0.04
High income countries	0.11	0.11	0.11	0.08	0.08	0.08
European Union	0.19	0.19	0.19	0.12	0.12	0.12
United States of America	0.02	0.02	0.02	0.01	0.01	0.01
Japan	0.27	0.27	0.27	0.18	0.18	0.18
Middle income countries	0.12	0.12	0.12	0.16	0.16	0.16
China	0.13	0.13	0.13	0.12	0.12	0.12
India	0.02	0.02	0.02	0.68	0.68	0.68
Thailand	1.08	1.09	1.07	0.96	0.97	0.96
Rest of Asia	0.35	0.36	0.35	0.20	0.20	0.20
Rest of Northern and central America	-0.06	-0.06	-0.06	0.02	0.02	0.02
Rest of Oceania and Free Trade Area of the Americas	-0.03	-0.03	-0.03	0.05	0.05	0.05
South America	0.06	0.06	0.05	0.08	0.08	0.08
Rest of the World	0.04	0.03	0.03	0.06	0.06	0.06

Source: Author's computations

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[17] Detailed macroeconomic results for the African countries are presented in table A11 and A12.

Table 11: Variation of the different poverty indexes according to fiscal closure[18]

Countries	1$ P0 index			1$ P1 index			1$ P2 index			2$ P0 index			2$ P1 index			2$ P2 index		
	Lump sum	Tax dir	Tax indir	Lump sum	Tax dir	Tax indir	Lump sum	Tax dir	Tax indir	Lump sum	Tax dir	Tax indir	Lump sum	Tax dir	Tax indir	Lump sum	Tax dir	Tax indir
North African countries																		
Egypt	-45.5	-45.5	-40.9	-33.3	-33.3	-33.3	0.0	0.0	0.0	-12.8	-13.1	-11.9	-19.8	-20.4	-18.5	-25.0	-26.0	-24.0
Tunisia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Morocco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	4.3	1.6	0.0	6.3	7.1	0.0	14.3
Southern African Development Community																		
South Africa	-0.3	-0.4	-0.2	0.0	-1.2	0.0	0.0	0.0	0.0	-0.2	-0.3	-0.1	-0.2	-0.3	-0.1	-0.3	-0.5	-0.3
Botswana	-0.4	-0.4	-0.8	-0.8	-0.8	-1.2	-0.6	-0.6	-1.7	-0.3	-0.3	-0.5	-0.5	-0.5	-0.8	-0.7	-0.5	-1.0
Southern African Development Community																		
Malawi	-7.1	-6.8	-7.1	-9.3	-9.3	-9.3	-14.8	-11.1	-14.8	-2.6	-2.5	-2.6	-4.5	-4.3	-4.5	-5.8	-5.6	-5.8
Tanzania	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Zambia	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.1
Zimbabwe	-0.7	-0.3	-0.7	-1.0	-0.5	-1.1	-1.3	-0.6	-1.4	-0.3	-0.1	-0.3	-0.6	-0.3	-0.6	-0.8	-0.3	-0.8
Other Sub-Saharan African countries																		
Nigeria	0.6	0.0	1.9	0.9	0.0	3.0	1.2	-0.1	3.8	0.2	0.0	0.5	0.5	0.0	1.6	0.7	0.0	2.2
Senegal	-0.8	-0.8	-0.8	-1.0	-1.0	-1.0	-4.3	-4.3	-4.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.6	-0.6	-0.6
Madagascar	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	-0.2	-0.3	-0.2	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	-0.1	-0.1
Uganda	0.0	-0.1	0.0	-0.1	-0.1	0.1	-0.1	-0.2	0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.1

Source: Author's computation

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[18] Detailed results are presented in tables A13 to A17.

VII. Conclusion

Since the GATT agreement, economic analysis focuses on trade as an engine for poverty alleviation. But since that, and as economic and social situations in most African countries does not improve much, the identification of the potential effects of the current round of negotiations at WTO on households in Africa is crucial to see in what extents global trade will participate in the poverty reduction efforts. It is crucial given that protection and other forms of market distortions (export subsidies and domestic support) are the main obstacles faced by Africa towards a better economic and social development.

This paper has evaluated the potential impacts of an agreement under the DDA on the African countries with a special focus on poverty. This was achieved by using the global dynamic CGE model – MIRAGE – linked to three poverty measures for the panel of African countries selected in this study.

The results of the simulation of the latest proposals on agricultural and non-agricultural trade liberalization under the DDA show that most of African countries will gain from this reform in reducing poverty. However, the gains are not uniform across countries and sub-regions of the continent. Egypt appears to be the only country expected to generate the highest gain in fighting poverty while Nigeria is likely to be the looser from the global trade scenario. For the remaining countries, the changes in poverty profiles are expected to be positives but remain relatively small to argue that trade is pro-poor.

The results of this study confirm the findings of the country analysis carried out with alternative methodology for Tunisia. Using a country CGE model with integrated micro-simulation approach, Chemingui and Thabet (2008) show that Tunisia will gains at the aggregate level from a global trade liberalization while the gains are not uniform across groups of households. Accordingly, poverty will declines in rural areas but will increases among urban households as a direct result of the removal of most distortions on global agricultural trade. However, for Egypt, the analysis carried out by Minot (2006) provides a different picture. The results of their analysis of the impact of the Doha Round on Egypt's general welfare will be modest, though impact at the sector level will be more significant. The large welfare results as well as performance in poverty reduction found in our analysis and not confirmed by the one carried out by Minot, seems to be due to cutting very high tariffs on textiles and wearing apparel in the 2001 MacMap HS6 database used in the present analysis. However, Minor updated the MacMap tariff data for Egypt to 2004 and no more peaks for textiles and wearing apparel exist while they still present only in beverages and tobacco that are not a key sectors in the Egyptian economy. These changes in the MacMap database seem at the origin of the large difference in the results between the two studies. While we recognize the needs to update the MacMap database for all the countries selected in this study, we found that such effort should be carried out in the context of another study on updating protection. Moreover, we believe that Egypt is a particular case where tariff peaks changed dramatically in a too small period of time.

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Annexes

TableA1: Structure of households revenues in the BaU scenario

Region	2001						2005						2010						2015					
	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW
North Africa																								
Egypt	50.3	44.8	1.5	2.0	0.0	1.5	50.1	44.9	1.5	2.0	0.0	1.5	49.9	45.0	1.5	2.1	0.0	1.5	49.5	45.4	1.6	2.1	0.0	1.4
Morocco	40.1	57.4	2.1	0.6	-0.2	0.0	39.9	57.5	2.1	0.6	-0.1	0.0	39.5	57.8	2.1	0.7	-0.1	0.0	38.9	58.4	2.1	0.7	-0.1	0.0
Tunisia	42.5	43.5	1.1	1.5	-0.5	11.9	42.5	43.7	1.1	1.6	-0.4	11.5	42.3	44.5	1.2	1.7	-0.3	10.7	41.7	45.8	1.2	1.8	-0.2	9.8
Rest of North Africa	53.2	37.4	0.9	8.5	0.0	0.0	53.3	37.2	0.9	8.6	0.0	0.0	53.5	36.8	0.9	8.8	0.0	0.0	53.8	36.5	0.9	8.9	0.0	0.0
South African Customs Union																								
Botswana	43.2	55.5	0.8	0.5	0.1	0.0	42.5	56.1	0.8	0.5	0.0	0.0	41.7	56.9	0.9	0.6	0.0	0.0	40.9	57.5	0.9	0.7	0.0	0.0
South Africa	39.0	58.4	0.6	2.1	0.0	0.0	39.6	57.7	0.6	2.1	0.0	0.0	39.7	57.5	0.6	2.2	0.0	0.0	39.6	57.7	0.6	2.2	0.0	0.0
Rest of SACU	37.2	60.5	1.3	0.9	0.1	0.0	36.8	60.9	1.3	0.9	0.1	0.0	36.3	61.4	1.3	0.9	0.1	0.0	35.8	61.9	1.3	0.9	0.1	0.0
Southern African Development Community																								
Malawi	38.8	53.9	4.1	1.0	0.9	1.3	39.5	53.2	4.2	1.0	0.8	1.3	40.0	52.9	4.3	1.0	0.6	1.1	40.2	52.8	4.4	1.0	0.5	1.1
Mauritius	45.8	49.2	1.2	0.7	3.1	0.0	45.8	49.6	1.3	0.7	2.7	0.0	45.7	50.1	1.3	0.7	2.3	0.0	45.4	50.7	1.3	0.6	2.0	0.0
Mozambique	44.8	48.4	2.7	0.7	0.1	3.3	43.2	50.4	2.8	0.7	0.1	2.9	41.2	52.6	2.8	0.7	0.1	2.6	39.5	54.5	2.8	0.7	0.0	2.4
Tanzania	39.7	43.8	4.8	1.1	0.1	10.6	39.6	44.8	4.8	1.2	0.0	9.6	39.3	45.9	4.9	1.2	0.0	8.6	38.8	46.9	5.0	1.3	0.0	8.0
Zambia	46.9	49.1	2.7	1.1	0.2	0.0	46.8	49.2	2.7	1.2	0.1	0.0	46.5	49.4	2.7	1.3	0.1	0.0	46.0	49.8	2.7	1.5	0.1	0.0
Zimbabwe	43.8	53.4	2.0	0.6	0.2	0.0	45.1	51.9	2.2	0.5	0.3	0.0	46.5	50.3	2.4	0.5	0.3	0.0	47.5	49.2	2.6	0.4	0.3	0.0
Rest of SADeC	47.3	35.2	1.1	9.0	0.0	7.4	46.8	34.8	1.1	9.1	0.0	8.3	46.0	34.0	1.1	9.2	0.0	9.8	45.1	33.4	1.0	9.1	0.0	11.5
Other Sub-Saharan African countries																								
Madagascar	37.2	55.4	3.4	2.6	0.1	1.4	37.4	55.1	3.4	2.7	0.1	1.4	37.5	55.0	3.5	2.7	0.0	1.3	37.4	55.1	3.5	2.8	0.0	1.3
Nigeria	59.1	26.8	2.2	11.9	0.0	0.0	58.1	27.7	2.2	11.9	0.0	0.0	57.0	28.8	2.3	11.9	0.0	0.0	56.0	29.8	2.4	11.8	0.0	0.0
Senegal	44.2	29.2	1.7	0.9	0.0	24.1	44.6	29.5	1.7	0.9	0.0	23.3	44.9	30.0	1.7	1.0	0.0	22.4	45.1	30.6	1.8	1.0	0.0	21.5
Uganda	35.9	54.7	5.8	1.1	0.0	2.5	35.3	55.4	5.8	1.2	0.0	2.3	34.8	56.0	5.8	1.2	0.0	2.2	34.3	56.5	5.9	1.3	0.0	2.1
Rest of Sub-Saharan Africa	40.1	47.0	2.4	2.7	0.0	7.8	39.4	47.0	2.4	2.6	0.0	8.5	38.4	47.0	2.4	2.6	0.0	9.7	37.3	46.8	2.5	2.4	0.0	10.9

Source: Author's computation

Table A2: Structure of households revenues in the Simulation scenario

Region	2001						2005						2010						2015					
	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW	Capital	Lab	Land	Natural Resources	Rent	Transfer From ROW
North Africa																								
Egypt	50.3	44.8	1.5	2.0	0.0	1.5	50.1	44.9	1.5	2.0	0.0	1.5	49.7	45.2	1.6	2.1	0.0	1.5	48.7	46.1	1.6	2.1	0.0	1.5
Morocco	40.1	57.4	2.1	0.6	-0.2	0.0	39.9	57.5	2.1	0.6	-0.1	0.0	39.5	57.8	2.1	0.7	-0.1	0.0	38.9	58.4	2.1	0.7	-0.1	0.0
Tunisia	42.5	43.4	1.1	1.5	-0.4	11.8	42.5	43.6	1.1	1.6	-0.3	11.5	42.3	44.5	1.2	1.7	-0.3	10.6	41.7	45.8	1.2	1.8	-0.2	9.7
Rest of North Africa	53.2	37.4	0.9	8.5	0.0	0.0	53.3	37.2	0.9	8.6	0.0	0.0	53.5	36.9	0.9	8.8	0.0	0.0	53.7	36.5	0.9	8.9	0.0	0.0
South African Customs Union																								
Botswana	43.2	55.5	0.8	0.5	0.0	0.0	42.5	56.1	0.8	0.5	0.0	0.0	41.7	56.7	0.9	0.6	0.0	0.0	41.0	57.3	0.9	0.7	0.0	0.0
South Africa	39.0	58.4	0.6	2.1	0.0	0.0	39.6	57.7	0.6	2.1	0.0	0.0	39.7	57.5	0.6	2.2	0.0	0.0	39.6	57.6	0.6	2.3	0.0	0.0
Rest of SACU	37.3	60.5	1.3	0.9	0.1	0.0	36.8	60.9	1.3	0.9	0.1	0.0	36.3	61.3	1.4	0.9	0.1	0.0	35.8	61.7	1.3	0.9	0.1	0.0
Southern African Development Community																								
Malawi	38.9	53.9	4.1	1.0	0.8	1.3	39.6	53.3	4.2	1.0	0.7	1.3	39.8	53.1	4.5	1.0	0.5	1.1	40.0	53.1	4.4	1.0	0.4	1.0
Mauritius	46.0	49.5	1.2	0.7	2.6	0.0	46.0	49.8	1.3	0.7	2.3	0.0	45.5	50.4	1.5	0.7	2.0	0.0	45.2	51.0	1.3	0.7	1.7	0.0
Mozambique	44.8	48.4	2.7	0.7	0.1	3.3	43.2	50.4	2.8	0.7	0.1	2.9	41.2	52.6	2.8	0.7	0.1	2.6	39.5	54.5	2.8	0.7	0.0	2.4
Tanzania	39.7	43.8	4.8	1.1	0.1	10.6	39.6	44.8	4.8	1.2	0.0	9.6	39.3	46.0	5.0	1.2	0.0	8.6	38.7	46.9	5.0	1.3	0.0	8.0
Zambia	46.9	49.2	2.7	1.1	0.1	0.0	46.8	49.2	2.7	1.2	0.1	0.0	46.4	49.4	2.8	1.3	0.1	0.0	45.8	49.9	2.7	1.5	0.1	0.0
Zimbabwe	43.8	53.4	2.0	0.6	0.2	0.0	45.1	51.9	2.2	0.5	0.3	0.0	46.5	50.3	2.4	0.5	0.3	0.0	47.3	49.4	2.6	0.4	0.3	0.0
Rest of SADeC	47.3	35.2	1.1	9.0	0.0	7.4	46.8	34.8	1.1	9.1	0.0	8.3	46.0	34.1	1.1	9.1	0.0	9.8	45.1	33.4	1.0	9.1	0.0	11.5
Other Sub-Saharan African countries																								
Madagascar	37.2	55.4	3.4	2.6	0.1	1.4	37.4	55.1	3.4	2.7	0.0	1.4	37.1	55.3	3.6	2.7	0.0	1.3	36.9	55.4	3.5	2.7	0.0	1.2
Nigeria	59.1	26.8	2.2	11.9	0.0	0.0	58.1	27.7	2.2	11.9	0.0	0.0	57.0	28.8	2.3	11.9	0.0	0.0	56.1	29.5	2.4	12.1	0.0	0.0
Senegal	44.2	29.2	1.7	0.9	0.0	24.1	44.6	29.5	1.7	0.9	0.0	23.3	44.6	30.6	1.9	1.0	0.0	22.0	44.8	31.2	1.8	1.0	0.0	21.1
Uganda	35.9	54.7	5.8	1.1	0.0	2.5	35.3	55.4	5.8	1.2	0.0	2.3	34.8	56.0	5.8	1.2	0.0	2.2	34.3	56.5	5.9	1.3	0.0	2.1
Rest of Sub-Saharan Africa	40.1	47.0	2.4	2.7	0.0	7.8	39.4	47.0	2.4	2.6	0.0	8.5	38.4	47.0	2.4	2.6	0.0	9.7	37.3	46.9	2.5	2.4	0.0	10.9

Source: Author's computation

Table A3: Structure of households expenditure in the BaU scenario

Region	2001 Final Cons	Saving	Transfer to ROW	Transfer to GVT	2005 Final Cons	Saving	Transfer to ROW	Transfer to GVT	2010 Final Cons	Saving	Transfer to ROW	Transfer to GVT	2015 Final Cons	Saving	Transfer to ROW	Transfer to GVT
North Africa																
Egypt	83.3	16.5	0.0	0.2	84.8	16.8	0.0	-1.7	84.9	16.9	0.0	-1.8	85.0	16.9	0.0	-1.9
Morocco	68.5	26.7	2.6	2.2	68.2	26.6	2.6	2.6	67.9	26.5	2.5	3.2	67.6	26.4	2.4	3.7
Tunisia	65.2	29.4	0.0	5.4	65.2	29.4	0.0	5.4	65.3	29.5	0.0	5.2	65.5	29.6	0.0	4.9
Rest of North Africa	54.0	25.5	19.7	0.8	53.2	25.1	22.1	-0.3	51.8	24.4	25.8	-2.0	50.3	23.7	29.8	-3.9
South African Customs Union																
Botswana	33.5	21.3	45.2	0.1	33.9	21.5	43.6	1.0	33.9	21.6	43.4	1.2	33.5	21.3	44.9	0.4
South Africa	65.8	15.6	16.2	2.4	66.1	15.6	15.9	2.4	66.3	15.7	15.6	2.5	66.3	15.7	15.5	2.5
Rest of SACU	65.8	24.9	9.1	0.3	66.2	25.1	9.9	-1.2	67.0	25.4	11.3	-3.6	67.8	25.7	12.7	-6.2
Southern African Development Community																
Malawi	78.5	10.3	0.0	11.2	78.9	10.3	0.0	10.8	79.3	10.4	0.0	10.3	79.6	10.4	0.0	10.0
Mauritius	67.9	26.3	0.4	5.4	68.2	26.4	0.4	5.0	68.1	26.3	0.4	5.2	67.8	26.2	0.5	5.6
Mozambique	61.4	36.3	0.0	2.3	61.4	36.3	0.0	2.3	61.4	36.4	0.0	2.2	61.5	36.4	0.0	2.2
Tanzania	81.6	16.3	0.0	2.1	81.7	16.3	0.0	2.0	81.8	16.3	0.0	1.9	81.9	16.3	0.0	1.8
Zambia	75.2	19.5	5.1	0.2	75.3	19.6	4.9	0.3	75.5	19.6	4.5	0.3	75.8	19.7	4.1	0.4
Zimbabwe	76.1	8.3	14.7	0.9	75.2	8.2	19.4	-2.8	74.5	8.1	23.5	-6.1	74.4	8.1	24.7	-7.2
Rest of SADeC	73.3	24.4	0.0	2.4	72.3	24.0	0.0	3.7	70.7	23.5	0.0	5.8	69.0	22.9	0.0	8.1
Other Sub-Saharan African countries																
Madagascar	83.6	16.3	0.0	0.2	83.9	16.3	0.0	-0.2	83.5	16.3	0.0	0.2	83.2	16.2	0.0	0.6
Nigeria	50.8	29.8	17.0	2.4	51.1	30.0	15.0	3.8	51.3	30.1	13.7	4.8	51.5	30.2	12.9	5.5
Senegal	79.3	20.3	0.0	0.4	79.4	20.3	0.0	0.3	79.4	20.3	0.0	0.2	79.5	20.4	0.0	0.2
Uganda	80.2	19.7	0.0	0.1	79.6	19.6	0.0	0.8	79.0	19.4	0.0	1.5	78.7	19.4	0.0	1.9
Rest of Sub-Saharan Africa	77.9	19.2	0.0	2.9	78.1	19.2	0.0	2.7	78.4	19.3	0.0	2.3	78.8	19.4	0.0	1.9

Source: Author's computation

Table A4: Structure of households expenditure in the simulation scenario

Region	2001				2005				2010				2015			
	Final Cons	Saving	Transfer to ROW	Transfer to GVT	Final Cons	Saving	Transfer to ROW	Transfer to GVT	Final Cons	Saving	Transfer to ROW	Transfer to GVT	Final Cons	Saving	Transfer to ROW	Transfer to GVT
North Africa																
Egypt	83.3	16.5	0.0	0.2	84.8	16.8	0.0	-1.7	85.1	16.9	0.0	-2.0	81.9	16.3	0.0	1.8
Morocco	68.5	26.7	2.6	2.2	68.2	26.6	2.6	2.6	67.6	26.4	2.5	3.6	66.0	25.7	2.4	5.9
Tunisia	65.1	29.4	0.0	5.5	65.2	29.4	0.0	5.4	65.2	29.5	0.0	5.3	64.7	29.2	0.0	6.1
Rest of North Africa	54.0	25.5	19.7	0.8	53.2	25.1	22.1	-0.3	51.8	24.4	25.7	-2.0	50.3	23.7	29.8	-3.9
South African Customs Union																
Botswana	33.5	21.3	45.2	0.1	33.9	21.5	43.6	1.0	33.9	21.6	43.2	1.3	33.5	21.3	44.6	0.7
South Africa	65.8	15.6	16.2	2.4	66.1	15.6	15.9	2.4	66.2	15.7	15.6	2.6	66.0	15.6	15.5	3.0
Rest of SACU	65.8	24.9	9.1	0.2	66.2	25.1	9.9	-1.2	66.8	25.3	11.2	-3.4	67.4	25.5	12.7	-5.6
Southern African Development Community																
Malawi	78.6	10.3	0.0	11.1	78.9	10.3	0.0	10.7	79.5	10.4	0.0	10.1	79.8	10.4	0.0	9.7
Mauritius	68.3	26.4	0.4	4.9	68.5	26.5	0.4	4.6	67.8	26.2	0.4	5.6	63.9	24.7	0.4	11.0
Mozambique	61.4	36.3	0.0	2.3	61.4	36.3	0.0	2.3	61.4	36.3	0.0	2.2	61.5	36.4	0.0	2.2
Tanzania	81.6	16.3	0.0	2.1	81.7	16.3	0.0	2.0	81.8	16.3	0.0	1.9	81.9	16.3	0.0	1.8
Zambia	75.2	19.5	5.1	0.2	75.3	19.6	4.9	0.2	75.5	19.6	4.5	0.3	75.8	19.7	4.2	0.4
Zimbabwe	76.1	8.3	14.7	0.9	75.2	8.2	19.4	-2.8	74.5	8.1	23.4	-5.9	73.9	8.0	24.6	-6.5
Rest of SADeC	73.3	24.4	0.0	2.4	72.3	24.0	0.0	3.7	70.7	23.5	0.0	5.8	68.9	22.9	0.0	8.2
Other Sub-Saharan African countries																
Madagascar	83.6	16.3	0.0	0.2	83.9	16.3	0.0	-0.2	83.4	16.2	0.0	0.4	83.1	16.2	0.0	0.8
Nigeria	50.8	29.8	17.0	2.4	51.1	30.0	15.0	3.8	51.3	30.1	13.7	4.9	50.0	29.4	13.0	7.6
Senegal	79.3	20.3	0.0	0.4	79.4	20.3	0.0	0.3	79.4	20.3	0.0	0.2	79.5	20.4	0.0	0.2
Uganda	80.2	19.7	0.0	0.1	79.6	19.6	0.0	0.8	79.0	19.4	0.0	1.6	78.7	19.4	0.0	2.0
Rest of Sub-Saharan Africa	77.9	19.2	0.0	2.9	78.1	19.2	0.0	2.7	78.4	19.3	0.0	2.4	78.4	19.3	0.0	2.4

Source: Author's computation

Table A5: The evolution of the 1$ P0 index:

Country	2005			2010			2015		
	Ref	Sim	Relative variation	Ref	Sim	Relative variation	Ref	Sim	Relative variation
North African countries									
Egypt	1.8	1.8	0.0	0.5	0.4	-12.2	0.2	0.1	-45.5
Tunisia	0.2	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Morocco	0.3	0.3	0.0	0.1	0.1	0.0	0.0	0.0	0.0
South African Customs Union									
South Africa	16.3	16.3	0.0	13.2	13.2	-0.2	11.1	11.0	-0.3
Botswana	24.0	24.0	0.0	20.0	20.0	-0.1	17.9	17.8	-0.4
Southern African Development Community									
Malawi	18.1	18.1	0.0	10.9	10.3	-5.4	7.2	6.7	-7.1
Tanzania	46.3	46.3	0.0	35.5	35.5	0.0	29.8	29.7	-0.1
Zambia	54.1	54.1	0.0	46.7	46.7	0.0	40.0	40.0	0.1
Zimbabwe	68.3	68.3	0.0	74.9	74.8	-0.1	71.5	71.1	-0.7
Other Sub-Saharan African countries									
Nigeria	63.7	63.7	0.0	57.6	57.7	0.2	52.9	53.3	0.6
Senegal	13.1	13.1	0.0	9.1	9.1	-0.4	6.6	6.5	-0.8
Madagascar	60.2	60.2	0.0	54.8	54.8	0.0	50.1	50.1	-0.1
Uganda	79.6	79.6	0.0	76.1	76.1	0.0	73.9	73.9	0.0

Source: Author's computation

Table A6: The evolution of the 1$ P1 index:

Country	2005			2010			2015		
	Ref	Sim	Relative variation	Ref	Sim	Relative variation	Ref	Sim	Relative variation
North African countries									
Egypt	0.3	0.3	0.0	0.1	0.1	-14.3	0.0	0.0	-33.3
Tunisia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Morocco	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South African Customs Union									
South Africa	2.8	2.8	0.0	1.4	1.4	0.0	0.8	0.8	0.0
Botswana	7.8	7.8	0.0	5.9	5.9	-0.2	5.0	5.0	-0.8
Southern African Development Community									
Malawi	3.9	3.9	0.0	1.9	1.8	-7.8	1.1	1.0	-9.3
Tanzania	15.4	15.4	0.0	10.3	10.3	0.0	7.9	7.9	-0.1
Zambia	26.1	26.1	0.0	21.3	21.3	0.0	17.2	17.2	0.1
Zimbabwe	33.0	33.0	0.0	37.9	37.9	-0.2	35.4	35.0	-1.0
Other Sub-Saharan African countries									
Nigeria	29.3	29.3	0.0	24.9	25.0	0.3	21.7	21.9	0.9
Senegal	2.5	2.5	0.0	1.5	1.5	-0.7	1.0	1.0	-1.0
Madagascar	28.4	28.4	0.0	24.6	24.6	0.0	21.5	21.4	-0.1
Uganda	40.1	40.1	0.0	36.3	36.3	0.0	34.0	34.0	-0.1

Source: Author's computation

Table A7: The evolution of the 1$ P2 index:

Country	2005			2010			2015		
	Ref	Sim	Relative variation	Ref	Sim	Relative variation	Ref	Sim	Relative variation
North African countries									
Egypt	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tunisia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Morocco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	#DIV/0!
South African Customs Union									
South Africa	0.9	0.9	0.0	0.4	0.4	0.0	0.2	0.2	0.0
Botswana	3.3	3.3	0.0	2.3	2.3	0.0	1.8	1.8	-0.6
Southern African Development Community									
Malawi	1.3	1.3	0.0	0.5	0.5	-9.3	0.3	0.2	-14.8
Tanzania	6.9	6.9	0.0	4.2	4.2	0.0	3.0	3.0	0.0
Zambia	16.0	16.0	0.0	12.6	12.6	0.1	9.8	9.8	0.1
Zimbabwe	19.7	19.7	0.0	23.5	23.4	-0.3	21.5	21.2	-1.3
Other Sub-Saharan African countries									
Nigeria	17.1	17.1	0.0	14.0	14.1	0.4	11.8	12.0	1.2
Senegal	0.7	0.7	0.0	0.4	0.4	-2.5	0.2	0.2	-4.3
Madagascar	16.5	16.5	0.0	13.8	13.8	0.0	11.6	11.6	-0.2
Uganda	24.1	24.1	0.0	21.0	21.0	0.0	19.1	19.1	-0.1

Source: Author's computation

Table A8: The evolution of the 2$ P0 index:

Country	2005			2010			2015		
	Ref	Sim	Relative variation	Ref	Sim	Relative variation	Ref	Sim	Relative variation
North African countries									
Egypt	37.9	37.9	0.0	27.2	26.4	-3.1	22.0	19.2	-12.8
Tunisia	4.2	4.2	0.0	1.9	1.9	0.0	0.9	0.9	0.0
Morocco	11.5	11.5	0.0	7.2	7.2	0.8	4.6	4.7	1.3
South African Customs Union									
South Africa	31.6	31.6	0.0	27.2	27.2	-0.1	24.1	24.0	-0.2
Botswana	50.0	50.0	0.0	44.2	44.2	0.0	41.0	40.9	-0.3
Southern African Development Community									
Malawi	59.9	59.9	0.0	49.8	48.9	-1.9	42.7	41.6	-2.6
Tanzania	86.3	86.3	0.0	80.6	80.6	0.0	77.0	77.0	0.0
Zambia	81.8	81.8	0.0	77.0	77.0	0.0	72.3	72.3	0.0
Zimbabwe	90.7	90.7	0.0	94.2	94.2	-0.1	92.5	92.2	-0.3
Other Sub-Saharan African countries									
Nigeria	89.8	89.8	0.0	87.4	87.5	0.0	85.4	85.6	0.2
Senegal	50.9	50.9	0.0	44.4	44.3	-0.2	39.2	39.0	-0.3
Madagascar	85.8	85.8	0.0	82.9	82.9	0.0	80.2	80.2	0.0
Uganda	94.9	94.9	0.0	93.9	93.9	0.0	93.2	93.2	0.0

Source: Author's computation

Table A9: The evolution of the 1$ P1 index:

Country	2005			2010			2015		
	Ref	Sim	Relative variation	Ref	Sim	Relative variation	Ref	Sim	Relative variation
North African countries									
Egypt	8.9	8.9	0.0	5.3	5.0	-5.1	3.7	3.0	-19.8
Tunisia	0.8	0.8	0.0	0.3	0.3	0.0	0.1	0.1	0.0
Morocco	2.3	2.3	0.0	1.2	1.2	0.8	0.6	0.7	1.6
South African Customs Union									
South Africa	13.6	13.6	0.0	10.7	10.7	-0.1	8.8	8.8	-0.2
Botswana	22.8	22.8	0.0	19.1	19.1	-0.1	17.2	17.1	-0.5
Southern African Development Community									
Malawi	22.3	22.3	0.0	16.3	15.7	-3.3	12.5	11.9	-4.5
Tanzania	42.8	42.8	0.0	35.3	35.3	0.0	31.0	31.0	-0.1
Zambia	48.4	48.4	0.0	42.7	42.8	0.0	37.5	37.5	0.1
Zimbabwe	57.5	57.5	0.0	62.3	62.2	-0.1	59.9	59.5	-0.6
Other Sub-Saharan African countries									
Nigeria	54.8	54.8	0.0	50.4	50.5	0.2	47.0	47.2	0.5
Senegal	17.7	17.7	0.0	14.2	14.2	-0.3	11.6	11.5	-0.4
Madagascar	52.7	52.7	0.0	48.6	48.6	0.0	45.1	45.1	-0.1
Uganda	64.9	64.9	0.0	61.9	62.0	0.0	60.1	60.1	0.0

Source: Author's computation

Table A10: The evolution of the 1$ P2 index:

Country	2005			2010			2015		
	Ref	Sim	Relative variation	Ref	Sim	Relative variation	Ref	Sim	Relative variation
North African countries									
Egypt	3.0	3.0	0.0	1.5	1.4	-6.7	1.0	0.7	-25.0
Tunisia	0.2	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Morocco	0.7	0.7	0.0	0.3	0.3	3.3	0.1	0.2	7.1
South African Customs Union									
South Africa	7.1	7.1	0.0	5.1	5.1	-0.2	3.9	3.9	-0.3
Botswana	13.0	13.0	0.0	10.5	10.5	0.0	9.2	9.1	-0.7
Southern African Development Community									
Malawi	10.7	10.7	0.0	7.1	6.7	-4.4	5.0	4.7	-5.8
Tanzania	25.3	25.3	0.0	19.2	19.2	0.0	16.0	16.0	-0.1
Zambia	33.6	33.6	0.0	28.5	28.5	0.0	24.0	24.0	0.1
Zimbabwe	41.0	41.0	0.0	45.6	45.5	-0.2	43.2	42.9	-0.8
Other Sub-Saharan African countries									
Nigeria	38.0	38.0	0.0	33.7	33.8	0.2	30.5	30.7	0.7
Senegal	8.1	8.1	0.0	6.1	6.0	-0.3	4.6	4.6	-0.6
Madagascar	36.6	36.6	0.0	32.7	32.7	0.0	29.5	29.4	-0.1
Uganda	47.9	47.9	0.0	44.5	44.5	0.0	42.4	42.4	0.0

Source: Author's computation

Table A11: Global macroeconomic effects on African countries of the indirect tax scenario

	North African countries				South African Customs Union			Southern African Development Community							Other Sub-Saharan African countries				
	Egypt	Tunisia	Morocco	Rest of North Africa	South Africa	Botswana	Rest of SACU	Malawi	Mauritius	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADeC	Nigeria	Senegal	Madagascar	Uganda	Rest of SSA
Macroeconomic effects																			
GDP (vol)	6.4	0.8	1.1	0.0	0.4	0.1	0.2	0.8	2.9	0.0	0.1	0.0	0.2	-0.1	1.3	0.4	0.1	0.1	0.0
Welfare	5.8	0.2	0.1	-0.3	0.3	0.5	0.1	2.6	1.3	-0.2	0.1	-0.1	0.3	-0.4	0.0	0.2	0.2	0.1	-0.3
Real effective exchange rate	-5.1	-0.6	-2.4	0.2	-0.1	0.6	0.2	4.4	-3.0	-0.2	0.5	-0.1	1.1	0.0	-3.2	2.2	1.1	-0.1	-0.2
Terms of trade	-7.3	-1.2	-3.4	-0.7	-0.2	0.4	0.0	4.2	-4.2	-0.4	0.2	-0.3	1.5	-0.4	-2.6	1.0	0.6	-0.3	-0.7
Tariff revenue (points of GDP)	-0.4	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	-0.1
Employment in agricultural sectors	0.6	0.4	1.4	1.4	1.8	5.9	4.7	1.8	5.4	0.6	0.1	0.5	2.4	0.7	0.1	2.0	2.4	0.1	0.3
Employment in non agricultural sectors	-0.3	-0.1	-0.6	-0.5	-0.2	-1.1	-0.7	-1.5	-1.1	-0.3	-0.2	-0.3	-1.0	-0.3	-0.3	-2.5	-2.9	-0.4	-0.3
Trade effects																			
Exports (val)	30.4	3.8	9.7	-0.7	4.1	0.3	1.0	8.5	10.0	-0.8	0.9	-0.6	5.9	-0.6	2.9	6.3	-1.5	-0.6	0.7
Exports (vol)	40.3	4.9	13.1	-0.8	4.2	-0.2	1.0	4.2	14.8	-0.6	0.7	-0.4	4.3	-0.6	5.1	4.4	-2.0	-0.2	1.0
Imports (val)	20.0	3.5	9.8	-1.2	5.7	0.3	0.9	8.4	13.7	-0.8	0.7	-0.3	5.5	-0.6	4.8	3.5	-0.9	0.1	0.6
Imports (vol)	19.9	3.5	9.5	-1.8	5.6	0.3	1.0	8.6	13.8	-0.8	0.8	-0.4	5.5	-0.9	4.4	2.8	-0.8	0.3	0.3
Effects on labor																			
Skilled real wages	9.7	0.2	-0.8	-0.4	0.2	-0.7	-0.2	2.3	-0.6	-0.9	0.0	-0.1	0.4	-0.6	-1.1	0.0	-1.6	-0.2	-0.4
Unskilled real wages	6.5	0.2	0.1	0.0	0.2	0.0	0.1	3.4	2.6	-0.2	0.2	0.2	0.5	-0.2	-1.0	3.2	1.2	0.3	-0.3
Unskilled real wages in agriculture	6.8	0.4	0.8	0.7	1.1	2.9	2.4	4.2	5.3	0.1	0.2	0.5	1.6	0.1	-0.9	4.2	2.4	0.3	-0.2
Unskilled real wages in non agricultural sectors	6.3	0.1	-0.2	-0.2	0.1	-0.5	-0.3	2.6	2.0	-0.3	0.1	0.1	-0.1	-0.4	-1.2	1.9	-0.3	0.1	-0.4
Other factors remuneration																			
Real return to capital	3.3	0.0	-0.3	-0.5	0.2	0.2	0.2	0.3	0.3	-0.2	-0.1	-0.4	-0.5	-0.4	-0.7	-1.0	-1.5	-0.3	-0.5
Real return to land	7.2	0.3	2.2	1.1	1.7	9.7	7.5	5.0	10.0	0.7	0.2	0.8	2.9	0.9	-0.2	5.7	4.4	0.5	-0.1
Real return to natural resources	2.8	-1.3	1.8	-0.5	3.9	-1.6	-0.8	-4.1	5.5	-0.2	0.0	0.9	-2.9	-0.5	3.4	-1.4	0.5	0.6	-0.6

Source: Author's computation

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Table A12: Global macroeconomic effects on African countries of the direct tax scenario

	North African countries				South African Customs Union			Southern African Development Community							Other Sub-Saharan African countries				
	Egypt	Tunisia	Morocco	Rest of North Africa	South Africa	Botswana	Rest of SACU	Malawi	Mauritius	Mozambique	Tanzania	Zambia	Zimbabwe	Rest of SADeC	Nigeria	Senegal	Madagascar	Uganda	Rest of SSA
Macroeconomic effects	9.8	1.1	4.7	0.0	1.0	0.0	0.2	0.0	10.4	-0.1	-0.2	0.3	-3.5	-0.1	6.9	0.2	1.1	1.7	0.0
GDP (vol)	5.0	0.0	-1.4	-0.3	0.1	0.8	0.1	2.7	-1.5	-0.2	0.1	-0.1	0.8	-0.4	-2.6	0.3	0.1	-0.1	-0.3
Welfare	-4.1	-0.5	-1.6	0.2	0.0	0.5	0.1	4.1	-0.6	-0.3	0.4	0.0	0.0	0.0	-2.1	2.1	1.2	0.3	-0.2
Real effective exchange rate	-6.2	-1.2	-2.7	-0.7	-0.1	0.4	0.0	4.0	-2.3	-0.4	0.2	-0.2	0.5	-0.4	-1.2	1.0	0.8	0.1	-0.7
Terms of trade	-0.4	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	-0.1
Tariff revenue (points of GDP)	0.1	0.4	0.3	1.4	1.8	5.9	4.7	1.8	5.0	0.6	0.1	0.4	2.4	0.7	-0.8	2.0	2.3	0.0	0.3
Employment in agricultural sectors	0.0	-0.1	-0.1	-0.5	-0.2	-1.1	-0.7	-1.5	-1.0	-0.3	-0.2	-0.2	-1.0	-0.3	2.1	-2.5	-2.7	0.1	-0.2
Employment in non agricultural sectors																			
Trade effects	31.5	3.9	11.4	-0.7	4.3	0.2	0.9	8.0	14.5	-0.9	0.8	-0.4	4.4	-0.6	5.3	6.2	-1.0	0.4	0.7
Exports (val)	39.9	4.9	14.0	-0.7	4.3	-0.1	1.0	4.0	17.1	-0.6	0.6	-0.2	3.9	-0.6	6.0	4.3	-1.7	0.4	1.0
Exports (vol)	19.9	3.5	10.5	-1.2	5.8	0.3	0.9	8.2	15.9	-0.8	0.6	-0.2	5.1	-0.6	5.7	3.5	-0.7	0.4	0.6
Imports (val)	19.7	3.5	10.2	-1.8	5.7	0.4	1.0	8.5	15.9	-0.8	0.7	-0.2	5.1	-0.9	5.3	2.8	-0.5	0.6	0.3
Imports (vol)																			
Effects on labor	9.7	0.1	-0.7	-0.4	0.1	-0.3	-0.2	2.2	-2.4	-0.8	-0.1	0.0	-0.1	-0.6	-1.5	0.0	-1.2	0.6	-0.4
Skilled real wages	5.9	0.0	-1.2	0.0	0.0	0.4	0.1	3.4	0.5	-0.1	0.2	0.2	0.6	-0.2	-5.5	3.2	1.2	-0.1	-0.3
Unskilled real wages	6.0	0.2	-1.0	0.7	0.9	3.3	2.4	4.3	3.0	0.2	0.3	0.4	1.8	0.1	-5.9	4.2	2.3	-0.1	-0.2
Unskilled real wages in agriculture	5.9	-0.1	-1.2	-0.2	-0.1	-0.2	-0.3	2.6	0.0	-0.3	0.1	0.1	0.1	-0.4	-4.5	1.9	-0.2	0.0	-0.4
Unskilled real wages in non agricultural sectors																			
Other factors remuneration	2.7	-0.1	-2.6	-0.5	-0.2	0.4	0.1	0.7	-3.9	-0.1	0.0	-0.5	0.6	-0.4	-4.3	-1.0	-1.9	-0.9	-0.5
Real return to capital	5.4	0.0	-1.0	1.1	1.3	10.2	7.4	5.2	6.4	0.8	0.3	0.6	3.5	0.9	-5.9	5.7	4.0	-0.2	-0.1
Real return to land	2.9	-1.4	0.4	-0.5	3.9	-1.3	-0.8	-4.0	3.6	-0.2	-0.1	0.9	-4.7	-0.5	3.6	-1.5	0.6	1.0	-0.6
Real return to natural resources	9.8	1.1	4.7	0.0	1.0	0.0	0.2	0.0	10.4	-0.1	-0.2	0.3	-3.5	-0.1	6.9	0.2	1.1	1.7	0.0

Source: Author's computation

Table A13: The evolution of the 1$ P0 index:

P0_1dol	Value in the BaU scenario		Level			Variation according to the BaU scenario		
Countries	Ref 2005	Ref 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015
North African countries								
Egypt	1.77	0.22	0.12	0.12	0.13	-45.5	-45.5	-40.9
Tunisia	0.18	0.02	0.02	0.02	0.02	0.0	0.0	0.0
Morocco	0.32	0.03	0.03	0.03	0.03	0.0	0.0	0.0
South African Customs Union countries								
South Africa	16.34	11.07	11.04	11.03	11.05	-0.3	-0.4	-0.2
Botswana	24	17.88	17.8	17.8	17.74	-0.4	-0.4	-0.8
Southern African Development Community								
Malawi	18.14	7.16	6.65	6.67	6.65	-7.1	-6.8	-7.1
Tanzania	46.31	29.75	29.72	29.73	29.72	-0.1	-0.1	-0.1
Zambia	54.09	40.01	40.04	40.03	40.05	0.1	0.0	0.1
Zimbabwe	68.3	71.53	71.05	71.32	71.01	-0.7	-0.3	-0.7
Other Sub-Saharan African countries								
Nigeria	63.74	52.94	53.25	52.92	53.93	0.6	0.0	1.9
Senegal	13.05	6.55	6.5	6.5	6.5	-0.8	-0.8	-0.8
Madagascar	60.24	50.1	50.05	50.04	50.07	-0.1	-0.1	-0.1
Uganda	79.57	73.93	73.92	73.89	73.96	0.0	-0.1	0.0

Source: Author's computation

Table A14: The evolution of the 1$ P1 index:

P1_1dol	Value in the BaU scenario		Level			Variation according to the BaU scenario		
Countries	Ref 2005	Ref 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015
North African countries								
Egypt	0.25	0.03	0.02	0.02	0.02	-33.3	-33.3	-33.3
Tunisia	0.04	0.01	0.01	0.01	0.01	0.0	0.0	0.0
Morocco	0.05	0.01	0.01	0.01	0.01	0.0	0.0	0.0
South African Customs Union countries								
South Africa	2.76	0.81	0.81	0.8	0.81	0.0	-1.2	0.0
Botswana	7.79	4.99	4.95	4.95	4.93	-0.8	-0.8	-1.2
Southern African Development Community								
Malawi	3.91	1.07	0.97	0.97	0.97	-9.3	-9.3	-9.3
Tanzania	15.42	7.89	7.88	7.88	7.88	-0.1	-0.1	-0.1
Zambia	26.05	17.2	17.22	17.21	17.22	0.1	0.1	0.1
Zimbabwe	33.04	35.4	35.04	35.24	35.01	-1.0	-0.5	-1.1
Other Sub-Saharan African countries								
Nigeria	29.25	21.74	21.94	21.73	22.39	0.9	0.0	3.0
Senegal	2.5	0.96	0.95	0.95	0.95	-1.0	-1.0	-1.0
Madagascar	28.35	21.47	21.44	21.43	21.45	-0.1	-0.2	-0.1
Uganda	40.14	34	33.98	33.95	34.02	-0.1	-0.1	0.1

Source: Author's computation

Table A15: The evolution of the 1$ P2 index:

P2_1dol	Value in the BaU scenario		Level			Variation according to the BaU scenario		
Countries	Ref 2005	Ref 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015
North African countries								
Egypt	0.07	0.01	0.01	0.01	0.01	0.0	0.0	0.0
Tunisia	0.02	0.01	0.01	0.01	0.01	0.0	0.0	0.0
Morocco	0.01	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
South African Customs Union countries								
South Africa	0.93	0.24	0.24	0.24	0.24	0.0	0.0	0.0
Botswana	3.29	1.79	1.78	1.78	1.76	-0.6	-0.6	-1.7
Southern African Development Community								
Malawi	1.25	0.27	0.23	0.24	0.23	-14.8	-11.1	-14.8
Tanzania	6.94	3	3	3	3	0.0	0.0	0.0
Zambia	16	9.79	9.8	9.79	9.8	0.1	0.0	0.1
Zimbabwe	19.69	21.48	21.2	21.36	21.18	-1.3	-0.6	-1.4
Other Sub-Saharan African countries								
Nigeria	17.08	11.84	11.98	11.83	12.29	1.2	-0.1	3.8
Senegal	0.72	0.23	0.22	0.22	0.22	-4.3	-4.3	-4.3
Madagascar	16.49	11.6	11.58	11.57	11.58	-0.2	-0.3	-0.2
Uganda	24.07	19.13	19.12	19.1	19.15	-0.1	-0.2	0.1

Source: Author's computation

Table A16: The evolution of the 2$ P0 index:

P0_2dol	Value in the BaU scenario		Level			Variation according to the BaU scenario		
Countries	Ref 2005	Ref 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015
North African countries								
Egypt	37.85	22	19.18	19.11	19.39	-12.8	-13.1	-11.9
Tunisia	4.21	0.86	0.86	0.85	0.86	0.0	-1.2	0.0
Morocco	11.46	4.61	4.67	4.61	4.81	1.3	0.0	4.3
South African Customs Union countries								
South Africa	31.58	24.05	24	23.98	24.02	-0.2	-0.3	-0.1
Botswana	49.96	41.02	40.89	40.9	40.81	-0.3	-0.3	-0.5
Southern African Development Community								
Malawi	59.9	42.7	41.6	41.64	41.59	-2.6	-2.5	-2.6
Tanzania	86.28	77.03	77.01	77.01	77.01	0.0	0.0	0.0
Zambia	81.76	72.32	72.34	72.33	72.34	0.0	0.0	0.0
Zimbabwe	90.72	92.5	92.24	92.39	92.22	-0.3	-0.1	-0.3
Other Sub-Saharan African countries								
Nigeria	89.83	85.42	85.56	85.42	85.85	0.2	0.0	0.5
Senegal	50.86	39.15	39.04	39.05	39.04	-0.3	-0.3	-0.3
Madagascar	85.83	80.23	80.2	80.19	80.21	0.0	0.0	0.0
Uganda	94.9	93.17	93.17	93.16	93.18	0.0	0.0	0.0

Source: Author's computation

Table A17. The evolution of the 2$ P1 index:

P1_2dol	Value in the BaU scenario		Level			Variation according to the BaU scenario		
Countries	Ref 2005	Ref 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015
North African countries								
Egypt	8.94	3.73	2.99	2.97	3.04	-19.8	-20.4	-18.5
Tunisia	0.77	0.11	0.11	0.11	0.11	0.0	0.0	0.0
Morocco	2.27	0.64	0.65	0.64	0.68	1.6	0.0	6.3
South African Customs Union countries								
South Africa	13.57	8.82	8.8	8.79	8.81	-0.2	-0.3	-0.1
Botswana	22.78	17.19	17.11	17.11	17.06	-0.5	-0.5	-0.8
Southern African Development Community								
Malawi	22.31	12.5	11.94	11.96	11.94	-4.5	-4.3	-4.5
Tanzania	42.76	31.02	30.99	30.99	30.99	-0.1	-0.1	-0.1
Zambia	48.38	37.48	37.5	37.5	37.51	0.1	0.1	0.1
Zimbabwe	57.54	59.88	59.53	59.73	59.51	-0.6	-0.3	-0.6
Other Sub-Saharan African countries								
Nigeria	54.81	46.96	47.19	46.95	47.69	0.5	0.0	1.6
Senegal	17.72	11.56	11.51	11.51	11.51	-0.4	-0.4	-0.4
Madagascar	52.65	45.09	45.06	45.04	45.07	-0.1	-0.1	0.0
Uganda	64.88	60.06	60.05	60.02	60.08	0.0	-0.1	0.0

Source: Author's computation

Table A18: The evolution of the 2$ P2 index:

P2_2dol	Value in the BaU scenario		Level			Variation according to the BaU scenario		
countries	Ref 2005	Ref 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015	Lump sum 2015	Tax dir 2015	Tax indir 2015
North African countries								
Egypt	2.96	0.96	0.72	0.71	0.73	-25.0	-26.0	-24.0
Tunisia	0.24	0.03	0.03	0.03	0.03	0.0	0.0	0.0
Morocco	0.67	0.14	0.15	0.14	0.16	7.1	0.0	14.3
South African Customs Union countries								
South Africa	7.05	3.92	3.91	3.9	3.91	-0.3	-0.5	-0.3
Botswana	13.02	9.17	9.11	9.12	9.08	-0.7	-0.5	-1.0
Southern African Development Community								
Malawi	10.69	4.99	4.7	4.71	4.7	-5.8	-5.6	-5.8
Tanzania	25.27	15.98	15.96	15.97	15.96	-0.1	-0.1	-0.1
Zambia	33.56	24.01	24.03	24.02	24.03	0.1	0.0	0.1
Zimbabwe	41.01	43.24	42.91	43.1	42.88	-0.8	-0.3	-0.8
Other Sub-Saharan African countries								
Nigeria	37.98	30.48	30.69	30.47	31.16	0.7	0.0	2.2
Senegal	8.07	4.64	4.61	4.61	4.61	-0.6	-0.6	-0.6
Madagascar	36.58	29.47	29.44	29.43	29.45	-0.1	-0.1	-0.1
Uganda	47.87	42.38	42.37	42.34	42.41	0.0	-0.1	0.1

Source: Author's computation